代表性教研论文

序号	论文名称	期刊	时间	作者	位次
1	Research on Information-based Talent Cultivation Mode in New Zealand	武汉大学学报信息科学版	2014	林金娇	1/5
2	Abnormal video homework automatic detection system	Journal of Ambient Intelligence and Humanized Computing	2021	林金娇	1/4
3	Entity Coreference Resolution for Syllabus via Graph Neural Network	Intelligent Computing and Block Chain	2020	林金娇	1/5
4	Micro-video Learning Resource Portrait and Its Application	Human Centered Computing	2020	林金娇	1/5
5	Domain knowledge graph-based research progress of knowledge representation	Neural Computing and Applications	2021	林金娇	1/5
6	Personalized Learning Service Based on Big Data for Education	2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)	2020	林金娇	1/4
7	Video Knowledge Discovery Based on Convolutional Neural Network	Cloud Computing, Smart Grid and Innovative Frontiers in Telecommunications	2019	林金娇	1/6
8	Design and Implementation of Family Doctor App on Android Platform	2018 10th International Conference on Information Technology in Medicine and Education (ITME)	2018	刘位龙	1/4
9	Sparse Linear Method Based Top-N Course Recommendation System with Expert Knowledge and L0 Regularization	International Conference on Human Centered Computing	2017	林金娇	1/4
10	Mobile Learning knowledge architecture Construction and resource Integration in Information Management and Information System	2016 8th International Conference on Information Technology in Medicine and Education (ITME)	2016	林金娇	1/1
11	The Construction and Implementation of Seminar Teaching Model for Information Management and Information System Specialty	DEStech Transactions on Computer Science and Engineering	2016	林金娇	1/1
12	Experimental Case Design of "Mobile Device Programming" for Specialty of Information Management and Information System	2016 8th International Conference on Information Technology in Medicine and Education (ITME)	2016	杨潇	1/1
13	Course Reform of Mobile Device Programming for Information Management and Information System	3rd International Conference on Education, Management, Arts, Economics and Social Science	2015	杨潇	1/2

序号	论文名称	期刊	时间	作者	位次
14	An Information Professional Personnel Training Mode Based on Social Requirement of Independent Colleges	2nd International Conference on Teaching and Computational Science	2014	林金娇	1/4
15	The Adaptation of Mobile Learning System Based on Business Rules	Journal of Measurement Science and Instrumentation	2010	林金娇	1/1
16	Research on university information system oriented business adaptability	2009 IEEE International Symposium on IT in Medicine & Education	2009	林金娇	1/1
17	大数据背景下信息管理与信息系统专业人才培养模式研究 ——以山东财经大学为例	中国管理信息化	2017	张戈	1/3
18	基于社会需求的信息管理与信息系统专业人才培养模式研究	中国管理信息化	2014	林金娇	1/4
19	信息管理与信息系统专业实践教学体系研究——基于 CISC2010 研究成果	中国管理信息化	2011	张戈	1/3
20	基于项目驱动的“管理信息系统”课程教学研究	现代教育技术	2008	张戈	1/3
21	大学生自我认知的作用机理、差异测评模型及提升路径探析	宿州教育学院学报	2022	徐德英	1/1

DOI: Article ID：1671-8860（2014）00-0000-00

Research on Information-based Talent Cultivation Mode in New Zealand

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Abstract: At present the world higher education is developing rapidly. Guaranteeing the quality of talent cultivation is one of the important issues that the Universities widespread care. In this paper it firstly analyzes the concept of talent cultivation in New Zealand, then introduces the majors, curriculum, teaching structure, students and teachers of Information-based talent cultivation in Unitec. Finally it points out the impacts of Information-based talent cultivation mode in New Zealand on the Information-based talent cultivation of independent colleges in China.

Keywords: Information-based Talent cultivation; Higher Education in New Zealand; Students-centered; Social Demand

1 Introduction

At present the world higher education is developing rapidly. Guaranteeing the quality of talent cultivation is one of the important issues that the Universities widespread care[1-2]. Today, our country's higher education are experiencing great changes from elite education to popular education. On the one hand, plenty of graduates step into the society every year and cannot find appropriate jobs, one the other hand the talents gap increases, too. Hence the quality of talent cultivation is more important than before. It should be studied that how to construct one set of up and down through qualification architecture and quality assurance architecture[3]. To review New Zealand, although the political system and culture background is different from China, it plays the important role in New Zealand education development especially the higher education development. In this paper, starting from the practical problems of independent colleges Information-based talent cultivation in China, with the main researching objects of information talent cultivation education quality assurance architecture in unitec, through the systematical analysis of quality assurance architecture, it summarizes the successful experience and supplies with reference to information talent cultivation development in China.

In New Zealand, higher education talent cultivation not only supplies with professional education and training to students of different age levels, raises the qualified talents that the enterprises demand, and promotes the local economy development; it also supplies with life training opportunities to the people in New Zealand following the situation that the Information-based development of science and technology, more high school graduates and adults of different age levels choosing higher education to accept their learning and training; finally, with the enhancement of international communication, higher education in New Zealand is becoming more market oriented and internationalized, which helps to attract plenty of students from abroad and promotes the higher education internationalized.

Unitec institution of science and technology is one unique higher education organization, which demands the students to grasp one obvious prominent skill[4]. The teaching methods of the institution is to combine the academic standards, theories with technology and professional advantages in higher institution together. At present, the talent cultivation of independent colleges in China is researching on the same issue and how to enhance the social competition and suit the social demand of students. Thus, it is meaningful to research on the impact of the talent cultivation mode of Unitec institution of science and technology to the talent cultivation mode of independent colleges in China.

As visiting scholar the author experiences the Information-based talent cultivation mode in school of computing, Unitec. Therefore, in this paper it introduces and analyzes the four layers of majors, curriculum, students and teachers. Finally it gives the reference of Information-based talent cultivation mode to Information-based talent cultivation of independent colleges in China.

2 Major setup of information-based talent cultivation in unitec

2.1 The basis of major setup

The majors of information talent cultivation in Unitec keep up with the development of industry and enterprises, which is the basis point of economy development and society service, and is also one of the basic factors of institution of science and technology enrollment. Major setup is market oriented, it should accord to the market requirement to set up the majors and set

Received on April 7, 2014.

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Foundation Support: Shandong Science and Technology Development Project,Nos.2012GGX10122, 2013G0021109; the Shandong Province Higher Educational Science and Technology Program,Nos.J11LG21, J13LN35;Jinan Science and Technology Development Project ,No.201202058, Teaching Reform of the Key Project of Shandong Province ,No.2012073 ; International Cooperation Program for Excellent Lecturers by Shandong Provincial Education Department, and Teaching Research Project of Shandong University of Science and Technology ,No.qx2013286.

up the integrated majors to realize the communication and integration of relative and different subjects. The major setup should also satisfy following requirement, such as: firstly, it must be examined and approved by corresponding departments and organizations; then, it should satisfy the needs of industry and enterprises; finally, it should satisfy the interests of the students. Therefore, it is to say that the major setup of Information-based talent cultivation in Unitec is totally determined by the social requirement.

2.2 The characteristics of major setup

According to the basis of major setup we can get that the characteristics of major setup in Information-based talent cultivation process are as follows:

First, market oriented

The major setup of Unitec all are based on the tight communication with industry and enterprises, it has characteristic of pertinence, applicability and practicalness and should follow the market requirement to set subjects and courses.

Second, to raise the applied skill talents

The raising objective of Information-based education in Unitec is clear, is to raise applied skill talents. In order to realize the raising objective, the industry, enterprises all should join in the process of subjects and courses planning, implementation, and evaluation. And the main objective should be realize the talent cultivation of the industry and enterprises need through subject setup and form the industry oriented education system.

Third, strong regional

The programs and internship units of school of computing, Unitec locates in every areas of New Zealand, and the objective is to satisfy practical requirement of the local economy development and industry talent cultivation.

3 The curriculum setup of information talent cultivation in unitec

3.1 The concept of curriculum setup-competence based view

The competence based view of curriculum reflects the transition from traditional teaching process to learning process. The center of curriculum is not the teachers but the students, the teachers become part of students' learning resource and the promoter and organizer of the students' learning. According to the individual difference of students to offer different courses, acknowledge the former knowledge that the students learned(formal or informal courses). The curriculum is totally customers' requirement oriented, the curriculum content contains the knowledge, skills and attitudes for competence, it also reflects ability requirement to practitioners of occupation post and professional role directly, it would form ability standards through professional ability analysis and transform the ability standards into courses. Adopting the module curriculum structure, professional ability centered, and according to ability unit or ability element to develop the learning modules. The ultimate curriculum objective focuses on cultivating competent workers, problem solvers, and life learners.

3.2 The structure of curriculum setup-module

The curriculum in school of computing, Unitec fits the practical requirement of business industry, and must pass the evaluation or authorization of New Zealand Qualification Association. And the institution adopts Unit&Module curriculum operation way, the students would choose different modules and make different curriculum programs according to their own ability and requirement.

One module is one relatively independent but intact learning unit, it relates to certain credits, the certification training and diploma education of every level correspond to one group of modules and corresponding credits. Independent and intact module is the basic unit of the whole module curriculum, the direct objects of students would elect, and the basic unit of students examination and evaluation.

The module is not absolutely isolated but relatively independent, it relates with other modules in corresponding learning fields, would point to bigger raising objective of composing intact module curriculum, and link up with corresponding professional certification. The curriculum includes the core modules and elective courses, the modules that the students would choose should conform to the requirement of the curriculum.

In order to assure the integration of flexibility and systematicness, all the students must learn the core modules, the students' elective module should be instructive to the students, should help to the students to formulate the learning plan, the module curriculum stipulates that only the qualified students can learn the module, and they can only get corresponding credits through finishing one module. The teaching adopts small class size, and one by one individual tutoring and group discussion forms. With students' interests centered, teachers oriented and the students as the subject in the teaching process, it pays attention to individual development of students and the teachers would support the students with service. In the classroom teaching process, the teachers' explanation is mainly adopted, the teachers instructs the students how to learn, but most time the students learn study independently and the learning time is relatively flexible, but the students must finish every module in required time.

3.3 The characteristics and examination standards of curriculum

The curriculum setup focuses on praticalness and implementation, most courses relate intensely to Information-based talents education or training, and usually there is no culture fundemental courses and P.E. kinds of public courses. The teaching of courses combine theory with practice, and it focuses on practical application and professional training.

Besides the independent practical teaching steps, the theory teaching and learning integrates with the practical training, especially the strongly practical courrses, basically the courses are carried out with the combination of scene teaching, speaking, doing, and practising in practice classrooms or corresponding major classrooms. There are strict standards to the curriculum in the institution. Firstly, every course has detailed examination standards, such as, through this course, what should you know? What should you do? What extent should you reach? All of them have corresponding standards, which should be satisfied. Secondly, examination process runs through the learning process, the ordinary homework, paper, report and design has strict examination, and should be record and taken as accordance of final score.

4 Information talent cultivation teaching staff in unitec

The recruitment of new teachers in Unitec adopts competitive mechanism and public oriented, the recruitment is carried out by the human resource department, the hiring is appointed by the council and sign the contraction finally. For cultivating applied talents with strongly practical skills, the school of computing is responsible for the appointment qualification of the teachers.

Besides common degree requirement, full time teachers must satisfy following conditions: 3 to 5 years major working experience, appropriate skill qualification especially the teaching qualification(adult education diploma), University degree attained, through specific training, sophisticated teaching and cultivatting methods. Before the teachers are hired, they must pass probation period of one year to gradually enrich academic attainments, major knowledge background and abundant teaching experience. The teacher team is composed of full time teachers and part time teachers, and the part time teachers are more that the full time teachers.

The school of computing, Unitec also focuses on hiring part time teachers from the talent market to remedy the deficiency of full time teachers. The main standards of hiring part time teachers are: three or more years of major working experience, appropriate major skill qualification, strong ability of producing operation. Because the part time teachers have higher society status, generous material treatment, and the hiring process is fair and public, it attracts plenty of sophiscated professional skillers of enterprises and industry to apply for the positions. They not only have solid professional knowledge and abundant practical experience but also integrate the newest situaton producing, operating, managing technology improvement with the content that students learned and timely teach the students to relate the theory with practice. The hiring of part time teachers makes up the deficiency of teachers because of major transition, which contributes the exchange of full time and part time teachers and enhances the quality of the talents that the institution raised.

5 The information-based talent cultivation students in unitec conclusion

New Zealand requires that the students from scholl of science and technology should insist “easy in and hard out”. During the enrollment, the enrollment age is flexible, besides the current graduate from middle school, there are plenty of adults. For age, most of the students are 18 years old, but generally there are still more adults in the campus. It can be seen that the enrollment age requirement is loose, the college considers that the high education is life education, which also reflects that the update of knowledge and skill is rapid, and the requirement of workers’ knowledge and skill. Many graduates from middle school enter the society to look for jobs, because that the employers in New Zealand regard experience as important factor, after the students have accumulated specific working experience, according to working or personal knowldege development, the students go back to school of science and technology to carry out further learning to increase their own knowledge skill and attain education certificate. Thus, the part time students are dominant in the school of science and technology. Many students are working students, some of the take part time job and the others take full time work and studey only in their spare time. The graduation process is strict, usually the qualification examination is adopted(it is kind of combining academic achievement test with professional qualification certificate), which means that the students not only need to attain the education certificate but also the skill level certificate or professional qualification that could reflect the corresoponding professional ability and skill level.

The core of student quality assurance is the framework of education qualification certificate in New Zealand, through which the knowledge that student has learned and the experience that the student has earned both can attain authorized qualification certificte. In 1991, New Zealand formally issued and executed the national unified qualification framework and the qualification certificate system. The qualification certificate is the authorization of learning result and ability coming from personal learning, training, and working experience, it can prove the personal knowledge and skill. The school of science and technology, Unitec adopts the credit accumulation way, which is convinient for students to choose the appropriate qualification certificate level according to their own condition and quality, flexiblely satisfies the needs of students of different level and type, and makes the students would achieve the quality standard of talent culitivation. The special agency in New Zealand divides the different academic education, training, and corresponding adademic and professional qualification after Grade 11

into 10 levels according to knowledge skill, professional ability, education level, basic education length, education degree that the students should attain. Every level has corresponding national qualification standard, meanwhile it should accrod with nationally authorized certificate and diploma. 1 to 4 level are certificate training, 4 to 6 level are diploma education(corresponding to junior college), 5 to 8 level are degree education(corresponing undergraduated and bachlor degreee), 8 to 10 level are postgraduate education. The professional education in New Zealand equals to 1 to 8 level area, among which 1 to 4 level training are corresponding to junior professional education in China, 4 to 8 level are corresponding to senior professional education in China. The school of science and technology, Unitec is the principal part of executing professional education, basically it carries out the degree education and different certificate training of 3 to 8 level.

6 The reference of information-based talent cultivation quality assurance system to information-based talent cultivation of independent college in china

6.1 To establish the diversified quality assurance system

Independent college, in which the cultivated talents must contact with the market with zero distance, is one special form of higher education, it must satisfy the employment requirement of zero distance, its cultivation objective, subject setup, facility should follow the development rule of higher education, meanwhile follows the development of times, science, and technology to continuely update the professional skill and knowledge. It is to say that the independent college should not only meet the quality indexes that the government education department requires but also satisfy the requirement of industry enterprises, changing talent market, and the college it self. Therefore, the education quality of independent college need to show the requirement of society, industry, and the college itself, but in China the government is the subject of quality assurance form, and relects the quality assurance requirement of the government which can not adapt to the development requirement of independent college now. Therefore the subject of diversely cooperative quality assurance should be established by government, society, and the college, and it is also the development trend of establishing quality assurance subject in developed countries. During the establishment of quality assurance system, the government, society, and college should become independent and related subjects, among which the government is the guidance, the society is the evaluation basement, and the college locates in the core position of self monitoring. The subject of diversely cooperative quality assurance not only enhances the popularity and transparency of social participation and education management, increases the social acceptance to independent college, also gives the college more self adjusting space, and increases the self quality control consciousness, which would more effectively assures the quality of the independent college education.

6.2 To establish the professional evaluation authority

Comparing with New Zealand the levels and types of Chinese higher education are more complicated, and the evaluation organization in New Zealand still has no such sub evaluation organization to evaluate so many kinds of college. Therefore, the establishment of different evaluation organization to evaluate the different type of college is one effective assurance way. The establishment of specialized evaluation organization should take the concept of diverse higher professional quality as the guidance, according to the practical situation of Information-based talent education development in China, through establishing national standard of different types of independent colleges to form independent third party evaluation organization and industry quality qualification organization and form the all-dimensional quality assurance network architecture integrated with nation, areas, and independent colleges. In order to assure the scientificity and authority of evaluation, different types of specialized evaluation organizations or associations lead by government, organized by famous people, experts, and industry representatives from specialized field to exacture the evaluation, and effectively makes use of the evaluation result, which would make the relative persons(students, parents, enterprises) to understand the Information-based talent education quality of independent college and satisfy their own needs.

6.3 To improve the quality assurance mechanism of teacher

At present the teachers of independent college in China mainly are graduates from ordinary higher school, there are few teachers can satisfy the social requirement of Information-based talent education, which severely affects the education quality of independent college.

There has been improved teacher quality assurance mechanism in developed countries. We can learn the successful experience from them to establish strict, appropriate teacher qualification way of independent college, widen the source channel of professional teachers, execute the open teacher cultivation system, carry out training to different teachers, and generally evaluate the teachers' work regularly.Firstly, to carry out the pre-employment training of the new teachers, including teaching and skill practice. The teaching practice adopts tutoring, observing. The skill practice is used to examine the practical operation ability of teacher, through the process the teachers can attain specific skill certificate and corresponding practical skill, and it could enhance the establishment of double certificate teachers. Secondly, following the development of society, science, technology, and knowledge, the Information-based talent cultivation of independent college

must update to follow the development, so it must support the professional training and further education of the working teachers. The whole evaluation of the teacher not only includes the theroy teaching evaluation, practice teaching evaluation, and assessment of scientific research, but also includes the self moral evaluation of the teacher, through the evaluation they can find out the ineffeciency and adjust themselves in time.

6.4 To establish and improve the professional qualification system

At present in China, there is no scientific qualification evaluation system, and there are same certificates from different department, which makes the responsibility confusing. Thus the professional qualification system should be established in China. Firstly, The specialized management organization should be established by the country, and the organization should take charge of the mangement of all the qualification certificates. Secondly, the specialized organizaiton should establish the framework architecture of national professional qualification to wholy manage the classification of education background and certificate as well as the corresponding relationship of every professional qualification. Thirdly, there should be specialized organization to take charge of the national professional qualification authorization. Fourthly, the labor access system should be executed strictly, and gradually step into professional qualification certificate. Fifthly, the professional qualification system should dock with the international system, and pass the international authorization.

6.5 To give full play of professional organization

The professional organizations can play more practical role in management of professional education and training, which has been adopted by New Zealand and other developed courtries. We should encourage and promote to establish this kind of organizations, to which the functional departments should authorize more responsibilities of professional qualification, organization training, subject and curriculum development and quality evaluation, and allow them to work effectively in professional qualification standard establishment, policy survey, and human resource development.

7 Conclusion

Although New Zealand is only one island country, its education system is considered as one of the best education systems in the world. In New Zealand, every citizen has his own right to enjoy approriate way of education that would release their abilities, and has the chance of life education. The school of science and technology, Unitec in New Zealand, which insists life education concept, regards ability as standard, employment as guidance, according to requirement of local development, it sets up various types of subjects and courses, which relate with market and enterprises, it also cultivates applied skill talents of different levels that the society and market requires. The most important part of education process is subjective initiative of the students, who follow their situation to learn and truly integrate professional education with life education. At present the development of independent colleges in China are facing new chanllenges and opportunies, during the development process we need to learn and imitate the foreign anvanced experience, and the successful experience of school of science and technology, Unitec in New Zealand should be one of our choices.

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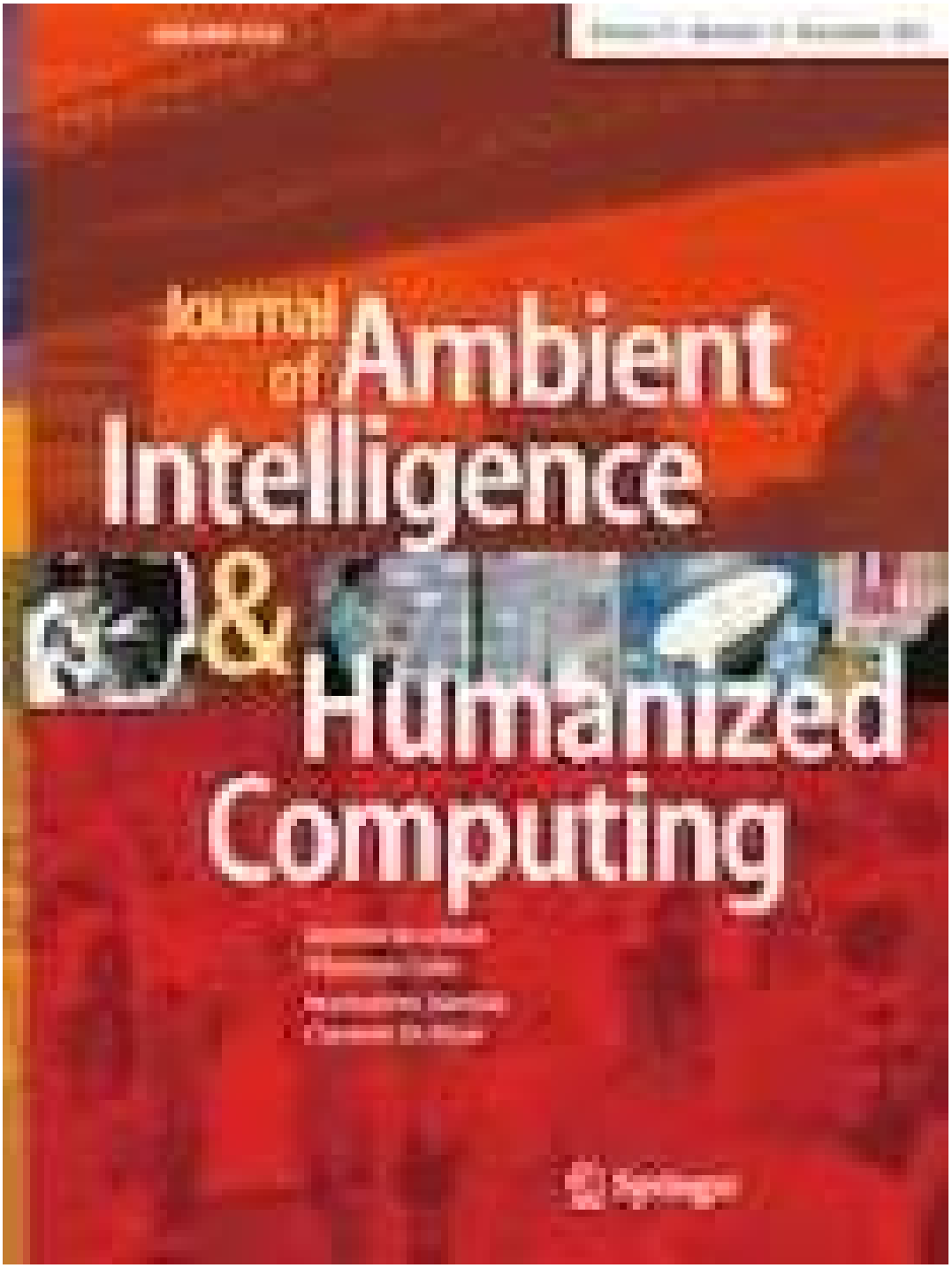


Volume 12, issue 12, December 2021

27 articles in this issue

1. A novel and efficient approach for the classification of skin melanoma

Authors

- A. Sherly Alphonse
- M. S. Starvin
- Content type: Original Research
- Published: 05 November 2020
- Pages: 10435 - 10459

2. **Gender recognition in the wild: a robustness evaluation over corrupted images**

   Authors (first, second and last of 4)

   - Antonio Greco
   - Alessia Saggese
   - Vincenzo Vigilante
   - Content type: Original Research
   - Open Access
   - Published: 23 December 2020
   - Pages: 10461 - 10472

3. **Taxonomy of controller placement problem (CPP) optimization in Software Defined Network (SDN): a survey**

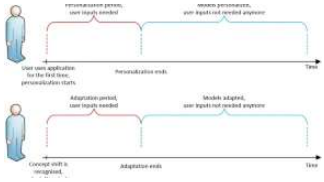
   Authors

   - Alireza Shirmarz
   - Ali Ghaffari
   - Content type: Original Research
   - Published: 03 January 2021
   - Pages: 10473 - 10498

4. **Context-aware incremental learning-based method for personalized human activity recognition**

   Authors

   - Pekka Siirtola
   - Juha Röning
   - Content type: Original Research
   - Open Access
   - Published: 02 January 2021
   - Pages: 10499 - 10513



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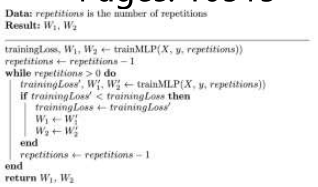
   Authors (first, second and last of 4)

   - José M. Valls
   - Ricardo Aler
   - David Camacho
   - Content type: Original Research
   - Published: 04 January 2021
   - Pages: 10515 - 10527



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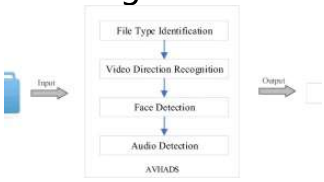
   Authors (first, second and last of 4)

   - Jinjiao Lin
   - Yanze Zhao
   - Haitao Pu
   - Content type: Original Research
   - Published: 06 January 2021
   - Pages: 10529 - 10537



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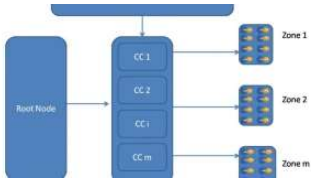
   Authors

   - Deepnarayan Tiwari
   - G. R. Gangadharan
   - Content type: Original Research
   - Published: 23 January 2021
   - Pages: 10539 - 10563



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   Authors (first, second and last of 6)

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   - Tamam Alsarhan
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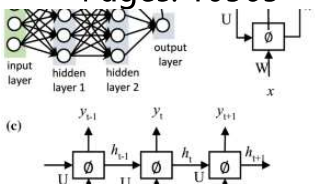
   - Content type: Original Research
   - Published: 07 January 2021
   - Pages: 10565 - 10580



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   Authors

   - Venkata Rami Reddy Chirra
   - Srinivasulu Reddy Uyyala
   - Venkata Krishna Kishore Kolli
   - Content type: Original Research
   - Published: 16 March 2021
   - Pages: 10581 - 10599

10. **Deep learning neural networks for acrylamide identification in potato chips using transfer learning approach**

    Authors

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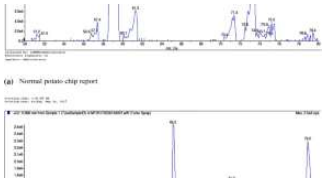
    - Parthasarathi Mangipudi
    - Malay Kishore Dutta
    - Content type: Original Research
    - Published: 05 January 2021
    - Pages: 10601 - 10614



11. **Tool monitoring of end milling based on gap sensor and machine learning**

Authors (first, second and last of 5)

- Siti Nurfadilah Binti Jaini
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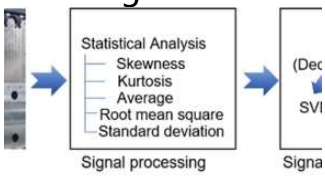
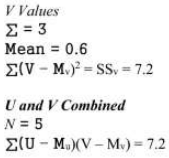
- Yongseung Kwon
- Content type: Original Research
- Published: 12 January 2021
- Pages: 10615 - 10627



12. **An optimized item-based collaborative filtering algorithm**

Authors

- Chigozirim Ajaegbu
- Content type: Original Research
- Published: 23 January 2021
- Pages: 10629 - 10636



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Authors

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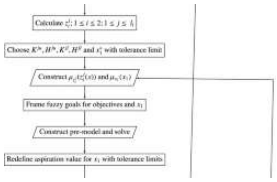
- Vandana Goyal
- Deepak Gupta
- Content type: Original Research
- Published: 30 June 2021
- Pages: 10637 - 10649



14. **Belief reliability analysis of competing for failure systems with bi-uncertain variables**

    Authors (first, second and last of 5)

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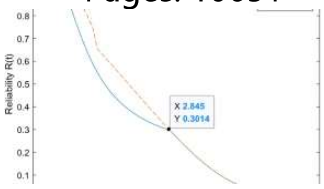
    - Chun Wei
    - Yanqing Wen
    - Content type: Original Research
    - Published: 13 January 2021
    - Pages: 10651 - 10665



15. **Fuzzy teaching learning based optimization approach for solving the QoS-aware web service selection problem in uncertain environments**

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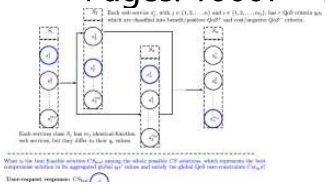
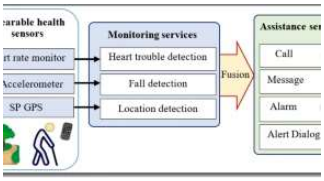
    - Ghizlane Khababa
    - Content type: Original Research
    - Published: 02 February 2021
    - Pages: 10667 - 10697



16. **Outdoor multimodal system based on smartphone for health monitoring and incident detection**

    Authors (first, second and last of 4)

    - Ikram Nedjai-Merrouche
    - Nadia Saadia
    - Amina Makhlouf
    - Content type: Original Research
    - Published: 05 January 2021
    - Pages: 10699 - 10721



17. [A new approach for solving the flow-shop scheduling problem using a parallel optimization algorithm]

Authors

- Habibeh Nazif
- Content type: Original Research
- Published: 11 February 2021
- Pages: 10723 - 10732

18. [Detection of DR from retinal fundus images using prediction ANN classifier and RG based threshold segmentation for diabetes]

Authors

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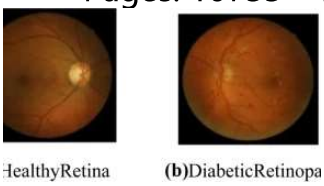
- S. Allwin
- Content type: Original Research
- Published: 06 January 2021
- Pages: 10733 - 10740



19. [Genus of graphs under picture fuzzy environment with applications]

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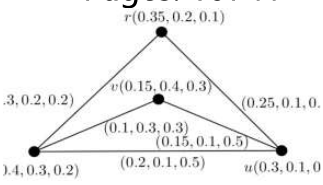
- Madhumangal Pal
- Content type: Original Research
- Published: 19 January 2021
- Pages: 10741 - 10756



20. **Neuroevolution based hierarchical activation function for long short-term model network**

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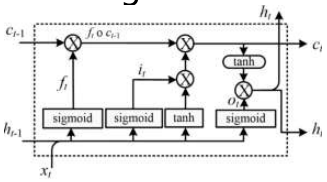
- K. Sathiyamurthy
- Content type: Original Research
- Published: 29 January 2021
- Pages: 10757 - 10768



21. **SHSDA: secure hybrid structure data aggregation method in wireless sensor networks**

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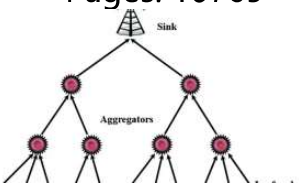
- Content type: Original Research
- Published: 02 January 2021
- Pages: 10769 - 10788



22. **Multi-objective workflow scheduling scheme: a multi-criteria decision making approach**

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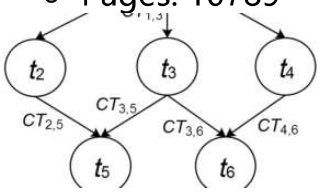
- Abhinav Tomar
- Prasanta K. Jana
- Content type: Original Research
- Published: 04 January 2021
- Pages: 10789 - 10808



23. **Manipulator grabbing position detection with information fusion of color image and depth image using deep learning**

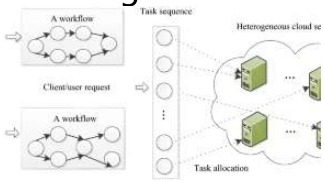
Authors (first, second and last of 6)

- Du Jiang
- Gongfa Li
- Ying Liu
- Content type: Original Research
- Published: 04 January 2021
- Pages: 10809 - 10822

24. **Workflow scheduling based on deep reinforcement learning in the cloud environment**

Authors (first, second and last of 4)

- Tingting Dong
- Fei Xue
- Jiangjiang Zhang
- Content type: Original Research
- Published: 09 January 2021
- Pages: 10823 - 10835



25. **An optimal mobile sink sojourn location discovery approach for the energy-constrained and delay-sensitive wireless sensor network**

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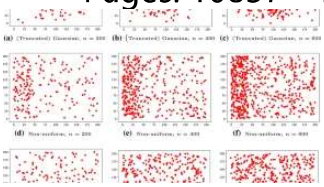
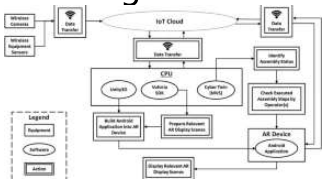
- Saugata Roy
- Nabajyoti Mazumdar
- Rajendra Pamula
- Content type: Original Research
- Published: 15 January 2021
- Pages: 10837 - 10864



26. **CPS-based manufacturing workcell for the production of hybrid medical devices**

Authors (first, second and last of 6)

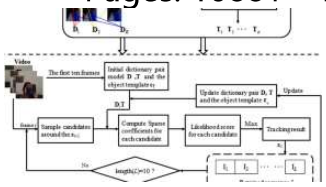
- Nicholas Ho
- Pooi-Mun Wong
- Chee-Kong Chui
- Content type: Original Research
- Published: 01 January 2021
- Pages: 10865 - 10879



27. **Online dual dictionary learning for visual object tracking**

Authors (first, second and last of 4)

- Xu Cheng
- Yifeng Zhang
- Guojun Lu
- Content type: Original Research
- Published: 05 January 2021
- Pages: 10881 - 10896



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Journal of Ambient Intelligence and Humanized Computing (2021) 12:10529–10537
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ORIGINAL RESEARCH

Abnormal video homework automatic detection system

Jinjiao Lin[1] · Yanze Zhao[1] · Chunfang Liu[1] · Haitao Pu[2,3]

Received: 11 August 2020 / Accepted: 16 December 2020 / Published online: 6 January 2021

Abstract
Automatic abnormal detection of video homework is an effective method to improve the efficiency of homework marking. Based on the video homework review of "big data acquisition and processing project of actual combat" and other courses, this paper found some student upload their videos with poor images, face loss or abnormal video direction. However, it is time-consuming for teachers to pick out the abnormal video homework manually, which results in prompt feedback to students. This paper puts forward the AVHADS (Abnormal Video Homework Automatic Detection System). The system uses suffix and parameter identification, Open CV, and the audio classification model based on MFCC feature to realize the automatic detection and feedback of abnormal video homework. Experimental results show the AVHADS is feasible and effective.

Keywords Video homework · Open CV · Abnormal detection · Audio classification

1 Introduction

Today's rapid updating of knowledge expects a new learning mode that students shift from focusing on the acquisition of knowledge to skills of social adaptability (Jiang et al. 2016). Ways of evaluating students also shifted from the single knowledge to students' ability and comprehensive quality. Homework is an important way to evaluate students, and traditional homework are generally in the form of text, sound, pictures, which cannot convey student's status such as movement and expression etc. in a comprehensive way to teacher. Thus, video homework that combine text, pictures and audio to present more complete information has become the choice of more teachers. During the COVID-19 epidemic, there was a spatial distance between students and teachers, and some teachers chose to learn about students' learning status through video homework.

Video homework is a good way which integrated big data information acquisition and student autonomy project output (Wang 2019). Here, video homework refers to student's record videos of related experiments, operations, presentations, or performances according to homework requirements. In the form of video homework, students are expected to explain how the experiment or operation process, or express the assignment theme through speech or performance after certain organization and design. Video homework is one of the operational forms that can promote personalized and proactive learning (Zhu 2019). Here is the advantages that other form of assessment do not have:

1. Video homework can help teachers to evaluate students better. An experiment on the sources of human information by the experimental psychologist Treicher showed that 83% of human information comes from sight, 11% from hearing, 3.5% from smell, 1.5% from touch, and 1% from taste (Xu 2003). Video homework contains text, pictures, sound, video and other rich information and content, which is helpful for students to express their learning content and thinking results in a more comprehensive way. Teachers can accurately evaluate students' familiarity with knowledge through their tone, expres-

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sion, sight, action in the video. In addition, Professor Jiang Dayuan pointed out that the purpose of learning is not to memorize knowledge, but to apply it (Jiang 2020). Video homework is a good way for students to apply their knowledge when solving problems and teachers can quickly evaluate how students can apply their knowledge by video homework and detect the problems of each student. Therefore, video homework is a conductive way to improving teaching.

2. Video homework can help students to master knowledge at a higher level. A famous experiment on memory persistence by the experimental psychologist Treicher showed that people tend to remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they hear and see, 70% of what they say in the communication (Wang 2011). Students present knowledge in the form of communication through video homework. It is a process of knowledge output through which students can achieve the lasting memory in the process of application of knowledge. In terms of content, video homework usually focus on complex problem solving, solution design, debate and discrimination, etc. It also contains the concept introduction, case evidence, hierarchical analysis, summarizes conclusions, etc. To ensure the quality of video homework, students will organize their presentations logically and ponder on the theme of homework carefully. Students might also evaluate themselves in the course of a lecture or performance. While recording of video assignments, students learn related technologies of video production and cultivate their ability to use information technology. In a word, video homework might improve students' cognition on memorization, understanding and application, and might also promote students' higher-level abilities such as synthesis, evaluation and innovation, which will realize Bloom's educational goal system (Xiang 2009) in the field of cognition.

2 Practical application

Video homework can achieve better learning results than what traditional homework can (Tu et al. 2017). This paper adopts the form of video homework in courses of "Actual practice of Big Data Collection and Processing Project" in Shandong University of Finance and Economics. The homework requires students to record the entire operation process of python experiment and explain the relevant knowledge with a purpose of getting to know the level of the students' knowledge familiarity in the six-level comprehensive education objective of Bloom, evaluating the students' learning situation and adjusting the later teaching. The homework ask the students to upload videos need which contain both input and output process, successful run results and clear explanation. Students are supposed to show their faces in the videos instead of only recording audios and PPT.

There are 443 video homework in total, and 89 (nearly 21%) cannot satisfied the homework requirement. The unqualified videos are compressed files, no faces or unclear voices. Some cannot be reviewed online due to the direction of images. Teachers can only manually identify those problems while marking all the uploaded files, which is time consuming and hold back the homework correction cycle. As a result, students cannot receive feedback timely. When the unqualified homework are return to students, they are less motivated to resubmit video homework. Therefore, in order to improve the efficiency of review of video homework and save the labor of identifying the unqualified ones, Abnormal Video Homework Automatic Detection System (AVHADS) is proposed in this paper, which realizes the preliminary detection of uploaded video homework. Unqualified video homework is automatically sent back to students with sensible explanations of which students might see it as a prompt feedback. It might prevent students from academic pressure caused by long homework correction time.

3 Related work

Many scholars have been contributing research efforts on automatic homework detection and review. Some scholars focused on the automatic review of program homework. Martin et al. (2018) used the argument-based machine learning (ABML) to finish semiautomatic identification of typical approaches and the errors in student solutions. They believe that timely feedback can improve students' programming learning efficiency. Zhao et al. (2010) designed the program for the automatic detection and correction of student program work. It can screen the similar procedures and supervise and encourage students to finish the homework independently. On the review of the graphics homework, Yang et al. (2014) designed and implemented an automatic grading system for civil engineering drawing based on vector graphics platform ATVGP. Peiying (2001) used VC programming to realize the automatic correction of engineering drawing homework based on Web. Li et al. (2019) put forward a program for automatic recognition and rating of homework pictures taken by mobile phones, which has achieved good results. The above research on automatic review of homework focuses on images and texts, which cannot solve the problems of detection and correction of video homework. Here, we attempt to study and realize the abnormal detection of video homework.

At present, the research on abnormal detection of video mainly focus on the video content, such as traffic violations (Ye et al. 2012), people's behaviors testing (Lian

et al. 2002). These researches are quite different from the abnormal detection of video homework, so they cannot solve the problem in this paper. The problem of anomaly detection in this paper mainly includes four aspects: file type identification, face detection, video direction recognition and audio detection.

File type identification is relatively simple, it is generally implemented through methods based on statistical characteristic (Zheng et al. 2007) and content (McDaniel et al. 2020). The file types involved in this paper are relatively fixed, so we choose simple suffix name matching to realize file type identification. There are many studies on video face detection. Keke et al. (2008) conduct face detection by using the face detection function in Open CV. Goyal et al. (2017) conduct an in-depth study of face detection using open CV, Ma et al. (2018) use the multi-task cascaded convolutional neural networks to realize the frontal and the non-frontal face detection, this paper does not cover the non-frontal face detection, so we chose Open CV (2016) which is easy to implement face detection. The detection of video direction is rarely involved in other problems, and relevant researches are scare. According to the specific problems in this paper, we choose to use the comparison of specific parameters to realize the detection of video direction. In this paper, it is difficult to solve the audio detection problem, and many researchers have done related researches. Muda et al. (2010) used Mel-Frequency Cepstral Coefficients (MFCC) to extract sound feature, and used the Dynamic Time Warping (DTW) to realize sound recognition. Yu et al. (2006) added Linear Prediction Cepstrum Coefficient (LPCC) on the basis of MFCC to describe sound feature, and used the methods of vectorization and DTW to realize speaker detection. Ali Technology (2018) makes use of the MFCC characteristics of human voice samples and non-human voices samples and the Inception-V3 model of CNN to realize the prediction of voice audio files. Based on MFCC + CNN, Wei et al. (2018) used random forest to classify audio, this method improved the accuracy of audio classification. Zhang (2019) replace CNN with ResNet to promote the accuracy of ESC recognition task. And Huang et al. (2020) used the multi-mode neural network to cluster the voices of different speakers (teachers and students) in the course audio, then realized the differentiation of multiple speakers by text matching. Most of these researches are aimed at specific kinds of problems; they are temporarily unable to solve the audio detection problem. The audio of video homework is different, as it mainly consists of the voices of other students in the student's living environment. Due to the big student's population and overlapping, this problem cannot be solved by matching voice print features. Therefore, we choose to use MFCC to describe audio features of video homework and use the trained classifier to detect the sound clarity of video homework.

4 Abnormal Video Homework Automatic Detection System (AVHADS)

Based on the above questions and related researches, this paper puts forward the AVHADS (Abnormal Video Homework Automatic Detection System) which can realize the automatic detection and feedback of abnormal video homework.

4.1 System framework

The whole system is divided into four modules. The first module is file type Identification which adopts the file suffix (zip, rar etc.) matching to realize file type identification. In the module, after uploading the video file, the system will detect the direction of the video. The system adopts the comparison of video length and width to determine whether the video direction is in the normal landscape state. If the direction of the video is correct, it invokes Open CV face detection classifier to identify whether there are students in the video homework. If there is a face in video, the system will detect whether the audio of the video homework is clear voice or not. If the homework file passes the detection, it will be uploaded successfully. When a certain module is not satisfied, the system outputs a reason of failure to upload homework. The whole system framework is shown in Fig. 1.

As file type recognition and image direction detection can be realized by simple parameter comparison, the paper will not be further discussed in detail.

4.2 Face detection

There have been many studies about face detection. The Open CV (Open Source Computer Vision Library) (Bradski 2008), which is developed by Intel, is open source library of visual algorithm and image processing. It is quite mature and widely used in face detection and recognition. This paper chooses alt2 classifier (haarcascade_frontalface_alt2. XML) to realize video work face detection. And it proves that this classifier performs better in Open CV (Lian 2016). The file of the classifier contains Haar-like features describing various parts of the human body. It realizes the classification of faces and non-faces through Integral image, AdaBoost algorithm and cascade classifier.

Haar-like feature is a way of feature representation based on the differences between black and white pixels in gray images. It includes three forms: edge feature, linear feature,

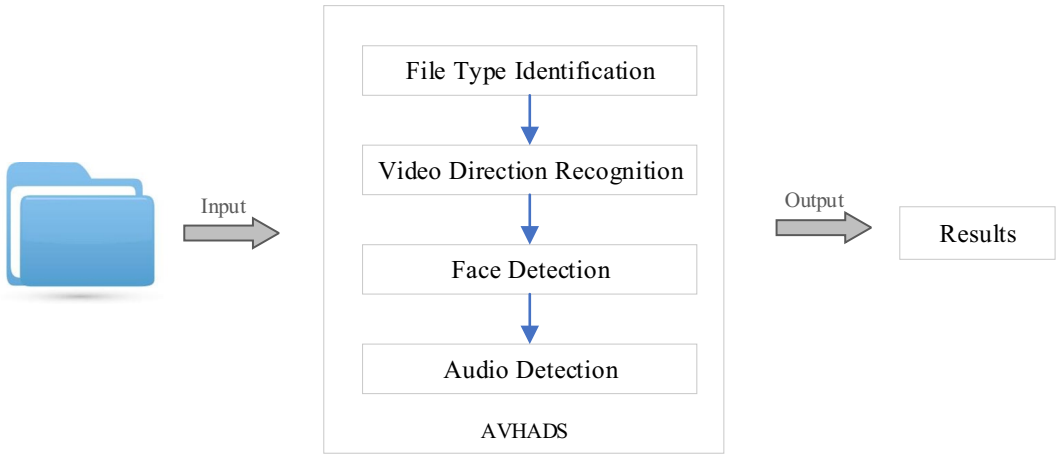


Fig. 1 System framework

Fig. 2 Haar-like features based on human eye features

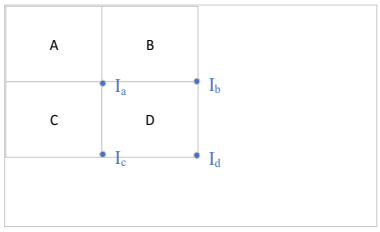


Fig. 3 Integral image

and center feature. Viola and Jones (2001, 2004) optimized it and applied it to face feature extraction. Lienhart and Maydt (2002) further expanded it and eventually applied it to Open CV classifier. Figure 2 shows Haar-like features based on human eye features, it is a kind of edge character, and the area of the black pixel represents the eye color darker than the surrounding area.

Integral Image is a fast method proposed by Viola and Jones (2001) to extract Haar-like features. It is a matrix representation method that can describe global information (Huang et al. 2005). It represents each point on the image as the sum of all pixels in the upper left of the point. Image feature representation can be realized by adding and subtracting pixel points between different rectangles. As shown in Fig. 3, point **I** can be expressed as the pixels sum of A, B, C, D, the pixel sum of D area may be expressed by the $\mathbf{I_b} + \mathbf{I_c} - \mathbf{I_a}$. Integral Image improves the efficiency of Haar-like feature representation.

AdaBoost algorithm is a kind of adaptive algorithm, which seeks the optimal classifier through numerous loop iteration (Lin 2013). Different facial features represent different classifiers, namely weak classifiers (He and Cheng 2018). Through multiple training iterations, the weak classifier with better classification performance is selected to form a strong classifier, and the final classifier is formed through the cascade of strong classifiers.

The main process of Haar classifier is that using the sliding window and Integral Image to achieve rapid traverse of gray image and Haar-like features calculation. Next through AdaBoost algorithm based on the Haar-like features to train face weak classifier and build strong classifier, and then through multiple strong classifier combined enhancing the effect of classification. As a result, face classification can be realized. The process is shown in Fig. 4.

Here we use haar classifier of Open CV to realize face detection in video homework that has been trained through the above process. Specific face detection process is that the video homework is divided into frames of images. After image gray-processing, the detectMultiScale() function in the trained alt2 identifies whether there are faces in images. The process is shown in Fig. 5.

4.3 Audio detection

Noises are inevitable when students record video homework in the dormitory or classroom. Most of the noises are students' conversation voices and other noises around them. The existing research on audio classification and detection focuses on specific audio matching, speaker recognition and content extraction, which cannot solve the problem of audio detection of students' video homework. Therefore, we need to use the audio data from students' homework to train model to realize audio detection (Fig. 6).

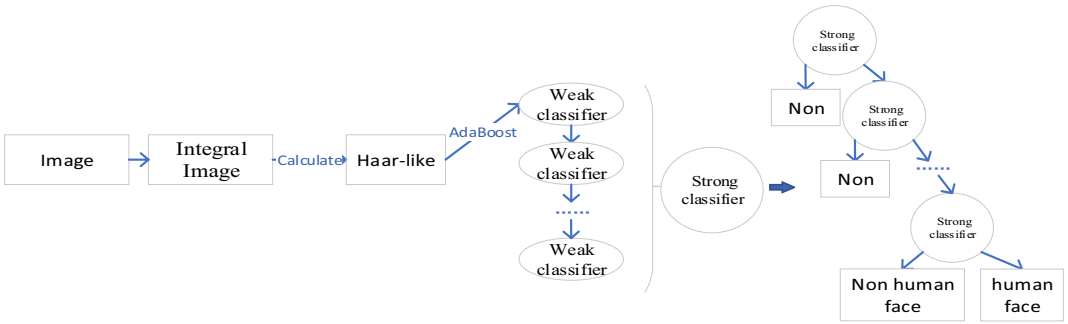
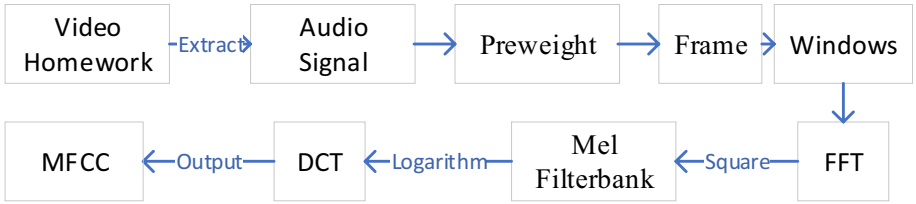


Fig. 4 Face classifier

Fig. 5 Face detection in video homework

Fig. 6 MFCC extraction process of video homework



Firstly we select 14 samples out of the 89 unqualified video homework and set them as noise samples manually. Then, we choose 42 samples from qualified video homework and defined them as clear samples. And we select the audio detection model with higher accuracy through training.

Audio detection is divided into two parts: audio feature extraction and detection model training.

4.3.1 Audio feature extraction

Audio feature extraction is to identify the noticeable features in the audio and eliminate the rest of the redundant information. Basing on the relevant studies on audio processing and the need for the sound clarity of students' video homework, we select Mel-Frequency Cepstral Coefficients (MFCC) based on human ear perception characteristics (Chundong et al 2019) to describe the characteristics of clear audio and noisy audio. The process is as follows (Li et al. 2017 and Lingnizhan 2019).

(1) Pretreatment

The audio pretreatment includes pre-emphasis, framing and windowing.

The purpose of pre-emphasis is to highlight the high frequency formant. The filter coefficient is set as 0.97 in the pre-emphasis, and the formula is:

$$S(n)^* = S(n) - \partial \times S(n-1) \tag{1}$$

The audio is decomposed into shorter frames and processed as steady-state signals, and the smooth transition from frame to frame is realized through the partial overlap between each frame. Basing on the short-time stabilization characteristic of the audio of the student video homework, we frame the signal into 25 ms, set frame shift = 10 ms and N = 512. And each frame ($\boldsymbol{S_i(n)}$) multiplied by the Hamming window ($\boldsymbol{W(n)}$) to increase the continuity of left and right ends and reduce the leakage in the frequency domain, and we set $\alpha = 0.46$. The formula is:

$$W(n,a) = (1-\partial) - \partial \times \cos\left(\frac{2\pi n}{N-1}\right), n = 0,1,2,\ldots,N-1 \tag{2}$$

$$S_i(n)' = S_i(n) \times W(n) \tag{3}$$

(2) FFT

The frequency domain signal Xi (k) of each frame is obtained by the Discrete Fourier Transform. The formula is:

$$X_i(k) = \sum_{n=1}^{N} X_i(n) e^{-\frac{j2\pi kn}{N}}, \quad 1 \le k \le K \tag{4}$$

where i is the number of frames and ***K*** is the length of DFT.

(3) Mel filter bank

The power spectrum E (I, k) is obtained by taking the square of the result of FFT operation. It was filtered through a filter to map the linear spectrum to the Mel nonlinear spectrum based on auditory perception. The conversion formula is as follows.

The formula for converting from frequency to Mel scale is:

$$\mathrm{Mel}(f) = 2595 * \log_{10}\left(1 + \frac{f}{700}\right) \tag{5}$$

To go from Mel back to frequency:

$$f = 700\left(10^{\frac{Mel(f)}{2595}} - 1\right) \tag{6}$$

Then the energy of the power spectrum of each frame in the MEL filter is calculated:

$$SE(i,m) = \sum_{k=0}^{N-1} E(i,k)H_m(k), 0 \le m \le M \tag{7}$$

where ***i*** is the frame number, ***K*** is the spectral line k in the frequency domain, $\boldsymbol{H_m(k)}$ is the frequency domain response of Mel filter, and M is the number of filters. In our experiment, we set M = 24.

(4) Discrete Cosine Transform (DCT)

Logarithm of the energy obtained through the filter is taken decorrelation processing by DCT to obtain the MFCC.

$$C(i,n) = \sum_{m=0}^{N-1} SE(i,m)\cos\left(\frac{\pi n(m-0.5)}{M}\right), \quad 0 < n \le L \tag{8}$$

where i is the frame number, **M** is the "mth" filter, and **L** is the parameter order of MFCC. In this experiment, we set **L** = 12.

Finally, we use the plt function and related parameters to obtain the MFCC spectrum diagram of audio.

MFCC feature were extracted with the above process to describe the audio features of the manually screened samples. The audio in 56 video homework selected manually were extracted. Then, first 3.5 s of the audio were intercepted. The integrity features of audio were preserved by pre-weighting, framing and windowing. After that, filter and DCT transformation, the MFCC feature of the audio in video homework was extracted through FFT. The extracted MFCC feature image will be used as the input of the audio detection classification model.

4.3.2 Model training and evaluating

The distinction between clear and noisy samples is essentially a dichotomy problem, so we can use the classification algorithm to realize the audio detection of video homework. Essentially, classification algorithm is to distinguish samples with different features, and the computer learns features to distinguish different categories. We choose more classical KNN, SVM and CNN models to train the manually screened data sets, and compare the training effect of using common spectrum features and MFCC features to describe the audio. Then, we select the training model with higher accuracy and apply it to the audio detection in the system.

(1) KNN

K Nearset Neighbor Classifier (KNN) was proposed by Cover and Hart (1967). KNN has been widely used in many fields because of its simplicity and high classification accuracy (Zhang et al. 2008). It calculates the adjacent sample of the predicting samples based on the distance function, and confirms the category of the predicting samples according to the category of the adjacent sample. The category of predicting audio samples of the video homework is determined by the number of the category of the nearest K samples. Among k adjacent samples, the predicting sample is regarded as a clear sample if there are more clear samples. The predicting sample is regarded as a noisy sample vice versa. Figure 7 shows an example of KNN classification when K = 6. The experiment invokes the KNeighborsClassifier() function to realize the training of KNN.

(2) SVM

Cortes et al. (1995) proposed support vector machines (SVM), it has its unique advantages when solving small sample, nonlinear and high dimensional pattern recognition problems (Liu et al. 2003). SVM searches for the optimal classification surface based on two types of sample data, which not only enables the two types of samples to be separated without error, but maximizes the classification interval between the two types (Vapnik 1997). The experiment invokes the svm. SVC () function to realize the training of KNN.

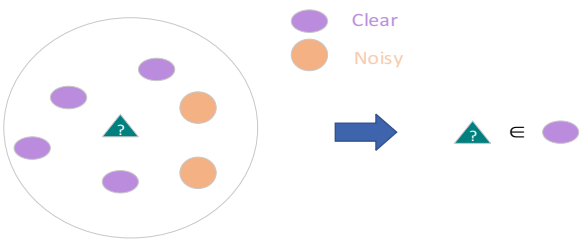


Fig. 7 K nearset neighbor classifier

(3) CNN

With the development of deep learning, CNN has been widely used in many fields. Based on labeled sample data, it learns the sample features of different categories through iterative calculation to achieve classification. This experiment uses a five-layer convolutional neural networks to realize the classification training of video homework audio (Fig. 8), which includes two convolutional layers, two pooling layers and a full connection layer. The specific parameters of each layer are as follows:

Input: spectrum diagram of 128*128*3.

Layer1: convolution layer, convolution kernel size is (5,5), the number is 64, strides = 1;

Layer2: pooling layer with kernel size of (2,2);

Layer3: convolution layer, convolution kernel size is (5,5), the number is 128, strides = 1;

Layer4: pooling layer with kernel size of (2,2);

Layer5: full connection layer with 512 neurons.

We select ReLU as activation function. The features of sample spectrum diagram extracted by the convolution layer are inputted the ReLU function in the form of vector to nonlinear transformation. The ReLU function converges quickly and calculates easily. Problems are not detected in the gradient disappearance (Kutyniok 2019). Its function formula is:

$$\mathrm{ReLU}(x) = \max(0, x) \tag{9}$$

Our experiment is actually a binary classification problem. Therefore, we choose the cross entropy function as the loss function. It can measure the effect of the model and is relatively easy to calculate. The prediction probability of the positive sample is p and the negative sample is 1-p, and its calculation formula is (Ezail 2019):

$$L = -\frac{1}{N}\sum_i \left[y_i \times \log\left(p_i\right) + \left(1 - y_i\right) \times \log\left(1 - p_i\right)\right] \tag{10}$$

where $\mathbf{y_i} = 1$ if $\mathbf{i}$ sample is positive and $\mathbf{y_i} = 0$ if $\mathbf{i}$ sample is negative.

At the same time, we choose the Adam optimizer proposed by Kingma and Lei Ba to optimize the experiment, it has the advantages of high computational efficiency, simple implementation and small memory occupancy (Kingma and Ba 2014).

In the audio detection experiment, clear samples and noisy samples were input into the training model in the form of sample-label. The average accuracy of model was taken as the evaluation index to compare the effectiveness of the model in audio detection after lots of training. The experimental results are shown in Table 1.

Table 1 Results

Method	The average accuracy (%)
Spectrum + KNN	58.33
Spectrum + SVM	73.33
Spectrum + CNN	71.84
MFCC + KNN	92.38
MFCC + SVM	89.58
MFCC + CNN	81.17

According to Table 1, the average accuracy of MFCC + KNN reaches 92.38%, which is optimal in the comparison experiment and can be well applied to audio classification. Therefore, this system chooses MFCC + KNN method to realize audio detection of video homework (Fig. 9).

4.4 System application and evaluation

The final system framework is shown in Fig. 10.

We have tested the system with the collected video homework, the accuracy rate of the system reached 84.26%. The system detected 89 unqualified video homework within 5 min and 42 s, which is much faster than a few hours of manual screening. In the detection of individual homework, the system provides prompt feedback to students when they submit homework. Compared with the method of manual screening by teachers, this method is much more efficient.

5 Conclusions

Automatic detection of the unqualified video homework is getting more important as video homework becomes a more popular. This paper puts forward the AVHADS (Abnormal Video Homework Automatic Detection System), which is based on the problem of uploading video homework in "big data acquisition and processing project of actual combat" and other courses. Based on MFCC feature and CNN to realize the automatic detection and feedback of abnormal video homework, the system uses suffix and parameter identification, Open CV, and the audio classification model. It shows that the AVHADS is feasible and effective through experiments.

In conclusion, AVHADS can realize preliminary detection of the unqualified video homework, which is much more time-saving and can sent feedback to students promptly. Nevertheless, the accuracy of the system can be further improved through training. In addition, this system is only the preliminary form detection of students' video homework, and it does not review the specific content of homework.

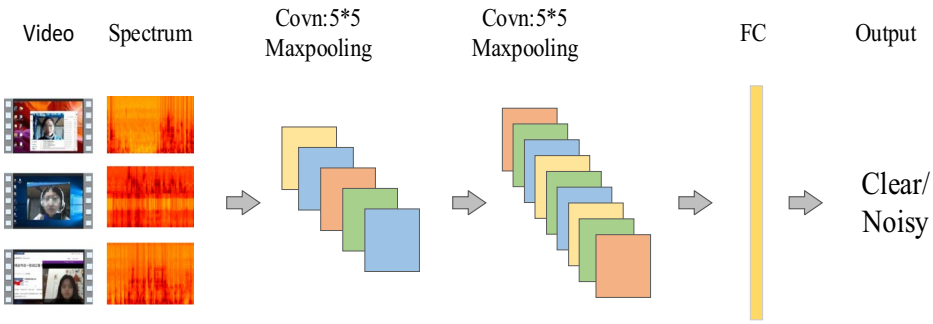


Fig. 8 Convolutional neural networks

Fig. 9 Audio detection

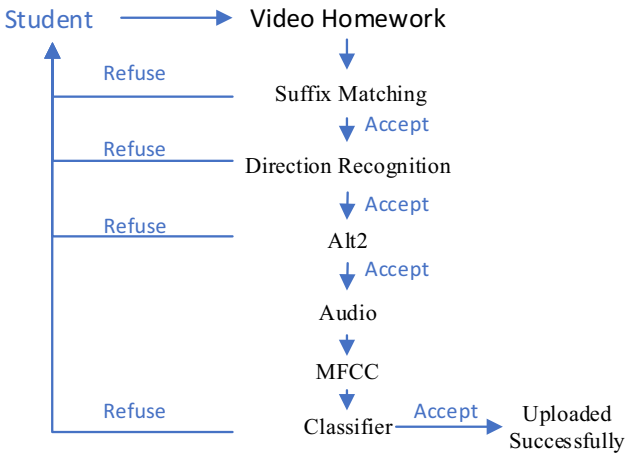


Fig. 10 Video homework detection

In the further researches, facial expression analysis, tone change, voice pause and other features can be combined to realize automatic review of video homework with artificial intelligence technology.

Acknowledgements Youth Innovative on Science and Technology Project of Shandong Province (2019RWF013), Postgraduate Education Reform Research Project of Shandong University of Finance and Economics (SCJY1911), Teaching Reform Research Project of Shandong University of Finance and Economics in 2020 (jy202011), Teaching Reform Research Project of Shandong Province (M2018X169, M2020283), "Course Ideological and Political" Teaching Reform Research Project of Shandong University of Finance and Economics (kcsz202085).

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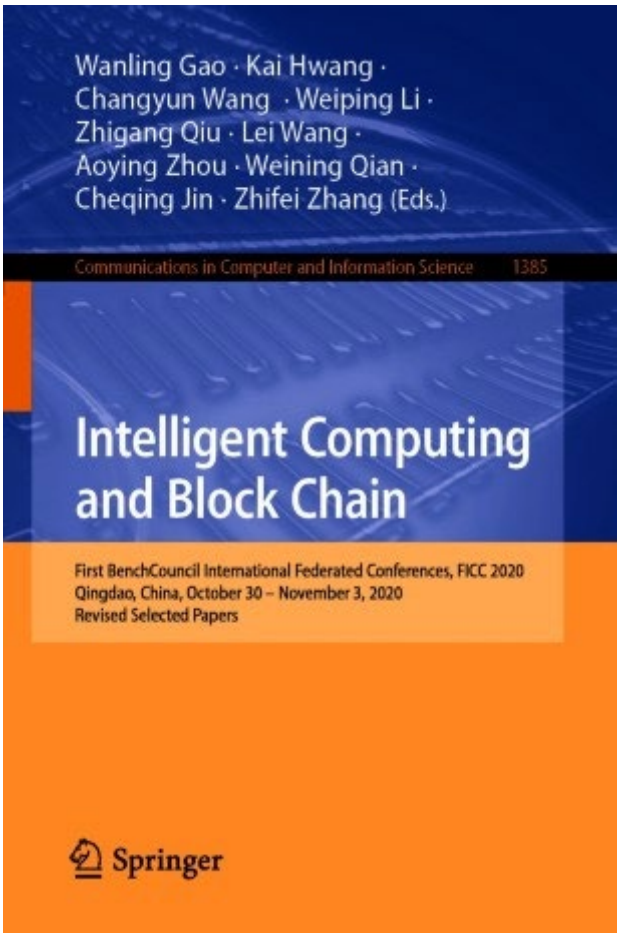
Wanling Gao · Kai Hwang ·
Changyun Wang · Weiping Li ·
Zhigang Qiu · Lei Wang ·
Aoying Zhou · Weining Qian ·
Cheqing Jin · Zhifei Zhang (Eds.)
Communications in Computer and Information Science 1385
Intelligent Computing and Block Chain
First BenchCouncil International Federated Conferences, FICC 2020
Qingdao, China, October 30 – November 3, 2020
Revised Selected Papers
Springer

Contents

AI and Medical Technology

BLU-GAN: Bi-directional ConvLSTM U-Net with Generative Adversarial Training for Retinal Vessel Segmentation 3
Li Lin, Jiewei Wu, Pujin Cheng, Kai Wang, and Xiaoying Tang

Choroidal Neovascularization Segmentation Based on 3D CNN with Cross Convolution Module 14
Xiwei Zhang, Mingchao Li, Yuhan Zhang, Songtao Yuan, and Qiang Chen

Task-Free Recovery and Spatial Characterization of a Globally Synchronized Network from Resting-State EEG 22
Akaysha C. Tang, Adam John Privitera, Yunqing Hua, and Renee Fung

PRU-net: An U-net Model with Pyramid Pooling and Residual Block for WMH Segmentation 39
Xin Zhao, Xin Wang, and Hong Kai Wang

Two-Way Perceived Color Difference Saliency Algorithm for Image Segmentation of Port Wine Stains 50
Wenrui Kang, Xu Wang, Jixia Zhang, Xiaoming Hu, and Qin Li

A New Pathway to Explore Reliable Biomarkers by Detecting Typical Patients with Mental Disorders 61
Ying Xing and Yuhui Du

Activities Prediction of Drug Molecules by Using Automated Model Building with Descriptor Selection 73
Yue Liu, Wenjie Tian, and Hao Zhang

Survival Prediction of Glioma Tumors Using Feature Selection and Linear Regression 85
Jiewei Wu, Yue Zhang, Weikai Huang, Li Lin, Kai Wang, and Xiaoying Tang

AI and Big Data

Root Cause Localization from Performance Monitoring Metrics Data with Multidimensional Attributes 95
Bo Zhou, Ping Zhang, and Runlin Zhou

A Performance Benchmark for Stream Data Storage Systems 107
Siqi Kang, Guangzhong Yao, Sijie Guo, and Jin Xiong

Failure Characterization Based on LSTM Networks for Bluegene/L System Logs. 123
Rui Ren, JieChao Cheng, Hao Shi, Lei Lei, Wuming Zhou, Guofeng Wang, and Congwu Li

Traffic Crowd Congested Scene Recognition Based on Dilated Convolution Network 134
Xinlei Wei, Yingji Liu, Wei Zhou, Haiying Xia, Daxin Tian, and Ruifen Cheng

Failure Prediction for Large-Scale Clusters Logs via Mining Frequent Patterns 147
Rui Ren, Jinheng Li, Yan Yin, and Shuai Tian

FLBench: A Benchmark Suite for Federated Learning 166
Yuan Liang, Yange Guo, Yanxia Gong, Chunjie Luo, Jianfeng Zhan, and Yunyou Huang

Fake News Detection Using Knowledge Vector 177
Hansen He, Guozi Sun, Qiumei Yu, and Huakang Li

A Reconfigurable Electrical Circuit Auto-Processing Method for Direct Electromagnetic Inversion 190
Jun Lu

Implementing Natural Language Processes to Natural Language Programming 204
Yi Zhang, Xu Zhu, and Weiping Li

AI and Block Chain

LSO: A Dynamic and Scalable Blockchain Structuring Framework 219
Wei-Tek Tsai, Weijing Xiang, Rong Wang, and Enyan Deng

CISV: A Cross-Blockchain Information Synchronization and Verification Mode 239
Yu Gu, Guozi Sun, Jitao Wang, Kun Liu, Changsong Zhou, and Xuan You

A Formal Process Virtual Machine for EOS-Based Smart Contract Security Verification 253
Zheng Yang and Hang Lei

AVEI: A Scientific Data Sharing Framework Based on Blockchain 264
Liangming Wen, Lili Zhang, Yang Li, and Jianhui Li

SCT-CC: A Supply Chain Traceability System Based on Cross-chain Technology of Blockchain 281
Yong Wang, Tong Cheng, and Jinsong Xi

Game-Theoretic Analysis on CBDC Adoption 294
Chenqi Mou, Wei-Tek Tsai, Xiaofang Jiang, and Dong Yang

Design of Experiment Management System for Stability Control System Based on Blockchain Technology 306
Xiaodan Cui, Ming Lei, Tianshu Yang, Jialong Wu, Jiaqi Feng, and Xinlei Yang

A Cross-chain Gateway for Efficient Supply Chain Data Management 318
Chenxu Wang, Xinxin Sang, and Lang Gao

AI and Education Technology

Automatic Essay Scoring Model Based on Multi-channel CNN and LSTM 337
Zhiyun Chen, Yinuo Quan, and Dongming Qian

Research on Knowledge Graph in Education Field from the Perspective of Knowledge Graph 347
Zhiyun Chen, Weizhong Tang, Lichao Ma, and Dongming Qian

Course Evaluation Analysis Based on Data Mining and AHP: A Case Study of Python Courses on MOOC of Chinese Universities 361
Hongjian Shi

Process-Oriented Definition of Evaluation Indicators, Learning Behavior Collection and Analysis: A Case Study 369
Jiakuan Fan, Wei Wang, Haiming Lin, Yao Liu, and Chang Liu

The Reform and Construction of Computer Essential Courses in New Liberal Arts Aiming at Improving Data Literacy 381
Yue Bai, Min Zhu, and Zhiyun Chen

Entity Coreference Resolution for Syllabus via Graph Neural Network 396
JinJiao Lin, Yanze Zhao, Chunfang Liu, Tianqi Gao, Jian Lian, and Haitao Pu

An Exploration of the Ecosystem of General Education in Programming 404
Yao Liu, Penglong Jiao, Wei Wang, and Qingting Zhu

The New Theory of Learning in the Era of Educational Information 2.0—Connected Constructivism 417
Yazi Wang, Chunfang Liu, Yanze Zhao, Weiyuan Huang, Bizhen You, and Jinjiao Lin

AI and Financial Technology

A Stock Index Prediction Method and Trading Strategy Based on the Combination of Lasso-Grid Search-Random Forest 431
Shaozhen Chen, Hui Zhu, Wenxuan Liang, Liang Yuan, and Xianhua Wei

Dynamic Copula Analysis of the Effect of COVID-19 Pandemic on Global Banking Systemic Risk 449
Jie Li and Ping Li

Real-Time Order Scheduling in Credit Factories: A Multi-agent Reinforcement Learning Approach 461
Chaoqi Huang, Runbang Cui, Jiang Deng, and Ning Jia

Predicting Digital Currency Price Using Broad Learning System and Genetic Algorithm. 476
Nan Jing, Zhengqian Zhou, Yi Hu, and Hefei Wang

Selective Multi-source Transfer Learning with Wasserstein Domain Distance for Financial Fraud Detection 489
Yifu Sun, Lijun Lan, Xueyao Zhao, Mengdi Fan, Qingyu Guo, and Chao Li

Author Index 507

Entity Coreference Resolution for Syllabus via Graph Neural Network

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Abstract. Automatic identification of coreference and the establishment of corresponding model is an essential part in course syllabus construction especially for the comprehensive Universities. In this type of tasks, the primary objective is to reveal as much information as possible about the course entities according to their names. However, it remains a difficulty to most of the latest algorithms since the references to courses are commonly in line with the specifications of each University. Thus, it is important to link the course entities with similar identities to the same entity name due to the contextual information. To resolve this issue, we put forward a graph neural network (GNN)-based pipeline which was designed for the characteristics of syllabus. It could provide both the similarity between each pair of course names and the structure of an entire syllabus. In order to measure the performance of presented approach, the comparative experiments were conducted between the most advanced techniques and the presented algorithm. Experimental results demonstrate that the suggested approach can achieve superior performance over other techniques and could be a potentially useful tool for the exact identification of the entities in the educational scenarios.

Keywords: Knowledge point · Convolutional neural network · Coreference resolution

1 Introduction

Coreference resolution has become one of the most popular research fields for detecting the same entities in various practical scenes [1, 2]. And a large amount of algorithms have been provided to address the task of coreference resolution in natural language processing (NLP). However, none of them has been specifically designed for the entity discovery for the syllabus in University. For instance, in the work of [3] a learning method was presented to coreference resolution of noun phrases in unlimited text. One small and annotated corpus was leveraged as the dataset to produce a certain type of noun phrases like pronouns. Within this study, the entity types are not confined to specific categories. Kottur et al. [4] focus on the visual coreference resolution issue, which consists of

W. Gao et al. (Eds.): FICC 2020, CCIS 1385, pp. 396–403, 2021.
https://doi.org/10.1007/978-981-16-1160-5_31

determining one noun phrase and pronouns whether refer to the same entity in a picture. A neural module network is employed for addressing this problem through using two elements: Refer and Exclude that could execute the coreference resolution in a detailed word level.

Since most of them focus on the association between each pair of entities rather than their contextual environment, it is also difficult for the previously proposed techniques to be adapted to the educational background. However, the rapid development of modern society proposes the higher requirements of students, the corresponding resources related to syllabus have grown greatly especially in the Universities. Therefore, the recognition of the same entities with similar or dissimilar names become much more complicated than ever before.

Meanwhile, the deep learning-based techniques have shown their performance in various NLP-oriented applications. For instance, Attardi et al. [5] propose an architecture of deep learning pipeline for NLP. A group of tools are built for creating distributional vector representations and addressing the NLP tasks in this work. In total, three techniques were introduced for embedding creation and two algorithms were exploited for the network training. And the convolutional network plays a vital role in this approach. In [6], a joint multiple-task model is introduced as well as a strategy for adapting its depth to the complexity of the tasks. Each layer contains the shortcut connection to both the word embedding and low-level predictions. One regularization with simple structure is used to implement the optimization of the objective function.

Recently, the graph neural network (GNN) could be a valuable deep learning model for implementing the coreference resolution tasks. Originally, GNN was used to deal with the non-Euclidean data. For instance, in the work of [7], a scalable approach based on a variant of convolutional neural network for semi-supervised classification within the graph structure data. Different from the traditional convolutional neural network, GNN is supposed to address the issues directly on graphs rather than the Euclidean data such as pixel images. And the original convolution operation is modified into the spectral graph convolution with the localized firstorder approximation. Both the local graph structure and the features of each node in the graph could be extracted with GNN. For clinical applications, a supervised GNN-based learning approach for predicting the products from organic reactions given the reactants, reagents, and solvents [8].

Base on the above analysis, we put forward a GNN-based pipeline trained by 1,312 pairs of entities for coreference resolution task. To note that all of the entities are extracted from the syllabus of the Universities in Shandong Province, China. The proposed GNN model adopts the spectral convolution operator as its primary computation unit. And each manually collected course entity is independently fed into the proposed GNN as one node of the whole graph of syllabus. Meanwhile, the similarity of each pair of entities and the corresponding adjacent relationship are taken as the characteristics of the nodes in the graph. In the trainings performed on the dataset, the parameters including the convolution and pooling layers' operators as well as the characteristics of the nodes could be optimized iteratively. With the labeled entities pairs, the trained GNN could be used to resolve the coreference in the given a new pair of course entities.

To measure the performance of the presented method, the comparison experiments were carried out on the samples of data collected manually between latest techniques and the presented approach. The corresponding results demonstrate that the presented GNN-based pipeline outperforms other techniques.

In general, this work has at least the following significance as:

- A GNN model is introduced to implement the coreference resolution task in course syllabus of Chinese University.
- The association between each pair of nodes in the presented graph structure could be used to represent the association between each pair of entities in the syllabus.
- Experiments on the real samples could demonstrate that the presented method is one potentially invaluable technique for coreference resolution.

The rest of this paper is as follows. In Sect. 2, we provide the concrete details of the presented approach. The results of the experiment are described in Sect. 3 and the conclusion is depicted in Sect. 4.

2 Methodology

2.1 Input of the Proposed GNN

According to Fig. 1, the proposed deep learning model adopts the similarity of each pair of entities and the corresponding adjacent relationship as its input. Each node in the input denotes one entity within the course syllabus and the link between each pair of nodes represents both the connection of the corresponding entities and their similarity. To note that the length of the link does not equal to the similarity of a pair of nodes.

2.2 Graph Convolutional Neural Network

1) Definition
It is assumed there are n entities (i.e. the course names) in general, $C_i = [C_1, C_2, ..., C_n]$. Each syllabus could be denoted by a matrix $C_i \in R^{m \times n}$, where *m* is the number of course in each syllabus, n is the dimensionality for the feature vector extracted from the original course samples and $n_i \in \{0, 1\}$. The dataset from the syllabus could be represented with one weighted graph with a data structure of tuple $G = (V, E, W)$, where V denotes the m nodes in the graph, E represents the whole group of edges in the same graph, and $W \in R^{m \times n_i}$ is the corresponding adjacency matrix. Meanwhile, is the weight assigned to the edge, which links $V_i \in V$ to $V_j \in V$. To note that the value of the association (the edge) denotes the similarity of the connected entities. Therefore, it has been set as one hyperparameter in the following experiments.

The convolutional operator illustrated in Fig. 1 approximately equals to the multiplication operation in the spectral domain and relates to the common convolution operator in the time domain. The whole process could be mathematically formulated as follows:

$$L = I_m - D^{-\frac{1}{2}} W D^{-\frac{1}{2}} \tag{1}$$

where D denotes the matrix degree and I_m is the an identity matrix.

As mentioned by Defferrard et al. [9], the Laplacian matrix then could be represented by using Chebyshev polynomials:

$$T_k(L) = 2LT_{k-1}(L) - T_{(k-2)} \tag{2}$$

where $T_0(L) = 1$ and $T_1(L) = L$.

To note that a polynomial ordered by K can generate K filters without bias. And, the filtering of a signal with K filters could be implemented with:

$$o = g_\theta(L) * c = \sum\nolimits_k = O_k \theta_k T_k(\bar{L})c \tag{3}$$

where c denotes a course from the syllabus dataset for, $L = \frac{2}{\lambda_{max}} - I_d$ and $\lambda_{max}\lambda_{max}$ is the highest eigenvalue of the normalized L. Therefore, the output of the l^{th} layer for each sample in a GNN can be formulated as:

$$O_c^l = \sum_{i=1}^{F_{in}} g_{\theta_i^l}(L)c_s^l, i \tag{4}$$

Where F_{out} is the outcome filter and F_{in} represents the inputfilter that would yield $F_{out} \times F_{out}$ vectors, $\theta_i^l \in R^k$ are the Chebyshev coefficients, and $\theta_{s,i}^l$ is the input feature map for sample c at layer *l*.

2) Network architecture

The structure of the proposed GNN is provided in Table. 1. Totally, it is composed of 5 convolutional layers. No pooling operation is used in the network architecture for conserving the completeness the extracted features. The dropout rates for 2nd, 3rd, 4th, and 5th convolutional layers are 0.4.

Table 1. Network architecture of the proposed GCNN**.**

Table head	Layer						
	Conv	Conv	Conv	Conv	Conv	Conv	Classifier
Channels	32	32	64	64	128	128	2
K-order	9	9	9	9	9	90	N/A
Stride	1	1	1	1	1	1	N/A

The initial training rate of the proposed GNN is 0.001. The training is conducted with a fixed 600 steps. The learning rate would decrease by a factor of 0.5 once the validation accuracy drops in two consecutive rounds.

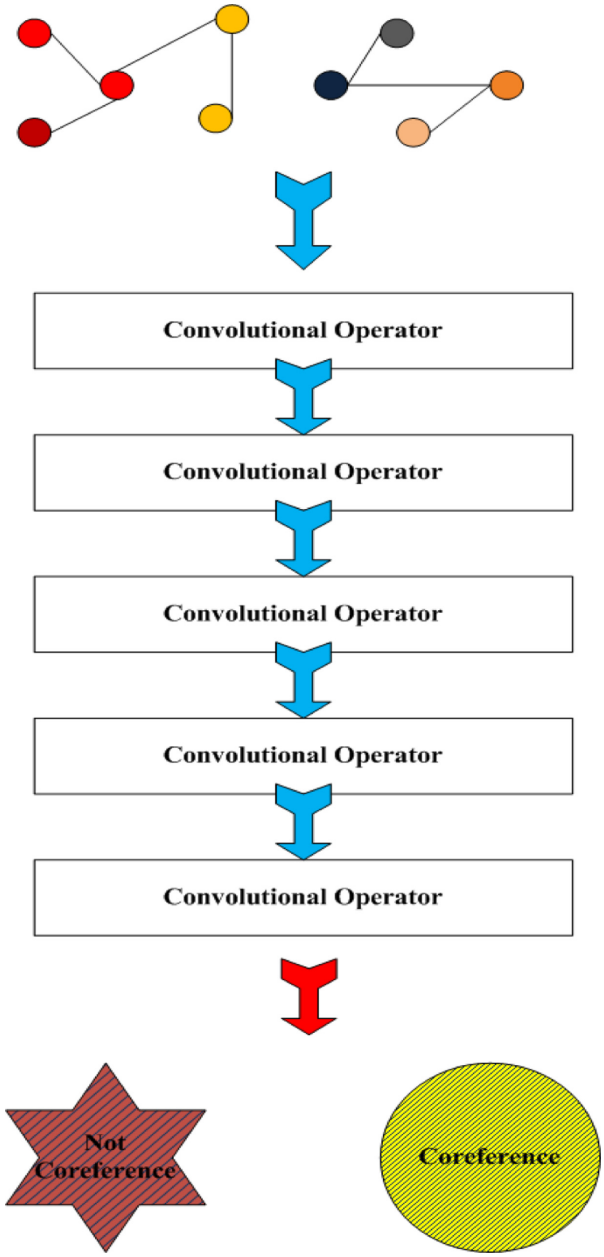

Fig. 1. The method of the presented GNN

3 Results and Discussion

The comparison experiments on the manually collated samples between latest techniques and the presented one to measure the performance of the presented GNN-based pipeline. And the results of the experiment as well as the analysis are provided in the following section.

3.1 Dataset

The proposed GNN is trained solely on samples data collected manually of course entities according to the syllabus in Universities of Shandong Province, China. In total, 1,312 pair of entities (600 of them are coreference) were manually collected from the raw materials.

Two educational experts were asked to perform the labeling tasks. Furthermore, none of the data augmentation techniques has been adopted to increase the diversity of the data samples due to the similarity of the course entities (only the course names). The adjacent matrix of the entities and the similarity of each pair of entities were both taken as the input the proposed GNN pipeline.

3.2 The Setting of the Hyperparamete

To determine the optimal setting of the hyperparameter as mentioned in Sect. 2.2, the classification experiments with different values of this hyperparameter from 0 to 1 with step of 0.1 were carried out and the corresponding accuracy is illustrated as Fig. 2.

Since the highest accuracy is achieved when we set λ at 0.5, the value of 0.5 is adopted in the following experiments. Accordingly, the value 0.5 is used during process of training, testing, and evaluation.

In total, 70% of the samples are taken as the training set, 20% as the evaluation set, and the remaining are used as the testing set. The presented GNN has been fine-tuned by back propagation mechanism. Graphics Processing Unit (GPU), which has high performance, is employed in the presented GNN, and the learning rate of the Tensorflow deep learning platform is set as 0.01.

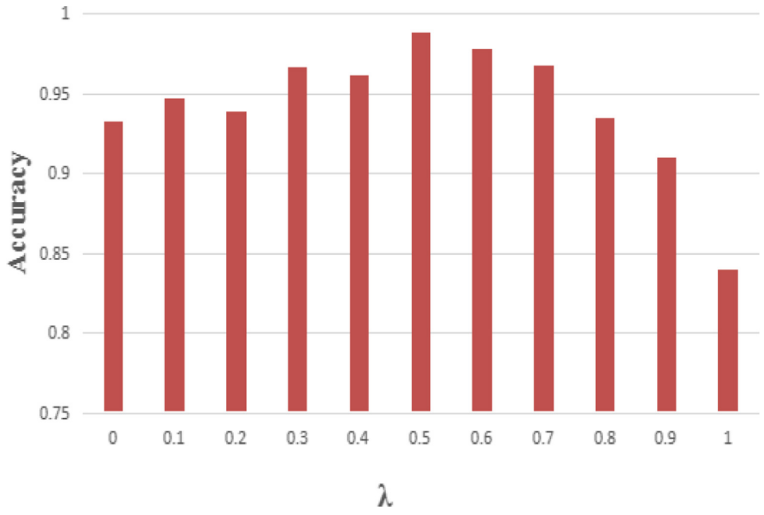

Fig. 2. Performance of the proposed GNN with different λ

3.3 Experiments

To measure the performance of the presented GNN-based pipeline, the comparison experiments between latest [10–13] and the proposed techniques were carried out on the data samples collected manually.

As illustrated in Table 2, our technique outperforms other coreference resolution techniques in accuracy significantly.

Table 2. Performance comparison between latest and the presented GNN-based approach.

Methods	Accuracy (%)
Lee et al. [10]	83.25
Meng et al. [11]	87.03
Pandian et al. [12]	86.47
Agarwal et al. [13]	90.13
Our method	98.56

3.4 Analysis

According to performance comparison between the latest and ours on the data samples collected manually, we could observe that effectiveness of the proposed GNN-based approach. Through transferring the coreference resolution tasks into the neighboring relationship between each pair of nodes in the non-Euclidean graph, the introduced GNN could reveal both the association between each pair of entities and the corresponding similarities. Meanwhile, the accuracy obtained could satisfy the practical requirement for course syllabus.

The proposed GNN could significantly enhance the classification of coreference. Since we set different λ to carry out the performance comparison experiments in Sect. 2.2, which is used to represent the similarity between the unknown similarity between one pair of entities.

4 Conclusion

The accurate identification of the coreference of a pair of course names is a potentially valuable tool for the automatic construction of course syllabus in Universities in China. A large amount of researches have paid attention to this area and have shown the effectiveness and efficiency of these works. However, most of the them did not aim at addressing the specific requirement of course syllabus. To bridge the gap, we propose a GNN-based network with transferring the coreference resolution issue into determining the node similarity in the graph. It offers an algorithm in an automatic manner.

This study offers at least the following contributions. First of all, a GNN designed for course syllabus scenarios is presented to implement the classification of coreference and non-coreference entities. Secondly, the original coreference resolution issue is transferred into a similarity measurement problem under the graph. Finally, the presented GNN outperforms other methods.

Next, we will go on study the extension of GNN and apply them in various fields, such as natural image processing [14], medical image processing [15] and [16].

Acknowledgment. Youth Innovative on Science and Technology Project of Shandong Province (2019RWF013), Postgraduate Education Reform Research Project of Shandong University of Finance and Economics (SCJY1911), Teaching Reform Research Project of Shandong University of Finance and Economics in 2020 (jy202011, Research on the Intelligent Teaching of Information Management and Information System -- Relying on the Intelligent Education Team, Study on the Reform of Curriculum Assessment Method in Shandong University of Finance and Economics).

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Qiaohong Zu
Yong Tang
Vladimir Mladenović (Eds.)
LNCS 12634
Human Centered Computing
6th International Conference, HCC 2020
Virtual Event, December 14–15, 2020
Revised Selected Papers
Springer

Contents

Dynamic Pick and Place Trajectory of Delta Parallel Manipulator 1
Qiaohong Zu, Qinyi Liu, and Jiangming Wu

Design of Aquatic Product Traceability Coding Scheme Based on EPC Label 12
Qiaohong Zu, Ping Zhou, and Xiaomin Zhang

DEVS-Based Modeling and Simulation of Wireless Sensor Network 19
Songyuan Gu, Chen Wu, and Yuanyuan Qin

Spatial Reciprocity Aided CSI Acquirement for HST Massive MIMO 31
Kaihang Zheng, Yinglei Teng, An Liu, and Mei Song

A Flexible Film Thermocouple Temperature Sensor 43
Yulong Bao, Bin Xu, Huang Wang, Dandan Yuan, Xiaoxiao Yan, Haoxin Shu, and Gang Tang

Design of a Morphing Surface Using Auxetic Lattice Skin for Space-Reconfigurable Reflectors 55
Bin Xu, Houfei Fang, Yangqin He, Shuidong Jiang, and Lan Lan

The Method of User Information Fusion Oriented to Manufacturing Service Value Net 68
Wenjia Wu, Lin Shi, Jiaojiao Xiao, and Changyou Zhang

Image Fusion Method for Transformer Substation Based on NSCT and Visual Saliency 75
Fang Zhang, Xin Dong, Minghui Liu, and Chengchang Liu

Permission Dispatching Mechanism Inside and Outside of the Warranty Period for Equipment Maintenance Service System 84
Yujie Liu, Wenjia Wu, Wen Bo, Chen Han, Quanxin Zhang, and Changyou Zhang

New Technology Development and Application Trends Based on Monitoring of Patent Data 91
Ce Peng, Tie Bao, and Ming Sun

A K-means Clustering Optimization Algorithm for Spatiotemporal Trajectory Data 103
Yanling Lu, Jingshan Wei, Shunyan Li, Junfen Zhou, Jingwen Li, Jianwu Jiang, and Zhipeng Su

Temporal and Spatial Changes of Ecosystem Health in Guangdong Province in Recent 11 Years 114
Nan Zhang, Yong Xu, Shiqing Dou, Juanli Jing, and Hanbo Zhang

Salient Attention Model and Classes Imbalance Remission for Video Anomaly Analysis with Weak Label 126
Hang Zhou, Huifen Xia, Yongzhao Zhan, and Qirong Mao

A Data Fusion Model Based on Multi-source Non-real-Time Intelligence. . . . 136
Yuanyuan Qin and Songyuan Gu

Ancient Chinese Lexicon Construction Based on Unsupervised Algorithm of Minimum Entropy and CBDB Optimization 143
Yuyao Li, Jinhao Liang, and Xiujuan Huang

Availability Analysis of GNSS RAIM Based on Maximum Undetectable Position Bias 150
Shitai Wang and Min Yin

Psychological Semantic Differences of Zhang Juzheng Before and After DuoQing Event. 161
Shuting Li, Miaorong Fan, Fugui Xing, and Tingshao Zhu

Digital Rights Management Platform Based on Blockchain Technology 173
Wenan Tan, Xiao Zhang, and Xiaojuan Cai

A Deep Hybrid Neural Network Forecasting for Multivariate Non-stationary Time Series 184
Xiaojian Yang and Xiyu Liu

Risk Assessment of Flood Disasters in Hechi City Based on GIS 191
Min Yin, Chengcheng Wei, Juanli Jing, and Xiaoqian Huang

Cultural Symbol Recognition Algorithm Based on CTPN + CRNN. 202
Yanru Wang

Spatial-Temporal Variation and Future Changing Trend of NDVI in the Pearl River Basin from 1982 to 2015 209
Caixia He, Bingxin Ma, Juanli Jing, Yong Xu, and Shiqing Dou

An Improved Collaborative Filtering Algorithm Based on Filling Missing Data 220
Xin Zhou and Wenan Tan

Diagnosis Method of Alzheimer's Disease in PET Image Based on CNN Multi-mode Network 227
Shupei Wu and He Huang

Research on Multi-floor Path Planning Based on Recommendation Factors 238
Yanru Wang and Haoyang Yu

E-commerce Review Classification Based on SVM 246
Qiaohong Zu, Yang Zhou, and Wei Zhu

Experimental Research of Galfenol Composite Cantilever 258
Qinghua Cao, Xiaoxing Zhang, Nannan Wu, Zhifeng Zhou, and Jinming Zang

A Capacitive Flexible Tactile Sensor 269
Dandan Yuan, Haoxin Shu, Yulong Bao, Bin Xu, and Huan Wang

Multi-objective Optimization of E-commerce Logistics Warehouse Layout Based on Genetic Algorithm 276
Qiaohong Zu and Yanchang Liu

Magnetic Circuit Design of Galfenol Composite Cantilever 283
Qinghua Cao, Jinming Zang, Nannan Wu, and Zhifeng Zhou

A MEMS-Based Piezoelectric Pump with a Low Frequency and High Flow 295
Dehui Liu, Zhen Wang, Liang Huang, Shaojie Wu, and Dandan Yuan

Micro-video Learning Resource Portrait and Its Application 302
Jinjiao Lin, Yanze Zhao, Tianqi Gao, Chunfang Liu, and Haitao Pu

Research on Downscaling and Correction of TRMM Data in Central China 308
Hanbo Zhang, Shiqing Dou, Yong Xu, and Nan Zhang

Research on the Knowledge Map of Combat Simulation Domain Based on Relational Database 319
Li Guo, Boao Xu, Hao Li, Dongmei Zhao, Shengxiao Zhang, and Wenyuan Xu

Scale-Aware Network with Attentional Selection for Human Pose Estimation 326
Tianqi Lv, Lingrui Wu, Junhua Zhou, Zhonghua Liao, and Xiang Zhai

Short-Term Traffic Flow Prediction Based on SVR and LSTM 338
Yi Wang, Jiahao Xu, Xianwu Cao, Ruiguan He, and Jixiang Cao

A Logging Overhead Optimization Method Based on Anomaly Detection Model 349
Yun Wang and Qianhuizhi Zheng

Multi-objective Collaborative Optimization of Multi-level Inventory: A Model Driven by After-Sales Service 360
Mingxuan Ma, Yiping Lang, Xia Liu, Wendao Mao, Lilin Fan, and Chunhong Liu

The Research About Spatial Distribution of Urban Functions Based on POI Data 372
Jingwen Li, Yuan Ma, Jianwu Jiang, Wenda Chen, Na Yu, and Shuo Pan

The Psychological Characteristics Changes Analysis of Su Shi Before and After the Wutai Poetry Case ——Based on the CC-LIWC 382
Rui Ma, Fugui Xing, Miaorong Fan, and Tingshao Zhu

A Conference Publishing System Based on Academic Social Network 389
Jiongsheng Guo, Jianguo Li, Yong Tang, and Weisheng Li

Software Component Library Management Mechanism for Equipment Parts Service Value-Net 401
Zhuo Tian, Changyou Zhang, Xiaofeng Cai, and Jiaojiao Xiao

No-Reference Quality Assessment for UAV Patrol Images of Transmission Line 407
Xujuan Fan, Xiancong Zhang, Jinqiang He, Yongli Liao, and Dengjie Zhu

An Inclusive Finance Consortium Blockchain Platform for Secure Data Storage and Value Analysis for Small and Medium-Sized Enterprises 419
Jiaxi Liu, Peihang Liu, Zhonghong Ou, Guangwei Zhang, and Meina Song

An Under-Sampling Method of Unbalanced Data Classification Based on Support Vector 430
Jinqiang He, Yongli Liao, Dengjie Zhu, Xujuan Fan, and Xiancong Zhang

Image Classification Algorithm for Transmission Line Defects Based on Dual-Channel Feature Fusion 441
Yongli Liao, Jinqiang He, Dengjie Zhu, Xujuan Fan, and Xiancong Zhang

Research on Alarm Causality Filtering Based on Association Mining 452
Yuan Liu, Yi Man, and Jianuo Cui

Exploring Psycholinguistic Differences Between Song and Ming Emperors Bases on Literary Edicts 459
Shuangyu Liu and Tingshao Zhu

The Influence of the Reform of Entrance Examination on University Development 469
Dongfang Wan, Chenglin Zheng, Yue Wang, Wenjia Hu, Xinyi Ma, and Jinjiao Lin

Author Index 477

Micro-video Learning Resource Portrait and Its Application

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Abstract. The emergence of a large number of online learning platforms changes the learners' demands and learning styles, thus the society puts forward higher requirements for the personalization, intelligentization and adaptability of learning resource platforms. For large-scale, multi-source and fragmented micro-video learning resources and personalized education problems, based on micro-video online learning resources data, the paper studies the accurate, comprehensive and usable micro-video learning resources portrait method. And through the application of deep learning technology, it studies the theory and method of micro-video learning resource data analysis and personalized learning resource recommendation. It explores and forms the basic theories and methods of data-driven micro-video learning resources analysis to support the research of personalized education theories and methods.

Keywords: Micro-video · Learning resources · Resource portrait · Personalized recommendation

1 Introduction

Micro-video learning resources have the characteristics of multi-source, multi-dimensional and fragmentation. It can meet learners' ubiquitous, mobile and personalized learning characteristics and requirements in the age of intelligence. Especially because of the COVID-19 in 2020, micro-video learning resources online have attracted unprecedented attention. Massive micro-video learning resources promotes the teaching from "curriculum" to "knowledge point", and at the same time, the knowledge transfer has changed from the linear structure to the networked structure, and the traditional teaching methods and the recommendation of learning resources cannot fully meet the learning needs of learners. In addition, people's learning is based on knowledge points and its logical relationships, and learners' previous knowledge and experience will greatly affect the learning effect [1]. So it has great research significance to organize the existing micro-videos to explore the accurate, comprehensive and usable micro-video learning resources portrait method and personalized learning resource recommendation.

Q. Zu et al. (Eds.): HCC 2020, LNCS 12634, pp. 302–307, 2021.
https://doi.org/10.1007/978-3-030-70626-5_32

2 Related Work

2.1 Learning Resource Portrait

In China, the study of resource portrait and its application is the research focus for both pedagogy and computer science researchers. Professor Yu Shengquan proposed the framework of international standards for learning meta-level from the perspective of basic education [2]. Professor Yu Ping and Zhu Zhiting put forward the content shareability standard of open education resources [3]. Professor Yang Jiumin studied various interaction designs in videos from the perspective of learning effects of video resources [4]. These studies focus on video learning resources portrait and its applications in the foundation education. There is a lack of research on fine-grained and fragmented micro-video learning resources in higher education.

2.2 Micro-video Learning Resource Portrait

Micro-video learning resource portrait refers to the use of consistent concepts, relationships and properties to describe micro-video learning resources under certain technical specifications. Jiang et al. [5] proposed a multi-modal LDA model to mine the content portrait of video learning resources. Minxin et al. [6] used the existing classification relationships in text mining and domain ontology to find candidate keywords that can represent semantic relationships. Yang et al. [7] proposed an attention mechanism based on relation representation to extract the directed relation information among elementary mathematical knowledge points. These existing researches focus on text, they only extract the low-level features, and They don't extract the relationship between multi-source network knowledge.

2.3 Personalized Learning Resource Recommendation

At present, the existing personalized learning resources recommended method which can be roughly divided into the following types: based on collaborative filtering (CFB) [8], based on the content (CB) [9], based on sequence mining (SMB) [10], mixing method. These researches didn't fully consider the semantic part of learning resources and paid little attention to the logical structure and the systematization of learning resources.

Therefore, based on unsolved problems in the above studies, this paper explores the portrait and application of micro-video learning resources, and proposes a method to carry out learning resources portrait and personalized recommendation.

3 Portrait and Application Analysis of Micro-video Learning Resources

The main system framework of this paper is shown in Fig. 1, which mainly includes the micro-video learning resources portrait of and the personalized recommendation.

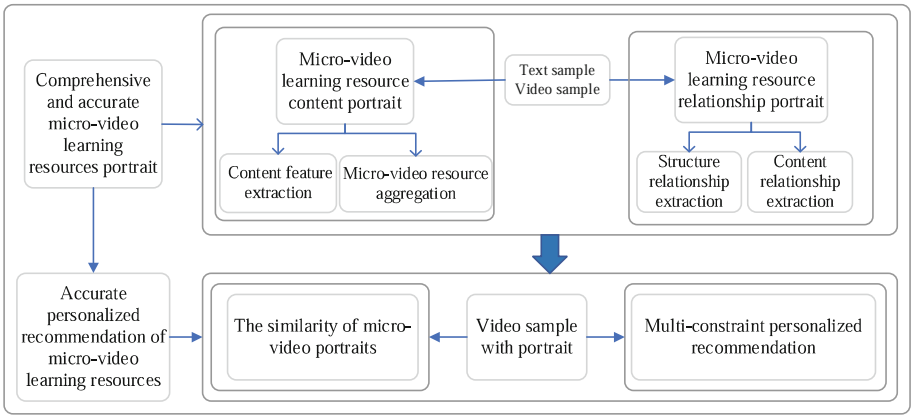

Fig. 1. System framework

3.1 Micro-video Learning Resource Portrait

Micro-video learning resource portrait mainly includes micro-video learning resource content portrait and micro-video learning resource relationship portrait.

1. Micro-video learning resource content portrait
Micro-video learning resource content portrait mainly includes the concept and properties of micro-video learning resources. When the content layer of micro-video learning resource is depicted, it is necessary to restore the source properties of the learning resource and label these properties. Specific as follows:
Firstly, we should extract the content feature of micro-video learning resource. Because of online learning resource covers all disciplines and fields and their content creators have different levels of knowledge, the same knowledge exist many different expressions, and it is not reality to determine the features of micro-video learning resources artificially. Therefore, we should study how to combine text, image and audio to mine the content features of micro-video learning resources. These features not only include low-level features such as keywords, but also contain a high-level feature, such as discipline, knowledge domain, knowledge unit, knowledge level, etc.
Secondly, we should aggregate micro-video learning resources. Different from basic education, which has standardized subject knowledge system, the knowledge system of higher education is open, the knowledge points are named according to their respective cultivation characteristics in higher education. Therefore, it is necessary to work out the domain knowledge point label system based on the above content features.
2. Micro-video learning resource relationship portrait.
It contains structural relationship and content relationship.

Firstly, we need to extract the structure relationship. The logical relationship between knowledge points may be different for different fields. A knowledge point may belong to a number of knowledge fields, and each knowledge field corresponds to a number of micro-videos. So the extraction of the micro-video learning resource relationship is a

multi-dimensional problem. Therefore, we need to study how to combine text, image and voice data to mine relationship features. These features should not only include low-level features such as hierarchical relationship and association relationship, but also include high-level features such as co-reference and preorder.

Secondly, we need to extract the content relationship. Micro-video learning resources are based on the knowledge point granularity, it includes concept, principle, test questions and other types of content relations. Therefore, we need to study how to carry out transfer learning based on small sample data such as expert knowledge to accurately predict content relations.

3.2 Personalized Recommendation of Micro-video Learning Resources

It is implemented based on the above portrait and learner needs.

Firstly, the similarity of micro-video portraits is the basis of the recommendation algorithm. It has multi-dimensional characteristics, and the dimensions are not the same. Therefore, we need to study the measurement of the similarity of micro-video portraits.

Secondly, personalized recommend is based on micro-video portraits, and it is necessary to fully consider students' personalized learning needs and other constraints, such as the learner's professional background, previous knowledge, field experience, learning needs, learning objectives, and so on, so we need to study personalized micro-video recommendation under multiple constraints.

4 The Implementation of Micro-video Learning Resource Portrait and Application

Based on the problems that need to be solved, combined with the application analysis of current artificial intelligence and other technologies, this paper proposes the method of micro-video learning resource portrait and personalized recommendation system.

4.1 Micro-Video Learning Resource Portrait

The purpose of this paper is to study the iterative discovery method of the concepts of content layer and hidden properties in multiple fusion of text, image and audio. In this method, subjects, fields, knowledge level and relationships are taken as semantic annotation factors. This technology is an important technology to solve the problem of feature extraction of data-driven micro-video learning resources, and it is the basis of personalized guidance. According to the technical characteristics of deep learning, we think that a Convolutional Neural Networks (CNNs) data processing model can be adopted to solve this problem. As shown in Fig. 2, during the construction of a federation classifier for implicit properties, the system extracts the content features of multivariate learning resources data (such as text, image, audio, etc.), and combined with multivariate data fusion, the system extracts the common features of multivariate data as the important features of the classifier.

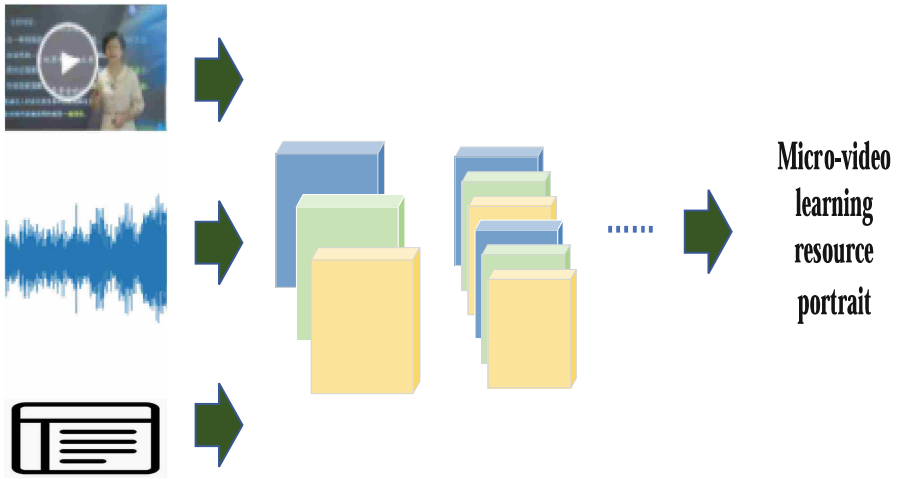

Fig. 2. Convolutional neural networks model

4.2 Personalized Recommendation System

This paper designed a micro-video learning resource portrait similarity method based on small sample. According to cognitive load theory, it provides appropriate methods to support the selection of micro-video learning resources. The collaborative filtering method can also be used to achieve the recommendation of micro-video learning resources, so it is necessary to calculate the portrait similarity of micro-video learning resources. In the definition of computational portrait similarity, we not only consider the content feature and structure feature, but also consider the timing factor of micro-video learning resources, and we use the latest change part of micro-video increment to calculate the result similarity. Different from other research similarities, in the field of education, whether the similarity of learning resources is accurate or not requires expert knowledge for final verification. Therefore, the sample micro-video data set needs to be reviewed online by corresponding experts and labeled as similar or not. Then, these labeled data are used as training sets to make accurate similarity prediction for micro-video learning resources. Multi-constraint personalized micro-video learning resource recommendation needs to consider the matching degree of students' personalized needs and micro-video learning resource portrait. According to the principle of homogeneity, we can match students who have similar personalized needs with micro-video learning resources which have similar portraits. Graph Convolutional Neural Network (GCN) is a neural network of learning graph structure, whose learning goal is to obtain the hidden state of graph perception of each node. We can take micro-video learning resources as nodes, and take their portrait as its characteristic value, then we can input this feature graph into graph convolution network for training and obtain corresponding similarity results.

5 Conclusion

This paper takes into account the disciplinary logic, domain and knowledge level of micro-video learning resource data, and proposes to use deep learning method to integrate multiple data such as text, image and audio to depict micro-video learning resources accurately. And it proposes a personalized recommendation method to calculate the similarity of micro-video learning resources by GCN. This paper explores and forms the basic theories and methods of data-driven micro-video learning resources analysis. In this paper, artificial intelligence technology is integrated into education, it provides a feasible way for micro-video learning resource portrait and its application.

Acknowledgment. Youth Innovative on Science and Technology Project of Shandong Province (2019RWF013), Postgraduate Education Reform Research Project of Shandong University of Finance and Economics (SCJY1911), Teaching Reform Research Project of Shandong University of Finance and Economics in 2020 (jy202011), Teaching Reform Research Project of Shandong Province (M2018X169, M2020283).

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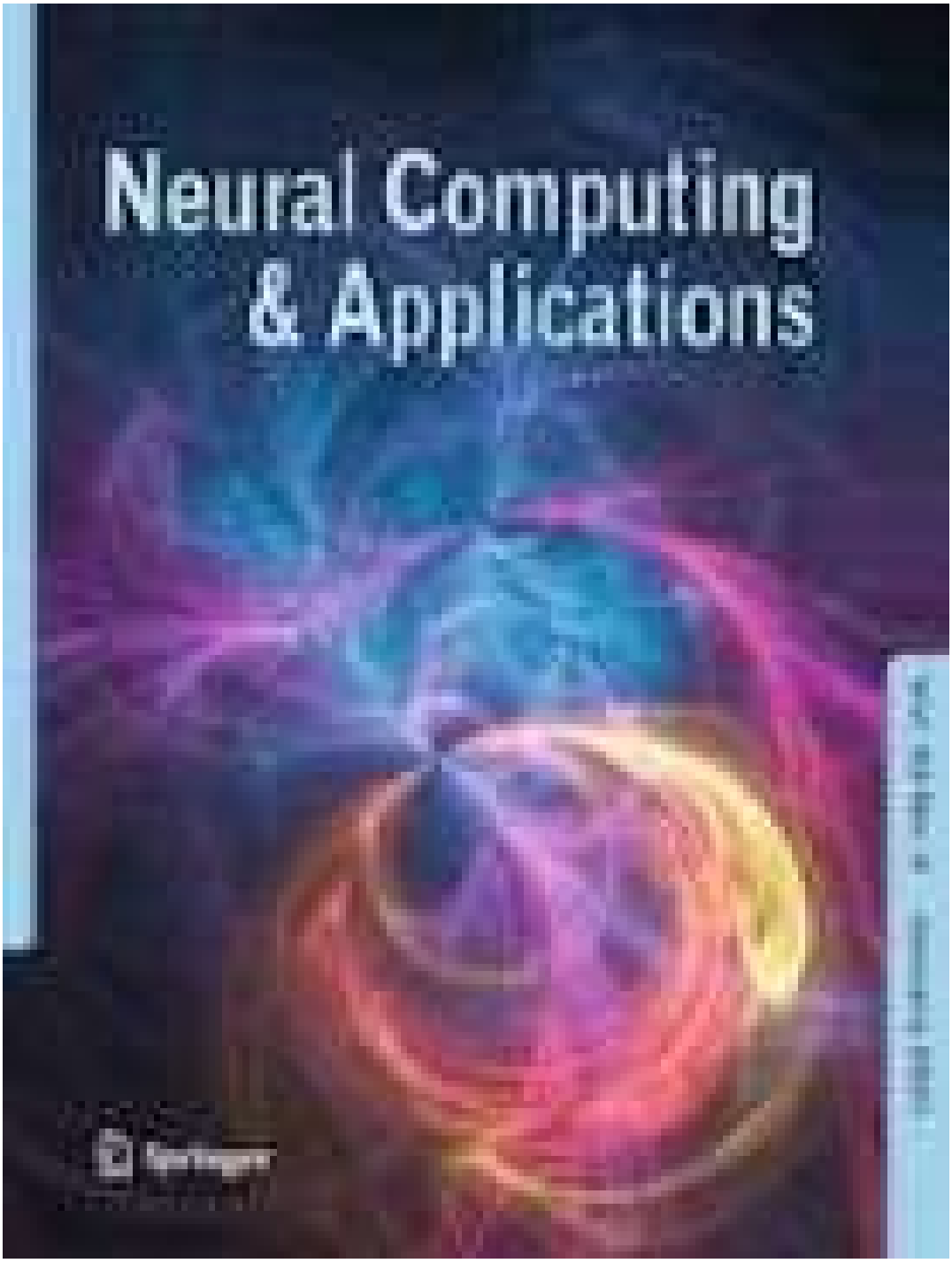

Volume 33, issue 2, January 2021

Special Issue on Data processing techniques and applications for Cyber-Physical Systems (DPTA 2019)

Issue editors

- Chuanchao Huang
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24 articles in this issue

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   - Neil Y. Yen
   - Content type: Editorial
   - Published: 11 January 2021
   - Pages: 501 - 503

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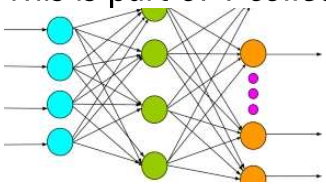

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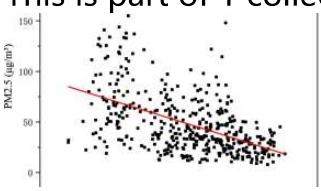

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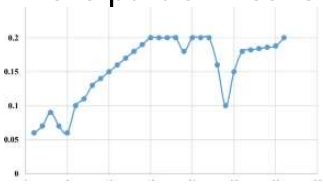

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- Pages: 535 - 545

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25

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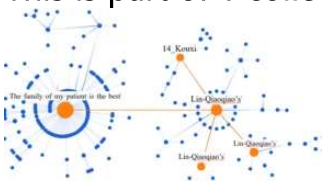

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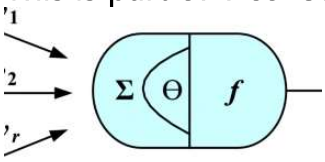

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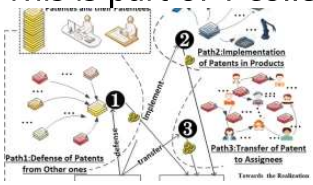

9. **Application of artificial neural network model based on GIS in geological hazard zoning**

   Authors (first, second and last of 5)

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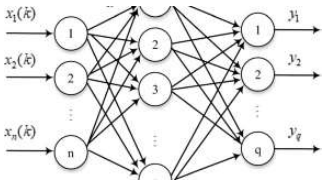

10. **Prediction of TBM penetration rate based on Monte Carlo-BP neural network**

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    - Published: 21 May 2020
    - Pages: 603 - 611

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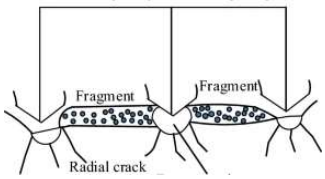

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    - Published: 13 June 2020
    - Pages: 613 - 624

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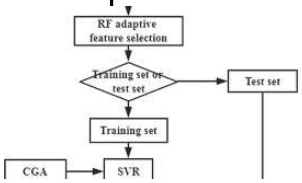

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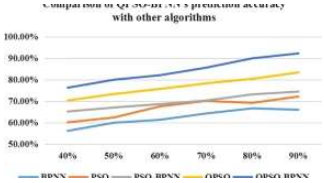

13. **Predicting academic performance of students in Chinese-foreign cooperation in running schools with graph convolutional network**

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- Published: 21 June 2020
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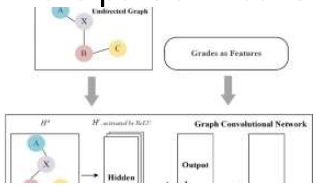

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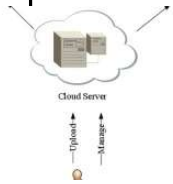

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- Pages: 655 - 666

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While t < Total simulated period do
Begin
Produce and mutate small amounts of random antigens
Produce a fixed number of antibodies
Perform antigen–antibody binding and affinity calculations
if(Optimal affinity in this period < Optimal affinity in the previous period) then
The antibody disappears
else The antibody is selected for cloning and inheritance, eliminating the antigen

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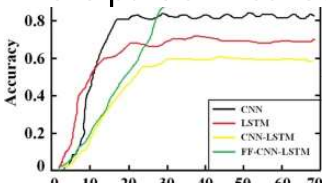

17. **Domain knowledge graph-based research progress of knowledge representation**

    Authors (first, second and last of 5)

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    - Published: 21 June 2020
    - Pages: 681 - 690

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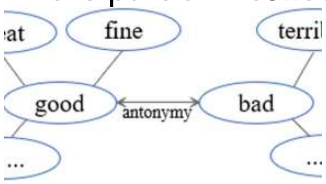

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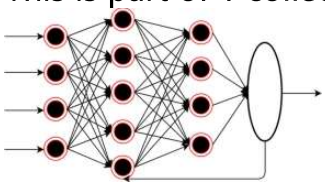

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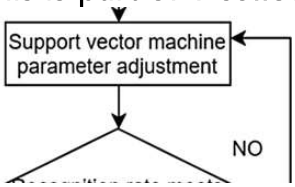

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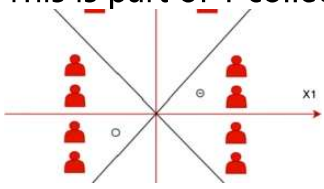

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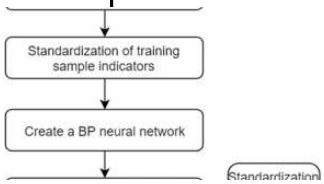

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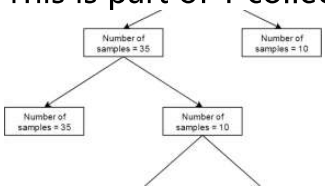

23. **A combined model based on SSA, neural networks, and LSSVM for short-term electric load and price forecasting**

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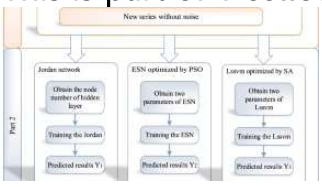

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Neural Computing and Applications
https://doi.org/10.1007/s00521-020-05057-5

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Domain knowledge graph-based research progress of knowledge representation

Jinjiao Lin[1] · Yanze Zhao[1] · Weiyuan Huang[2] · Chunfang Liu[1] · Haitao Pu[3]

Received: 27 January 2020 / Accepted: 3 June 2020

Abstract
Domain knowledge graph has become a research topic in the era of artificial intelligence. Knowledge representation is the key step to construct domain knowledge graph. There have been quite a few well-established general knowledge graphs. However, there are still gaps on the domain knowledge graph construction. The research introduces the related concepts of the knowledge representation and analyzes knowledge representation of knowledge graphs by category, which includes some classical general knowledge graphs and several typical domain knowledge graphs. The paper also discusses the development of knowledge representation in accordance with the difference of entities, relationships and properties. It also presents the unsolved problems and future research trends in the knowledge representation of domain knowledge graph study.

Keywords Domain knowledge graph · Knowledge representation · Entity · Relationship · Property

1 Introduction

Domain knowledge graph (industry knowledge graph or vertical knowledge graph) is based on domain-specific data. Domain knowledge graph is different from general knowledge graph which contains common sense information. Information in a domain knowledge graph is mostly suitable for a specific industry. It contains more complex knowledge and structure and plays an important role in domain information integration. With the in-depth study of knowledge graph and the progress of artificial intelligence technology, the construction of domain knowledge graph has more technical support, and studies of domain knowledge graph have gradually become a heated research topic.

At present, most researches on knowledge graph construction focus on the construction of general knowledge graph, and there are still gaps between the research of domain knowledge graph construction which contains more complex information and data. Knowledge representation, as a first step to knowledge graph construction, is the foundation of knowledge graph construction. Firstly, this research introduces knowledge representation of classical general knowledge graphs and current typical domain knowledge graphs. Secondly, it discusses the development of knowledge representation according to the difference in entities, relationships and properties.

The relevant concepts of knowledge representation are introduced in the second part. The third part discusses the knowledge representation of general knowledge graphs in different categories; the fourth part introduces the knowledge representation of typical domain knowledge graphs. And some unsolved problems in knowledge representation research have been presented in the last part.

2 Basic concept

2.1 Concept of knowledge representation

Knowledge representation is a set of rules to describe the world. It is the symbolization, formalization or modeling of

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Published online: 21 June 2020

the knowledge. Different knowledge representation methods are different formal knowledge models. In the concept of knowledge engineering representation, representation is a computer model describing the natural world, and it should meet the specific limitations of computers. Therefore, representation can be understood as a kind of data structure and a set of operations. It emphasizes the image form of the information of the natural world in a certain type of data structure in the computer and the processing methods adopted for the stored contents [1]. Knowledge representation defines the domain basic cognitive framework, which defines the basic concepts in domain and the basic semantic relationships between concepts [2].

2.2 Relevant concepts

Knowledge representation is a part of the study of knowledge graph. Wang Haofen, a professor of East China University of Science and Technology, believes that the purpose of knowledge graph is to describe various entities or concepts existing in the real world. Each entity or concept is identified with a globally unique ID, which is called identifier. Each property-value pair is used to describe the internal characteristics of an entity, and the relationship is used to connect two entities and describe their associations [3]. Therefore, knowledge representation not only involves knowledge, but also involves entities, properties and relationships.

Entities refer to something that exists in the objective world. Entities have distinction and can exist independently. An entity is a basic unit of the knowledge graph [4]. In the knowledge graph, nodes are regarded as entities [5]. A semantic class/concept is an abstract name for a set of things that have the same characteristics. A property refers to a property value from an entity, which describes the characteristics of this entity [5]. Relationships describe the contact between two or more entities [4, 5].

Knowledge is the set of all facts, concepts, rules or principles. Here, set is acquired and summarized by observing, learning and thinking about various phenomena in the objective world [3]. Knowledge includes language knowledge, commonsense knowledge, encyclopedic knowledge, domain knowledge, etc. Therefore, knowledge graph can be divided into language knowledge graph, commonsense knowledge graph, encyclopedic knowledge graph and domain knowledge graph [6]; more broadly, they can be summarized as general knowledge graph and domain knowledge graph according to their scope of application [4].

3 General knowledge graph

This section mainly introduces some general knowledge graphs and analyzes their knowledge representation. General knowledge graph includes language knowledge graph, commonsense knowledge graph and encyclopedic knowledge graph. This section selected several typical general knowledge graphs in different categories and analyzed their similarities and differences in knowledge representation. These knowledge graphs are not built successfully at one time, and each new knowledge graph is formed in the optimization of the original knowledge graph. The knowledge representation between them is different though there are also some similarities.

3.1 Language knowledge graph

Before the popularization of the Internet, lots of original expert systems and knowledge bases were constructed artificially, among which the early representative model was WordNet [6], and it can be regarded as a language knowledge graph. WordNet is the achievement of the task to develop a dictionary database undertaken by a group of psycho lexicologists and linguists at Princeton University since 1985 [7]. WordNet is regarded as an online electronic (synonymous) dictionary system, which is a proposal to combine traditional dictionary information with modern high-speed computing more effectively [8]. Its knowledge mainly comes from artificial construction, and we can simply understand WordNet as an electronic dictionary with some encyclopedic knowledge and real relationships.

WordNet assumes the role of a dictionary database, so the division of concepts or entities is not very clear. In our research, we will mainly analyze its knowledge representation through words. It takes the word as the smallest unit and builds a set of synonyms with the same meaning words. In addition, it defines a name for them and treats them as a concept. For example, *car, railcar, railway car, railroad car—(a wheeled vehicle adapted to the rails of railroad; "Three cars had jumped the rails")*—are a synonym set for streetcars; each synonym set includes a description of the concept. A word may have more than one meaning, so it may appear in more than one synonym set.

WordNet contains more relationships between words than entities. It includes the following basic relationships: synonym relationship, antonym relationship, hypernym and hyponym relationship, whole and part relationship [7–9]. Synonym relationship is a most basic relationship in WordNet, because word nodes are related by synonym relationship. It refers to the relationships between words with the same semantic meaning. Antonym relationship is

mainly the relationships between the adjectives, and there are direct antonym relationship and indirect antonym relationship. Direct antonym relationship refers to the relationships between words that have opposite meaning. Indirect antonym relationship refers to the relationships between a word and the antonym of its synonym, such as Fig. 1 [8]; *good* and *bad* is the direct antonym relationship, and *great* and *bad* is the indirect antonym relationship. The hyponymy relationship (*is kind of, is a generalization of*) mainly refers to the hierarchical relation between nouns. For example, the hypernym of *dog* is the synset of *animal*, and the hypernym of *animal* is the synset of *organism*. A word may contain many hyponymy words. WordNet contains 25 basic classes (final hypernym). WordNet also includes the relationships between whole and part (*is part of*), which means a *is a component of* b, a *is members of* b or a *is substance of* b. Relationships in WordNet are generally connected by pointers, but some noun entities are also connected by relational adjectives [8].

WordNet can be regarded as an electronic dictionary with encyclopedic knowledge, and it contains some basic features and functional properties. It takes some real things in the noun set as an entity, such as robin, dog, apple, etc. Their feature properties are linked to adjectives, and function properties are linked to verbs. An entity is connected with a descriptive property by property name, such as *WEIGHT(package)* = *heavy*. It means that *package* has a property *WEIGHT*, and the property value is *heavy*. An entity and its functional properties are linked by pointers between noun and verb sets.

3.2 Commonsense knowledge graph

Language knowledge graph (WordNet) realized the task of adding some simple facts to knowledge network, but it lacks representation of real events. Real-life events cannot be described by one word, and general relationships and properties also cannot show more facts in the real world. So people build commonsense knowledge graph which includes Cyc [10] and ConceptNet [11]. The knowledge in Cyc is represented by higher-order logic; according to concepts and assertions, Cyc uses argumentation to achieve the reasoning of common sense knowledge based on contextual contents [12–14]. ConceptNet originated in the

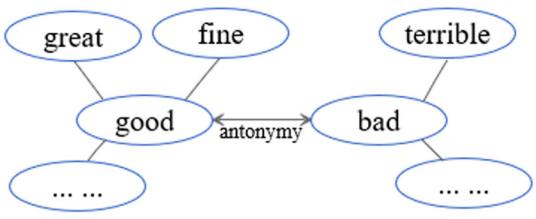

Fig. 1 Antonym relationship

Open Mind Common Sense (OMCS) project at the MIT Media Lab, which was proposed by famous artificial intelligence expert Marvin Minsky in 1999 [4]. It is a crowd sourcing knowledge base and a semantic network. ConceptNet contains a lot of common sense information, which helps computers to understand the real world. It extends the knowledge network that language knowledge graph has built. This section focuses on the knowledge representation of ConceptNet.

The node of ConceptNet is no longer a simple word, but semistructured English segments. It is usually a compound phrase or an action. ConceptNet contains more abundant knowledge of the real world than WordNet. It focuses on the common sense meaning of the natural language words (Unnamed Entity). It will connect the concepts with a lot of common sense and contains a lot of the complex relationships in real world. In addition, it can be better in context-based reasoning, whose knowledge mainly comes from OMCS project, expert knowledge base, purposeful games and other knowledge bases. It is a knowledge base automatically constructed by extracting knowledge according to certain rules [4].

The concepts and entities in ConceptNet are mainly composed with words or phrases. Najmi et al. [15] regard that entities in ConceptNet are described by noun phrase (NP). These phrases usually consist of one or more main nouns as root, with one or more other words to describe this main noun. Verb phrase (VP) is used to describe a concept sometimes. These concepts are usually extracted from the text of natural language [4]. They are more consistent with our usual expression habits. Its nodes contain not only the entity such as people, objects and regions, but also some of our actual action states, such as drink coffee, eat breakfast; these nodes help the expression of commonsense knowledge. Compared with the simple knowledge in language knowledge graph, ConceptNet passes commonsense information to the computer. For example, an entity *apple* is a fruit in WordNet and red is a property of it. But in ConceptNet, it might correspond to *Apple inc.*, rather than a fruit. The specific property and meaning must be inferred from its context.

ConceptNet5 includes 21 predefined and multilingual generic relationships (e.g., *IsA, UsedFor*, etc.) and non-formal relationships extracted from natural language texts that are closer to natural language descriptions (e.g., *on top of, caused by*, etc.) [4]. Compared with the hyponym relationship in WordNet, ConceptNet can summarize commonsense topics or categories by text and connect them with *SuperThematicKLine*, such as *buy food* and *purchase food* can be connected with *buy* by *SuperThematicKLine*. In addition to simple relationships in WordNet (*IsA, PartOf, MadeOf, SimilarTo,* etc.), ConceptNet also contains many complex relationships in reality, such as *fall*

off bicycle and *get hurt* connected by the relationship *EffectOf*. There is no such commonsense knowledge in WordNet, nor as relationships [16]. Examples of ConceptNet are shown in Fig. 2 [17].

Najmi et al. [15] analyzed relationships and properties in ConceptNet from the upper ontology construction. They believe that properties in ConceptNet are not defined like general ontology relationships. Even if some properties are logically incorrect, it may be "meaningful" in common sense. For example, *succeed* as a property is connected with *a person* through *Desires* [18]. It is not a property in the ordinary sense. However, it conforms to our common sense, so it is expressed in such way. They also pointed out that ConceptNet also has a number of adjective phrases (AP) used to describe properties, and they are often connected with *hasProperty*. Some of the functional properties are achieved by verb phrase (VP). For example, *Movement Forward* is a verb phrase, and it can be linked to *bike* with *isCapableOf*. Liu et al. [16] pointed out that if a property appears on many nodes, and these nodes belong to one parent node, this property can be extracted to the parent node. For example, *fruit* is a parent node for *apple* and *banana*, and *sweet* is a common property for them, so it can extract (*"sweet" PropertyOf "fruit"*). In addition, some adjective phrases which have modifiability can be connected with entities as a property.

The main improvements in ConceptNet compared with WordNet are summarized as follows.

ConceptNet uses an automated approach to build knowledge graph. It includes lots of informal commonsense knowledge accumulated from human experience in the real world. On the node of entities and concepts, it is no longer a single word, but a phrase which can contain certain state information. In relationships, in addition to simple relationships and category relationships, it also adds fact relationships contained in the real world, such as causative relationships, causal relationships, etc. In properties, ConceptNet extends the way to extract properties. In addition, it also contains properties from commonsense.

Fig. 2 Example of ConceptNet

3.3 Encyclopedic knowledge graph

Encyclopedia knowledge graph is mainly centered on the open knowledge graph supported by LOD [19] project. It mainly includes Wikidata [20], YAGO [21], Google Knowledge Graph [22], Freebase [23], etc. Wikimedia launched Wikidata in October 2012. It links pages which has same theme and allows readers to add or change data entries. Data in Wikidata are basically described by property-value pairs. For some complex information, property-value pairs are allowed to add dependencies property-value pairs. YAGO is a large semantic knowledge base conducted by the Max Planck Institute in Germany, and it has a million entities and more than five million facts [6]. It extracts facts from Wikipedia's classification system and information boxes and combines classification relationships from WordNet [24, 25]. It describes event information in more detail than Wikidata [26]. Google Knowledge Graph [22, 27] was proposed by Google in May 2012. It builds connection between entities and changes the rules of search based on keywords. It generalizes the content of the same topic and describes entities using structured fields. In addition, it clusters entities and properties based on the user's Google retrieval data. Freebase is a semantic web project started by a MetaWebin 2005. Its construction based on Wikipedia and swarm intelligence [4, 6]. It also allows to add or change data entries like Wikipedia. The knowledge representation of encyclopedia knowledge graph is relatively structured. In this section, we chose Freebase to analyze the detailed.

Compared with the previous two knowledge representations which have defined relationships, the most noticeable characteristics of Freebase are it does not control the top-level ontology very strictly [23], and visitors can create and edit the definition of classes and relationships by themselves. It can be more flexible to express different knowledge. Another notable feature of Freebase is that knowledge is stored structurally in base. Freebase is an open, shared, collaboratively built large-scale linked database [4], as well as a practical, extensible, graphical, structured database of general human knowledge. It is inspired by semantic Web research and collaborative data communities such as Wikipedia [28]. Freebase is built by community member's collaboration. Its main data sources include database such as Wikipedia and the contributions of community users. Freebase's knowledge representation

framework mainly includes the following elements: Domain, Topic, Type and Property.

Each piece of information in Freebase is called a topic. Topic can be a specific and meaningful data (such as Arnold Schwarzenegger), or an abstract concept (such as PI in mathematics, Christianity) [28]. It corresponds to the node in the graph and contains information, which is unique. Each Topic corresponds to a type (category) node, and Type is equivalent to a classification of Topic. For example, Topic "Yao Ming" can correspond to Type of "Person" and "Athlete," etc. Each Type represents a unique category. However, in order to match the complex information in real life, Type can be given a different name [29, 30]. Type that belongs to the same domain can constitute a Domain. This constitutes the basic structure of Freebase: Domain -> Type -> Topic [30].

As knowledge in Freebase is structured, it uses a lightweight classification system (Type System) [29]. Therefore, it contains relationships and properties which are different from the knowledge representation of WordNet and ConceptNet. Jun [29] believes that the property is the most important concept in Freebase. Property value can be either a literal value or a relationship with other node (such as "is a parent of"). In order to show the structure of Freebase more intuitively, here is an example which is provided by Ruan Yifeng, as shown in Fig. 3 [31]. The core Topic is *Arnold Schwarzenegger*, which corresponds to several types. Though a property is connected to the node of *Arnold Schwarzenegger*, it also corresponds to a property of Type. For example, *Arnold Schwarzenegger* corresponds to Type: *Person*, the property of Person is *country of birth*, its value is *Austria*. Topic: *Arnold Schwarzenegger* and Topic: *Austria* is connected by this property, which is also a relationship between these two topics [31]. Each Type involves different properties. Therefore, Type can be regarded as a property container, which contains the most commonly used properties needed to describe a concept.

Another difference from the above two knowledge representations is that Freebase proposes a new structure to handle multiple relationships: CVT (Compound Value Types). CVT is a node that does not require an explicit name, which is used to express complex data [32]. It can be understood as a table in which multiple relationships and properties are stored, and this table is connected with node. For example, in Fig. 4 [4], CVT describes multiple relationships about Obama's tenure. When you look up Obama's tenure, there is an implicit condition for looking up the length of the tenure. They can be looked up as a whole through the CVT. The multiple relationships contain "office position," "from," "to" [4]. The structure may be more complex without the CVT.

The main differences of Freebase compared with the above two are summarized as the follows:

Freebase contains a larger scope of knowledge. It includes not only common sense and encyclopedic knowledge, but also some knowledge of popular culture, art, location information, etc. In structure, it does not have the strict ontology constraints like the above two, and its metadata are flexible to modify and add, and it can be completed by users more conveniently. In order to reflect users' different opinions and understandings, there may be conflict and contradiction in type and property [28]. It also has CVT, a compound value type for storing complex data that are not found in the above two databases. It uses a more simple structure to display knowledge.

4 Domain knowledge graph

The above are some general knowledge graphs, whose entities and concepts come from the common knowledge in real life. In some areas with strong industry knowledge background, they cannot meet the requirements fully. Therefore, researches that focus on domain knowledge graph emerged. Several typical domain knowledge graphs are introduced in this section.

4.1 Geographic information knowledge graph

GeoNames [33] is a classical knowledge graph in the field of geography, which contains over ten million pieces of geographic information (area name, location, etc.), and it is

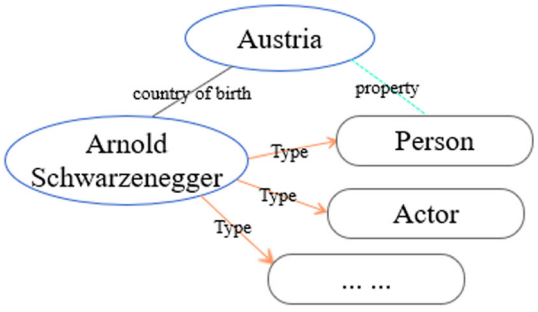

Fig. 3 Example of Freebase

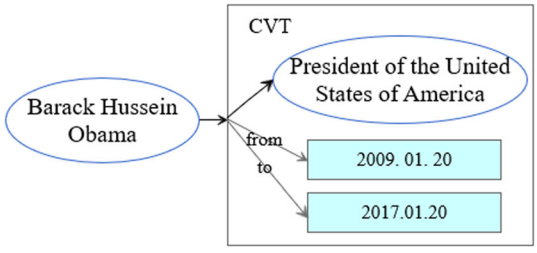

Fig. 4 Example of CVT

mainly displayed in English [34]. GeoName data were collected from the United States Geological Survey, the National Statistical Office, the National Post Office and the U.S. Army [35, 36].

GeoNames divides knowledge which contains nine feature classes, which are subdivided into 645 feature codes [37, 38]. The minimum feature set is the name, coordinates of latitude and longitude, parent regions and countries. It contains population data, aliases and links to Wikipedia, etc. [39]. It treats countries or cities as entities which corresponds to 19 pieces of information each. And some of the information fields are allowed to be empty. These pieces of information can be divided to two sorts. One is property information, such as area, population. These properties are basically geographical information related to the region. And the other is relationship information. For example, an entity can connect to feature classes by feature codes. Level 1 administrative code *admin1 code* and level 2 administrative code *admin2 code* can form hypernym and hyponym relationship [40]. Relationships contained in GeoNames are relatively simple. And these relationships are mainly based on the division of administrative regions, geographical location, attribution, geographic information etc. A simple example of GeoNames is shown in Fig. 5 [33].

The main differences of GeoNames are summarized as follows.

In terms of knowledge scope, the knowledge GeoNames contains is mainly from geographical field. Compared with the previous knowledge graphs, it covers more geographical information. On the structure, the structure of the GeoNames is relatively simple; the entities it contains have fixed and uniform properties, so there is a standard framework of knowledge representation structure. This is quite similar to encyclopedic knowledge graph such as Freebase, and it also supports user to edit data information. Because it relates to geographic information, it links to some specific map. This is not included in the general knowledge graph.

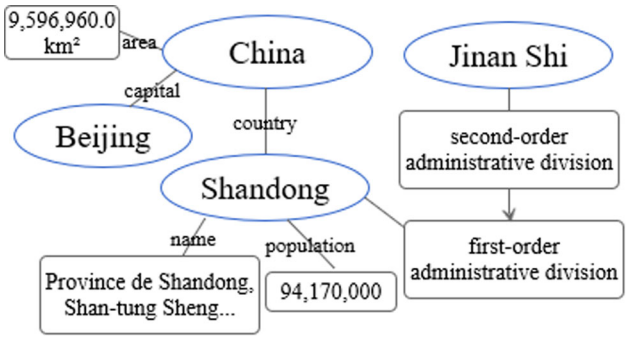

Fig. 5 Example of GeoNames

4.2 Knowledge graph of medical field

In the medical field, the construction of knowledge graphs has also been explored. There are relatively complete medical knowledge bases in this field, such as ICD-11 [41] which uses a tree structure to describe diseases and UMLS [42, 43] which use a structure form to store medical information. And Chinese scholars have also constructed knowledge graphs about traditional Chinese medicine [44–46]. These knowledge graphs contain medical concepts. Their structure is similar to the encyclopedic knowledge graph. In this section, we chose CMeKG [47] which contains more knowledge to analyze its knowledge representation.

CMeKG is mainly composed of concepts of diseases, drugs and diagnostic techniques and their relationships and properties. At present, CMeKG 2.0 [48] has 11,076 diseases, 18,471 drugs, 14,794 symptoms and 3546 treatment techniques, and it includes 1,566,494 triples to describe medical concepts, relationships and properties. It has being updated and improved constantly. Its entities include diseases, symptoms, medicines, etc. By far, the most important entity is disease. It contains treatment options, treatment drugs, diagnostic methods, symptoms, etiology and other properties. The general knowledge graph does not contain such detailed medical knowledge. CMeKG mainly includes the relationships between diseases and other entities, such as related causes, complications, related diseases, etc. In addition, it also includes relationships between symptoms and symptoms, drugs and drugs, etc. Like the general knowledge graph, it provides nodes that link to other knowledge bases. CMeKG is a simple Chinese medical knowledge graph, and its practical application

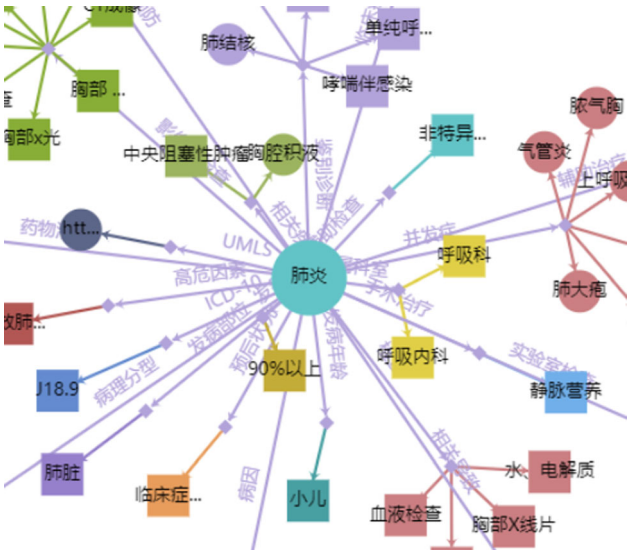

Fig. 6 An interface for CMeKG

needs more exploration. Figure 6 [48] shows an interface for CMeKG.

The main differences of CMeKG compared with the above knowledge graphs are summarized as follows:

In terms of knowledge scope, the knowledge CMeKG contains is mainly from medical field. Compared with the previous knowledge graphs, it covers more detailed medical information. On the structure, its properties and relationships are completely different from other knowledge graphs. Its properties and relationships are based on the medical field.

4.3 Knowledge graph of e-commerce field

The study on knowledge graphs of e-commerce field started earlier. The e-commerce knowledge graph is relatively mature and has been applied in various scenarios. Alibaba built the e-commerce semantic base in 2013 [49], and it includes six subsets, which are basic base, e-commerce base, entertainment base, book base, living base and miscellaneous base. It contains 33 first classes, 10 M entries and 150 relationships. The simple structure is shown in Fig. 7 [49]. This is a simple prototype of the e-commerce knowledge graph.

With the increase in data in e-commerce industry, product knowledge graph of e-commerce field is gradually established [49–52]. The data source includes e-commerce data, Web site information, industry information and encyclopedic information. In product knowledge graph, entities are the products and properties are the related features about this product. Goods belonging to different categories have different properties. For example, the food product has color, smell, shelf life and other properties, while the mobile phone product has accessories, model, battery, screen and other properties. Relationships in product knowledge graph can be roughly summarized as complement (co-buy), co-view, substitute, describe, search and IsA [52]. More broadly, it can be summarized as synonyms relationship, hypernym and hyponym relationship, holistic and partial relationship [51]; it is similar to the language knowledge graph WordNet, but relationships in product knowledge graph are more complex. Most

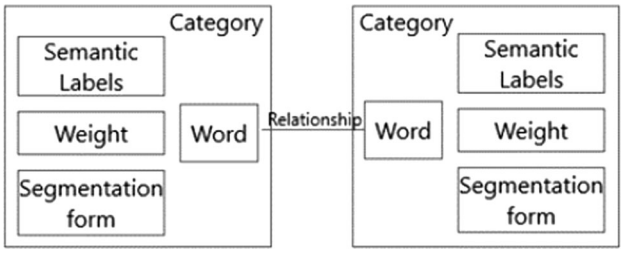

Fig. 7 Structure of e-commerce semantic base

relationships are N to N [52]. Taking mobile phones for example, *battery*, *mobile phone stents*, *audio speaker*, *charger* have *complement* relationship with *Mobile phone*. But at a finer semantic granularity, they correspond to *accessory*, *structural attachment*, *enhancement* and *add-on*. So the semantic meaning of relationships which contained in the product knowledge graph is more complicated.

With the upgrading of application scenarios, the e-commerce cognitive knowledge graph has been gradually constructed [53]. It mainly realized the function of commodity search and personalized recommendation. It includes user knowledge graph, product knowledge graph and scene knowledge graph. Through data fusion and relationships extraction, it links the three knowledge graphs to form the e-commerce cognitive knowledge graph.

Besides basic product properties, product knowledge graph includes some labels, such as *no salt*, *sugar free* or some keywords that users often search. These all are stored in the knowledge graph as properties. These properties are extracted from national regulations and user historical usage records.

The data of the user knowledge graph are derived from account information and historical usage records. In the user knowledge graph, entities are users, relationships between entities are social relationships and its properties are different from other knowledge graphs. The user knowledge graph contains general user information (*name, age, gender,* etc.), which is similar to the general user knowledge graph. Differences mainly lie in the label of the user description. It labels the user by age or some historical search data in e-commerce platform. Those labels are included in the user's properties, such as *old person*, *early pregnancy*. And the purchasing power and preferences of consumers can be inferred from their historical purchase data, and those labels also can be included in the user's properties. These properties are not included in other knowledge graphs.

In addition, the scene knowledge graph is built to connect user knowledge graph and product knowledge graph [53, 54]. Its main data source includes user's search data, product title, hot spots on the network and some industry data. It is a unique knowledge graph in e-commerce field. The scene in scene knowledge graph refers to the conceptualization of user needs, and it is a conceptual node abstracted from user's demand characteristics. The scene knowledge graph uses a short and precise phrase to describe a class of user demands. It takes the implicit user demand information as an entity and creates new nodes which are not included in other knowledge graphs, such as *Outdoor Barbecue, Breakfast for Pregnancy, Keep Warm for kids*. The name of these nodes is from the eight categories in e-commerce concept vocabulary. The eight categories are Time, Location, Object, Function, Incident,

Cate/Brand, Style and IP [54]. These scene nodes have certain properties such as color, so the nodes do not have special annotated properties. Relationships in the scene knowledge graph are mainly hypernym and hyponym relationship. Figure 8 [53] is a simple example of e-commerce knowledge graph.

Compared with other knowledge graphs, the differences are summarized as follows.

In terms of knowledge scope, this knowledge graph covers more e-commerce information and contains e-commerce scenario knowledge. On the structure, it enriches the contents of entities and creates new nodes. In addition, it uses a graph as a bridge to establish the connection between the two graphs, which are different from other knowledge graphs.

4.4 Conclusion

Through the research on the knowledge representation of several domain knowledge graphs, it can be seen that the design of knowledge representation in domain knowledge graphs is mainly related to the domain business requirements and the construction of domain knowledge graph can refer to the structure and content of the general knowledge graph to some extent. The main differences between domain knowledge graph and general knowledge graph are breadth, depth and granularities [2]. General knowledge graph has a wider breadth, which covers more knowledge.

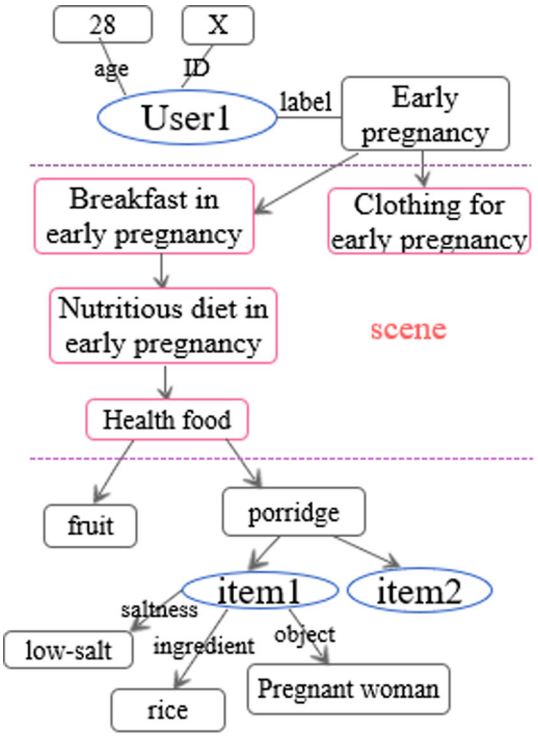

Fig. 8 Example of e-commerce knowledge graph

Domain knowledge graph which shows more detailed knowledge within the field has a deeper depth. In addition, there are some differences in the granularity of their knowledge partitioning. The main reason for the differences lies in their different knowledge backgrounds and data sources. Domain knowledge graph has more domain-specific data and knowledge, so its entities and properties may be quite different from general knowledge graph.

5 Research trends and prospects

There have been lots of researches which focus on general knowledge graph, and some researches have focused on knowledge representation learning, such as distance model SE [55], translation model TransE [56]. Liu et al. [57] summarized the method of knowledge representation learning. Research on domain knowledge graph is emerging. Knowledge representation is the first step for knowledge graph construction. Learning it helps beginners to understand the concept of knowledge graph and lays a foundation for domain knowledge graph construction.

For the research on domain knowledge graph construction, some problems should be explored.

(1) Expansion of knowledge representation

The main way to express knowledge is relational triple, whether it can be extended to multicomponent to express diverse information. For complex unstructured problems, such as the corresponding relationship between major and school in the education industry, a simple inclusion relationship cannot express it fully, whether properties and relationships can be extended?

(2) Multimode of knowledge representation

There are a lot of information resources on the network. They not only contain text, also include video and image, etc. Video and image maybe explain knowledge better than text. Therefore, how to design these nontextual resources into the structure of knowledge representation is an important problem.

(3) Knowledge representation automatic learning

Most of the knowledge representation learning methods are applicable to general knowledge graph. It is not well qualified for automatic extraction of domain knowledge with complex information. Therefore, domain knowledge automatic learning is a problem to be solved.

(4) Knowledge fusion

Compared with general knowledge, the structure of domain knowledge is more complex and it requires more data

experimentation and better algorithms if we want to integrate knowledge into industry background.

(5) Data collection

The establishment of knowledge graph requires lots of data. In some specific area, such as education, a complete education knowledge graph can assist teachers to do course designing and help students collect information. There are enough data to support education knowledge graph construction. However, data collection in the education industry is still not completed. So data collecting and analyzing platform is going to be a research trend of domain knowledge graph construction.

(6) Dynamic update

The knowledge contained in the domain knowledge graph is not unchanged all the time, such as major courses every year, the grade of school or major in the education field. Therefore, how to realize the dynamic change and update of knowledge in a quick way is an important research area.

Clarifying the concept and content of knowledge representation by sorting out the development of knowledge representation is expected, which will put forward the knowledge representation about higher education in the next step and will lay a foundation for the construction of education knowledge graph as well.

Acknowledgements Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (Z2016Z036), the Teaching Reform Research Project of Shandong University of Finance and Economics (jy2018062891470, jy201830, jy201810), Shandong Provincial Social Science Planning Research Project (18CHLJ08), Scientific Research Projects of Universities in Shandong Province (J18RA136), Youth Innovative on Science and Technology Project of Shandong Province (2019RWF013), SDUST Excellent Teaching Team Construction Plan (JXTD20160512 and JXTD20180510), Jinan campus of SDUST Excellent Teaching Team Construction Plan (JNJXTD201711), Teaching research project of Shandong University of Science and Technology (JNJG2017104), National Natural Science Foundation of China (61703243).

Compliance with ethical standards

Conflict of interest There are no conflicts of interests of this work.

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A Distributed Exam Item Bank System Based on Hadoop Ecosystem

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Year: 2020

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Juan Ang; Jun Ren
Publication Year: 2020 , Page(s): 13 - 19

▸ Abstract **HTML**

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Xuelan Zou; Xuemei Wang; Yunxia Hu
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Year: 2020

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Xie Ma; Sheng-Fei Bao; Xiao-Yan Bi; Peng Wu; Gong-Run Li; Liu Yan
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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Haosong Yue; Xinyuan Zhang; Zhexin Shi
Publication Year: 2020 , Page(s): 28 - 31

Abstract HTML

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Publication Year: 2020 , Page(s): 32 - 35

Abstract HTML

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Year: 2020

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Jian Zhao; Yingqi Li
Publication Year: 2020 , Page(s): 36 - 40

Abstract HTML

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Lei Wang; Rui-Qing Liu; Wen-Ya Xu; Xia Liu
Publication Year: 2020 , Page(s): 41 - 45

Abstract HTML

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
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Abstract HTML

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Year: 2020

The Reform and Exploration of Teaching Team in Postgraduate Courses

Wenhua Qian; Dan Xu; Guowu Yuan; Wu Hao
Publication Year: 2020 , Page(s): 51 - 53

▸ Abstract **HTML**

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Wenhua Qian; Dan Xu; Guowu Yuan; Wu Hao
2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Publication Year: 2020 , Page(s): 54 - 57

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Wei Zheng; Fangli Liu; Qianjing You
2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Year: 2020

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
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Shu Wang; Linyun Yuan; Binjie Wang; Hongzhi Yang
Publication Year: 2020 , Page(s): 70 - 74

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Wenhui Lu; Bin Wen
Publication Year: 2020 , Page(s): 75 - 79

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Year: 2020

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Yong Xian Pu; Yun Ju Feng; Quan Yu
Publication Year: 2020 , Page(s): 80 - 86

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Year: 2020

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Mei He; Chao Li; Yang Wang
Publication Year: 2020 , Page(s): 87 - 94

▸ Abstract **HTML**

Construction and Application of Teaching Resources Library Regarding Flight Attendant Specialty

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Dong Liu; Huanhuan Dai; Yunping Zhang; Qinpeng Li; Congpin Zhang
Publication Year: 2020 , Page(s): 95 - 98

Abstract HTML

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Dong Liu; Huanhuan Dai; Yunping Zhang; Qinpeng Li; Congpin Zhang
2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Publication Year: 2020 , Page(s): 99 - 103

Abstract HTML

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Guanqun Liu; Xiangdong Chen
Publication Year: 2020 , Page(s): 104 - 108

Abstract HTML

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

Research on Java EE Mixed Teaching Mode Based on CDIO
Caimao Li; Shaofan Chen
Publication Year: 2020 , Page(s): 109 - 113

Abstract HTML

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Year: 2020

The Application of SVR-based Combination Algorithm in Applying for College in China
Xingbing Liu; Yingying Wang; Zhen Zhang; Bin Chai; Yun Zhou; Shaoshuai Zhang
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Abstract HTML

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Year: 2020

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Yating Li; Aoxing Wang; Qifeng Li; Kui Xiao
Publication Year: 2020 , Page(s): 119 - 125

Abstract **HTML**

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Jun Wang; Zhaoxiang Ouyang; Jianhou Gan
Publication Year: 2020 , Page(s): 126 - 129

Abstract **HTML**

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Yifei Zhang; Zhezhu Li; Kun Liu
Publication Year: 2020 , Page(s): 130 - 134

Abstract **HTML**

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Year: 2020

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Year: 2020

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Jiabei Li; Tian Wei Xu; Juxiang Zhou
Publication Year: 2020 , Page(s): 144 - 149

Abstract HTML

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Year: 2020

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Publication Year: 2020 , Page(s): 150 - 154

Abstract HTML

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Year: 2020

A Study of English Learning Risk-taking Of High School Students in Ethnic Areas of Yunnan
Yuan Yuan; Yichuan Yuan; Zhidan Zhou; Jianlin Wang; Lulu Zhan
Publication Year: 2020 , Page(s): 155 - 164

Abstract HTML

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Year: 2020

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Year: 2020

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Publication Year: 2020 , Page(s): 168 - 171

Abstract **HTML**

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Year: 2020

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Publication Year: 2020 , Page(s): 172 - 174

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Publication Year: 2020 , Page(s): 175 - 180

Abstract **HTML**

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Year: 2020

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Year: 2020

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Publication Year: 2020 , Page(s): 186 - 189

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)

Year: 2020

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Publication Year: 2020 , Page(s): 190 - 193

▸ Abstract **HTML**

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Year: 2020

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Publication Year: 2020 , Page(s): 194 - 196

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Year: 2020

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Publication Year: 2020 , Page(s): 197 - 201

▸ Abstract **HTML**

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Year: 2020

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Publication Year: 2020 , Page(s): 202 - 206

Abstract HTML

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Publication Year: 2020 , Page(s): 207 - 210

Abstract HTML

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Year: 2020

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Publication Year: 2020 , Page(s): 211 - 214

Abstract HTML

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Year: 2020

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Publication Year: 2020 , Page(s): 215 - 224

Abstract HTML

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Year: 2020

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Publication Year: 2020 , Page(s): 225 - 229

Abstract HTML

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Publication Year: 2020 , Page(s): 230 - 234

Abstract **HTML**

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Publication Year: 2020 , Page(s): 235 - 238

Abstract **HTML**

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Year: 2020

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Publication Year: 2020 , Page(s): 239 - 243

Abstract **HTML**

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Year: 2020

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Publication Year: 2020 , Page(s): 244 - 247

Abstract **HTML**

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Year: 2020

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Publication Year: 2020 , Page(s): 252 - 259

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Year: 2020

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Ying Chen; Yanyan Zheng; Tiantian Yu
Publication Year: 2020 , Page(s): 260 - 263
Cited by: Papers (1)

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Year: 2020

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Songhua Hu; Lei Chang; Yanping Chen
Publication Year: 2020 , Page(s): 264 - 267

▸ Abstract HTML

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Year: 2020

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Cited by: Papers (1)

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Year: 2020

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Abstract **HTML** ©

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Year: 2020

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Year: 2020

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Publication Year: 2020 , Page(s): 283 - 287

Abstract **HTML** ©

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

Exploration and Practice of Online Teaching for Data Structure in Epidemic Period
Xuemei Wang; Xuelan Zou; Weifeng Yin
Publication Year: 2020 , Page(s): 288 - 291

Abstract **HTML** ©

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Yanyan Zheng; Ying Chen
Publication Year: 2020 , Page(s): 292 - 295

▸ Abstract **HTML**  ©

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

'Learning Outcomes Depreciation' to Solve Knowledge Timeliness in Lifelong Education
Yang Zhao
Publication Year: 2020 , Page(s): 296 - 300

▸ Abstract **HTML**  ©

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Year: 2020

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Publication Year: 2020 , Page(s): 301 - 305

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Year: 2020

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Nan Wan; Xinli Wu; Shi Guo; Li Yang; Qi Han; Rongzhang Yin
Publication Year: 2020 , Page(s): 306 - 311

▸ Abstract **HTML**  ©

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Year: 2020

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Zhijun Yang; Ning Lei; Yang Wang; Cuilian Lv
Publication Year: 2020 , Page(s): 312 - 315

▸ Abstract **HTML**  ©

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)

Year: 2020

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Xianming Yao; Jian Xu; Wanhua Yang
Publication Year: 2020 , Page(s): 316 - 321

▸ Abstract **HTML**

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

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Publication Year: 2020 , Page(s): 322 - 325
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Year: 2020

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Yan Zhang; Lin Tong; Bin Ding; Qiang Sun; Limin Chen; Nan Xiao
Publication Year: 2020 , Page(s): 326 - 330

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Year: 2020

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Publication Year: 2020 , Page(s): 331 - 334

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Year: 2020

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Publication Year: 2020 , Page(s): 335 - 339

Abstract **HTML** ©

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2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)

Year: 2020

Research on Information-based Teaching and its Influence on Future Education under the Background of Epidemic Situation

Wanhong Peng; Xiaoniu Li; Lilin Fan

Publication Year: 2020 , Page(s): 340 - 343

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Year: 2020

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Publication Year: 2020 , Page(s): 344 - 350

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Research on the Algorithm of Education Data Mining Based on Big Data

Lixia Ji; Xiao Zhang; Lei Zhang

2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)

Year: 2020

Author Index

Publication Year: 2020 , Page(s): 1 - 6

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Year: 2020

Contents
Publication Year: 2020 , Page(s): 1 - 4

Contents

2020 IEEE 2nd International Conference on Computer Science and Educational Informatization (CSEI)
Year: 2020

Load More

Personalized Learning Service Based on Big Data for Education

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***Abstract*—According to modern educational thoughts and theories, the paper uses the new information technology to study the personalized learning service based on big data for education and artificial intelligence technology, so as to provide learners with intelligent services of personalized learning. Under the technical support represented by big data, the paper builds dynamic and diverse learning resources, continuously collects and analyzes learner-related data, and provides differentiated teaching, personalized learning and accurate services in real time. It can meet the individual social and autonomous learning needs of each learner, match learning requirements intelligently and provide adaptive learning services. It intelligently builds a learning model suitable for each learner and realizes personalized learning in a real sense.**

Keywords—personalized learning, big data for education, artificial intelligence

I. INTRODUCTION

In February 2019, "China's education modernization 2035" was issued by the CPC Central Committee and State Council, it proposed to accelerate the reform of education in the information age, accelerate talent training mode reform using modern technology, and finish the organic combination of personalized training and large-scale education. The characteristics of modern education: more open education, more emphasis on students' individuality and diversity, more pursuit of people-oriented and equality. Modern education emphasizes the development of learning ability and lifelong education, it is more sustainable education. The era of education modernization has brought about more and higher demands on people's knowledge, capacity and values. The large-scale education system in the era of traditional industrial revolution has been unable to meet the personalized requirements of education services in modern information society, and education reform and innovation is at a "crossroads".

This paper borrows the new generation of information technology(big data, artificial intelligence and so on) to provide personalized learning intelligent services. Under the technical support of represented by big data, we build dynamic and diverse learning resources, continuously collect and analyze learner-related data, and provide differentiated teaching, personalized learning and accurate services in real time. It can meet the individual social and autonomous learning needs of each learner, match learning requirements intelligently and provide adaptive learning services. It intelligently builds a learning model suitable for each learner and realizes a real sense of personalized learning.

II. RELATED WORK

At present, all countries in the world are paying attention to personalized education, which is an important educational reform and innovation. The educational vision of achieving personalized learning in 2020 was described in British "Vision 2020: report of the teaching and learning review group in 2020", which was published in January 2007. The goal of developing personalized learning was proposed by the US National Academy of Engineering, and it identified the 14 major scientific and technological challenges facing humanity in the 21st century[1]. In 2016, Science reported six future research frontiers which the National Science Foundation of the United States will develop, including the innovation of learning evaluation mechanism supported by big data and the innovation of learning environment based on the frontier of human-machine interaction[2]. "The outline of the national medium and long term education reform and development plan(2010-2020)" was released by the Chinese government in 2010, it put forward the idea of "paying attention to different characteristics and personality differences of students and developing the dominant potential of each student", it encouraged personalized development and it supported the idea of providing "suitable education" for each student. "The ten-year development plan of educational informatization (2011-2020)" also put forward the idea of "striving to provide information environment and services with personalized learning and lifelong learning for each student and learner and building a convenient, flexible and personalized learning environment for the learning needs of different groups in the whole society"[3].

In the field of personalized learning technology, foreign countries started earlier. Firstly, at the theoretical level, foreign countries have achieved abundant results on such issues as the model of personalized learning, key links, concept and structure of personalized adaptive learning system. It mainly involves five parts: personalized learning diagnosis, personalized learning path, personalized resource recommendation, learning status visualization and learning intervention[4]. Secondly, at the system level, foreign researchers have developed many adaptive learning systems that can provide personalized services. For example, Brusilovsky professor at the university of Pittsburgh[5-8] carried out the user model according to students' knowledge base, interest preference and education background. To satisfy the personalized learning demands in the process of the learner interacting with the system, he has developed the InterBook, ELM-ART, KnowledgeSea, AnnotatEd, TaskSieve adaptive learning system. And later many research results are the improvement and supplement based on it. Professor DeBra from Eindhoffen University of

Technology, professor Wolf from Rmit University and professor Papanikolaou from the University of Athens, et al also built separately AHA!, iWeaver, INSPIRE and other personalized educational hypermedia systems[9, 10]. Personalized learning research is still concentrated on the theoretical level and some small-scale attempts in China. At the theoretical level, Kehang He systematically discussed the theory, technology and method of "personalized learning" from the core theory of "learner modeling", the key technologies of "artificial intelligence" and "educational data mining"[11]. Shengquan Yu from Beijing Normal University studied adaptive learning earlier, and he focuses on dynamic organization of learning contents, learning strategy and learning diagnosis, and he studied the adaptive learning model based on these three key links[12]. Jianping Zhang from Zhejiang University had also done indepth research on support system about adaptive learning, and he finished some related academic achievements. He elaborated on the concept of knowledge visualization, learning ability, user model, and adaptive testing[13]. At the level of teaching system, the research group of Lu Wang from Capital Normal University built a primary school curriculum learning personalized courseware generation system in 2003. The scientific classification of students, the personalization of teaching strategies and the diversification of teaching activity sequences can be realized in this system. The research team of Wei Zhao from Northeast Normal University studied a personalized education adaptive learning system. The construction of cognitive level model and learning style model, the promotion of learning information to peers and recommendation of personalized learning path have been preliminarily realized in this system. At present, researches on personalized learning mainly focus on the learning process and seldom involve the learning situation of learners. This paper tries to introduce the learning situation into personalized learning[14].

III. Personalized Learning Service Based on Big Data for Education and Artificial Intelligence Technology

Research framework of personalized learning service based on big data for education and artificial intelligence technology is shown in Fig. 1.

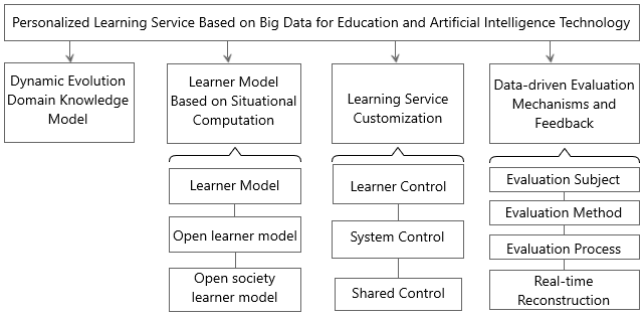

Fig. 1. Research on personalized learning service based on big data for education and artificial intelligence technology

A. The Connotation of Personalized Learning in the Background of Educational Modernization

Compared with traditional personalized learning, personalized learning in the context of education modernization has changed a lot. We multidimensional analysis the concept, characteristics, objectives and contents of personalized learning in the context of education modernization from the components of personalized learning, the process of personalized learning, the characteristics of personalized learning and the educational situation of learners.

B. Personalized Learning Service under the Background of Educational Modernization

Based on the connotation of personalized learning in education modernization, according to five elements in the general model of adaptive learning system (AEHS) proposed by Peter Brusilovsky (domain knowledge model, learners model, pedagogical model, adaptive engine and interface module), in the context of education modernization and in the new generation of information technology such as the artificial intelligence, big data analysis and other technical support, this paper studies the personalized learning service under the background of educational modernization from domain knowledge model and learner model, and the pedagogical model provides rules for the student model to access the domain model, as shown in Fig. 2.

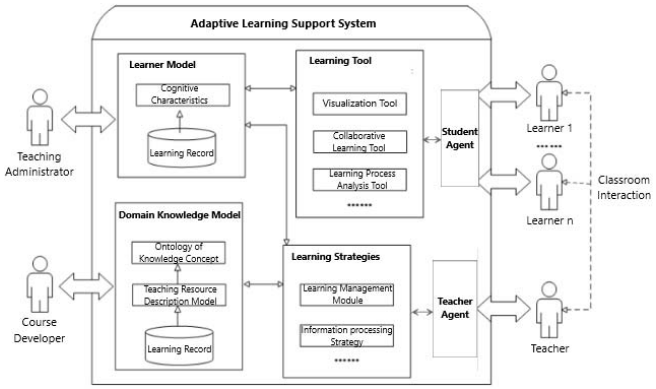

Fig. 2. Adaptive learning support system

1) Dynamic evolution domain knowledge model based on multidimensional and multi-level learning needs

This paper will deeply explore, comprehensively analyze and continuously understand learners' personalized learning needs, and build personalized learning on the basis of learners' personalized needs. Based on Maslow's hierarchy of needs theory and Bloom's classification of teaching objectives and He's deep learning theory, this research designs a questionnaire and analysis method for learners' individual and group learning needs and constructs multidimensional and multi-level learning needs. Based on the learning needs, this research constructs a dynamic evolution domain knowledge model. The basic characteristics of domain knowledge was presented from the ecology in this paper, such as generation, openness, evolution and intelligence, and uses the new information technology to realize the self-reorganization, growth, and evolution of domain knowledge.

2)Learner model based on situational computation

The learner model is an important basis for providing personalized learning services. This paper introduces learning situations into personalized learning. Learning situation refers to the environment, scene or background information of learners when they carry out learning activities, including the physical environment (such as

classrooms, library, outdoor, etc.), virtual scene (such as online learning platform, mobile learning system, online social networking, etc.) and knowledge background (such as the knowledge unit or knowledge point that you are currently studying, and the position in the whole knowledge graph, etc.). The learners calculation model based on the situation can better cognitive education of the subject learners, enrich and improve the learner model. According to the constructivist learning theory, mixed learning theory and relevance learning theory, this paper constructs the learner model based on situational computing from the static model and dynamic model of learners, including the open learner model based on situational computing and the open social learner model based on situational computing. According to the learner model based on situational computing and the use of artificial intelligence, epc network and big data technology, this paper achieves accurate perception of educational situations and accurate prediction of learners' needs. It provides the premise and conditions for personalized and customized learning services.

3) Learning service customization

From the perspective of service, the essence of personalized education is the personalized learning service, and the customization of learning service is the basic strategy to improve the level of personalized learning service. The object of learning service is the learner. The content of the service includes knowledge, resources, teachers and partners.Based on the existing domain knowledge model and learner model, this paper adopts big data thinking and methods to study the personalized customization of learning services. This paper hope to carry out accurate matching of learners' learning services, realize personalized learning services and even higher level intelligent learning services. Specifically, the core theories and technical issues of customizable learning services include knowledge supply, precise services and intelligent guidance. According to the chapter 34 of "The educational communication and technology research manual(4th edition)", there are three types of customization: learner control customization, system control customization and combination customization(Shared control). This paper studies the personalized customization of learning service under the background of educational modernization from these three dimensions.

C. *Evaluation of Personalized Learning Service based on Big Data for Education and Artificial Intelligence Technology*

Evaluation is the most important factor to identify the success of any personalized learning service optimization strategy. The evaluation results can provide relevant feedback, which is an effective guarantee for the quality of personalized learning service. The construction of personalized learning service is constantly developing and improving in practice, and it is in the process of construction, feedback, adjustment and improvement. Based on the four dimensions proposed in the chapter 34 of the manual (4th edition), this paper constructs the evaluation strategies and indicators of the personalized learning system. The evaluation is carried out from two perspectives: subjective evaluation and objective evaluation, user process and user experience. The evaluation index comes from the learning process and the learning effect of learners using personalized learning system. Through the study of the difference analysis, correlation analysis and regression analysis on the learner's personalized learning data, this paper explores the key factors affecting learners' use of the system and the degree of interaction between them. And it provides an important reference for improving the use of personalized learning system and constructing other personalized learning support systems.

D. *Data-driven multi-process Learning Performance Evaluation Mechanism and real-time Feedback Mechanism*

This paper explores the evaluation mechanism and method of personalized learning performance based on data-driven technology. This personalized learning performance evaluation is guided by learners' personalized needs and learning characteristics. The multi-evaluation subject model including personalized learning system, teachers, learners and study partners is established. Comprehensive evaluation is made on the learning effects of learners' knowledge mastery and ability development. And under the technical support of big data, it can realize real-time feedback and monitoring of learners' personalized learning at any time, adjust the learning process in real-time, and intelligently provides adaptive learning services. Finally, a closed-loop teaching process of learning-evaluation-feedback-learning is formed, and the learning model of each learner is constructed intelligently.

IV. CONCLUSION

This paper studies the personalized learning service under the background of educational modernization and introduces education situation into the personalized learning services model. Under the background of educational modernization, it solved the problem that the physical space and the network virtual space coexist and the educational situation changes from the traditional preaching, teaching and solving of puzzles to the intelligent environment of intelligent perception and multi-dimensional interaction. This project uses the Internet of things, artificial intelligence, big data and other new generation of information technology to realize the education situation can be calculated. It further improves the learner model, constructs the dynamic evolution domain knowledge model, and realizes the self-reorganization, growth and evolution of domain knowledge. This project collects a large number of personalized learning data and related information through personalized learning system. And it uses the method of big data for education to analyze and diagnose the characteristics, preferences, processes and effects of learners' personalized learning and provides learners with appropriate and accurate personalized learning services. It has broken through the limitation of the original personalized learning and has new connotation and characteristics, which is an important topic in the current education study field. It is an active adjustment to the inevitable trend of educational technicalization brought by the upgrading of modern information technology, and it is deep cognition of personalized learning supported by educational technology. The personalized learning service proposed in this paper adheres to the learning needs of learners as the center. It emphasizes the openness and technical characteristics of personalized learning under the background of educational modernization. And it further enriches diversified resources, promotes the scale of data and improves the intelligence of computing. It catalyzed the integration of natural science in education. In addition,

unlike the traditional empirical education research paradigm, it is transformed into a data-driven scientific research paradigm. It creates a new approach to make education precise and scientific. It accumulates the initial momentum of breakthrough in personalized learning. And this is a historic opportunity to realize the millennium dream of "teaching students based on their real aptitude".

ACKNOWLEDGMENT

Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (Z2016Z036), the Teaching Reform Research Project of Shandong University of Finance and Economics (jy2018062891470, jy201830, jy201810), Shandong Provincial Social Science Planning Research Project (18CHLJ08), Scientific Research Projects of Universities in Shandong Province (J18RA136), Youth Innovative on Science and Technology Project of Shandong Province (2019RWF013), SDUST Excellent Teaching Team Construction Plan (JXTD20160512 and JXTD20180510), Jinan campus of SDUST Excellent Teaching Team Construction Plan (JNJXTD201711), Teaching research project of Shandong University of Science and Technology (JNJG2017104), National Natural Science Foundation of China (61703243).

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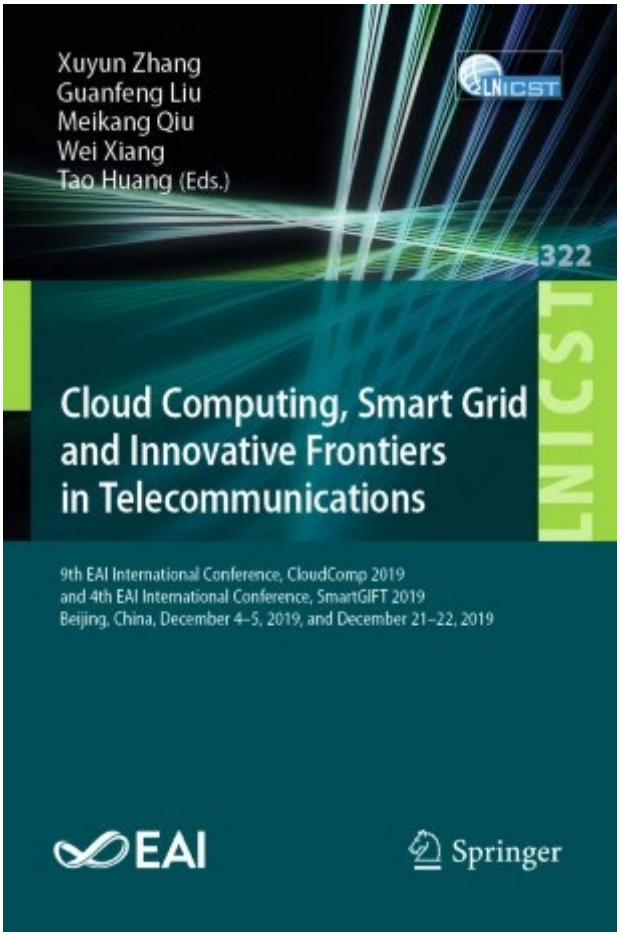
Xuyun Zhang
Guanfeng Liu
Meikang Qiu
Wei Xiang
Tao Huang (Eds.)
LNICST
322
Cloud Computing, Smart Grid and Innovative Frontiers in Telecommunications
LNICST
9th EAI International Conference, CloudComp 2019
and 4th EAI International Conference, SmartGIFT 2019
Beijing, China, December 4–5, 2019, and December 21–22, 2019
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Contents

Cloud Architecture and Scheduling

MCOPS-SPM: Multi-Constrained Optimized Path Selection Based Spatial Pattern Matching in Social Networks 3
Ying Guo, Lianzhen Zheng, Yuhan Zhang, and Guanfeng Liu

A Multi-objective Computation Offloading Method in Multi-cloudlet Environment 20
Kai Peng, Shuaiqi Zhu, Lixin Zheng, Xiaolong Xu, and Victor C. M. Leung

A Survey of QoS Optimization and Energy Saving in Cloud, Edge and IoT 33
Zhiguo Qu, Yilin Wang, Le Sun, Zheng Li, and Dandan Peng

A Multi-objective Computation Offloading Method for Hybrid Workflow Applications in Mobile Edge Computing 47
Kai Peng, Bohai Zhao, Xingda Qian, Xiaolong Xu, Lixin Zheng, and Victor C. M. Leung

An Introduction and Comparison of the Application of Cloud and Fog in IoT 63
Zheng Li and Yilin Wang

Distributed Cloud Monitoring Platform Based on Log In-Sight 76
E. Haihong, Yuanxing Chen, Meina Song, and Meijie Sun

A Self-adaptive PSO-Based Dynamic Scheduling Method on Hierarchical Cloud Computing 89
Shunmei Meng, Weijia Huang, Xiaolong Xu, Qianmu Li, Wanchun Dou, and Bowen Liu

Application of Bluetooth Low Energy Beacons and Fog Computing for Smarter Environments in Emerging Economies 101
Mingxu Sun, Kondwani Michael Kamoto, Qi Liu, Xiaodong Liu, and Lianyong Qi

Near-Data Prediction Based Speculative Optimization in a Distribution Environment 111
Mingxu Sun, Xueyan Wu, Dandan Jin, Xiaolong Xu, Qi Liu, and Xiaodong Liu

Rendering of Three-Dimensional Cloud Based on Cloud Computing 123
Yonghua Xie, Xiaoyong Kou, Ping Li, and Xiaolong Xu

Cloud-Based Data Analytics

Distributed Stochastic Alternating Direction Method of Multipliers for Big Data Classification 141
Huihui Wang, Xinwen Li, Xingguo Chen, Lianyong Qi, and Xiaolong Xu

Personalized Recommendation Algorithm Considering Time Sensitivity 154
Fuzhen Sun, Haiyan Zhuang, Jin Zhang, Zhen Wang, and Kai Zheng

Cloud-Based Master Data Platform for Smart Manufacturing Process 163
Lei Ren, Ziqiao Zhang, Chun Zhao, and Guojun Zhang

A Semi-supervised Classification Method for Hyperspectral Images by Triple Classifiers with Data Editing and Deep Learning. 171
Guoming Zhang, Junshu Wang, Ge Shi, Jie Zhang, and Wanchun Dou

A Survey of Image Super Resolution Based on CNN 184
Qianxiong Xu and Yu Zheng

Design and Development of an Intelligent Semantic Recommendation System for Websites 200
Zhiqiang Zhang, Heping Yang, Di Yang, Xiaowei Jiang, Nan Chen, Mingnong Feng, and Ming Yang

A Lightweight Neural Network Combining Dilated Convolution and Depthwise Separable Convolution 210
Wei Sun, Xijie Zhou, Xiaorui Zhang, and Xiaozheng He

Resource Allocation Algorithms of Vehicle Networks with Stackelberg Game 221
Ying Zhang, Guang-Shun Li, Jun-Hua Wu, Jia-He Yan, and Xiao-Fei Sheng

Research on Coordination Control Theory of Greenhouse Cluster Based on Cloud Computing 231
Xiangnan Zhang, Wenwen Gong, Yifei Chen, Dan Li, and Yawei Wang

Anomalous Taxi Route Detection System Based on Cloud Services 240
Yu Zi, Yun Luo, Zihao Guang, Lianyong Qi, Taoran Wu, and Xuyun Zhang

Collaborative Recommendation Method Based on Knowledge Graph for Cloud Services 255
Weijia Huang, Qianmu Li, Xiaoqian Liu, and Shunmei Meng

Efficient Multi-user Computation Scheduling Strategy Based on Clustering for Mobile-Edge Computing 266
Qing-Yan Lin, Guang-Shun Li, Jun-Hua Wu, Ying Zhang, and JiaHe Yan

Grazing Trajectory Statistics and Visualization Platform Based on Cloud GIS 275
Dong Li, Chuanjian Wang, Qilei Wang, Tianying Yan, Ju Wang, and Wanlong Bing

Cloud-Based AGV Control System 283
Xiangnan Zhang, Wenwen Gong, Haolong Xiang, Yifei Chen, Dan Li, and Yawei Wang

Cloud Applications

A Parallel Drone Image Mosaic Method Based on Apache Spark 297
Yirui Wu, Lanbo Ge, Yuchi Luo, Deqiang Teng, and Jun Feng

CycleSafe: Safe Route Planning for Urban Cyclists 312
Mehdi Shah, Tianqi Liu, Sahil Chauhan, Lianyong Qi, and Xuyun Zhang

Prediction of Future Appearances via Convolutional Recurrent Neural Networks Based on Image Time Series in Cloud Computing 328
Zao Zhang and Xiaohua Li

Video Knowledge Discovery Based on Convolutional Neural Network 341
JinJiao Lin, ChunFang Liu, LiZhen Cui, WeiYuan Huang, Rui Song, and YanZe Zhao

Time-Varying Water Quality Analysis with Semantical Mining Technology 349
Jun Feng, Qinghan Yu, and Yirui Wu

Data-Driven Fast Real-Time Flood Forecasting Model for Processing Concept Drift 363
Le Yan, Jun Feng, Yirui Wu, and Tingting Hang

A Survey on Dimension Reduction Algorithms in Big Data Visualization 375
Zheng Sun, Weiqing Xing, Wenjun Guo, Seungwook Kim, Hongze Li, Wenye Li, Jianru Wu, Yiwen Zhang, Bin Cheng, and Shenghui Cheng

Quantum Searchable Encryption for Cloud Data Based on Delegating Quantum Computing 396
Yinsong Xu, Wenjie Liu, Junxiu Chen, and Lian Tong

Quantum Solution for the 3-SAT Problem Based on IBM Q 410
Ying Zhang, Yu-xiang Bian, Qiang Fan, and Junxiu Chen

Cloud Grazing Management and Decision System Based on WebGIS 424
Dong Li, Chuanjian Wang, Tianying Yan, Qilei Wang, Ju Wang, and Wanlong Bing

Application Design of Provincial Meteorological Service System Based on National Unified Meteorological Data Environment 437
Qing Chen, Ming Yang, You Zeng, Yefeng Chen, Shucheng Wu, Yun Xiao, and Yueying Hong

Moving Vehicle Detection Based on Optical Flow Method and Shadow Removal 447
Min Sun, Wei Sun, Xiaorui Zhang, Zhengguo Zhu, and Mian Li

Refactor Business Process Models for Efficiency Improvement 454
Fei Dai, Miao Liu, Qi Mo, Bi Huang, and Tong Li

A New Model of Cotton Yield Estimation Based on AWS 468
Quan Xu, Chuanjian Wang, Jianguo Dai, Peng Guo, Guoshun Zhang, Yan Jiang, and Hongwei Shi

Cloud Security and Privacy

Intelligent System Security Event Description Method 487
Jun Hou, Qianmu Li, Yini Chen, Shunmei Meng, Huaqiu Long, and Zhe Sun

Designing a Bit-Based Model to Accelerate Query Processing Over Encrypted Databases in Cloud 500
Sultan Almakdi and Brajendra Panda

Review of Research on Network Flow Watermarking Techniques 519
Hui Chen, Qianmu Li, Shunmei Meng, Haiyuan Shen, Kunjin Liu, and Huaqiu Long

A Multi-objective Virtual Machine Scheduling Algorithm in Fault Tolerance Aware Cloud Environments 529
Heyang Xu, Pengyue Cheng, Yang Liu, Wei Wei, and Wenjie Zhang

PSVM: Quantitative Analysis Method of Intelligent System Risk in Independent Host Environment 544
Shanming Wei, Haiyuan Shen, Qianmu Li, Mahardhika Pratama, Meng Shunmei, Huaqiu Long, and Yi Xia

Coordinated Placement of Meteorological Workflows and Data with Privacy Conflict Protection 553
Tao Huang, Shengjun Xue, Yumei Hu, Qing Yang, Yachong Tian, and Dan Zeng

Method and Application of Homomorphic Subtraction of the Paillier Cryptosystem in Secure Multi-party Computational Geometry. 569
Meng Liu, Yun Luo, Chi Yang, Dongliang Xu, and Taoran Wu

A Secure Data Access Control Scheme Without Bilinear Pairing in Edge Computing 582
Xiaofei Sheng, Junhua Wu, Guangshun Li, Qingyan Lin, and Yonghui Yao

Simulations on the Energy Consumption of WRF on Meteorological Cloud 594
Junwen Lu, Yongsheng Hao, and Xianmei Hua

A Survey of Information Intelligent System Security Risk Assessment Models, Standards and Methods 603
Zijian Ying, Qianmu Li, Shunmei Meng, Zhen Ni, and Zhe Sun

Smart Grid and Innovative Frontiers in Telecommunications

Multiple Time Blocks Energy Harvesting Relay Optimizing with Time-Switching Structure and Decoding Cost 615
Chenxu Wang, Yanxin Yao, Zhengwei Ni, Rajshekhar V. Bhat, and Mehul Motani

Spectrum Sharing in Cognitive Radio Enabled Smart Grid: A Survey 627
Shuo Chen

Colorization of Characters Based on the Generative Adversarial Network. . . . 636
Changtong Liu, Lin Cao, and Kangning Du

Enhanced LSTM Model for Short-Term Load Forecasting in Smart Grids . . . 650
Jianing Guo, Yuexing Peng, Qingguo Zhou, and Qingquan Lv

Time-Switching Energy Harvesting Relay Optimizing Considering Decoding Cost 663
Wanqiu Hu, Yanxin Yao, Zhengwei Ni, Rajshekhar V. Bhat, and Mehul Motani

A Resource Allocation Scheme for 5G C-RAN Based on Improved Adaptive Genetic Algorithm 674
Xinyan Ma, Yingteng Ma, and Dongtang Ma

A Novel Adaptive Multiple-Access Scheme for Wireless Chip Area Network in the Smart Grid System 685
Xin-Yue Luo, Hao Gao, and Xue-Hua Li

Author Index 699

Video Knowledge Discovery Based on Convolutional Neural Network

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Abstract. Under the background of Internet+education, video course resources are becoming more and more abundant, at the same time, the Internet has a large number of not named or named non-standard courses video. It is increasingly important to identify courses name in these abundant video course teaching resources to improve learner efficiency. This study utilizes a deep neural network framework that incorporates a simple to implement transformation-invariant pooling operator (TI-pooling), after the audio and image information in course video is processed by the convolution layer and pooling layer of the model, the TI-pooling operator will further extract the features, so as to extract the most important information of course video, and we will identify the course name from the extracted course video information. The experimental results show that the accuracy of course name recognition obtained by taking image and audio as the input of CNN model is higher than that obtained by only image, only audio and only image and audio without ti-pooling operation.

Keywords: Knowledge discovery · TI-pooling · Convolutional nerve

1 Introduction

Online education platforms, forums, personal homepages, Weibo, various training groups, live broadcast platforms, etc. are all scattered with a large number of course video resources. Some of the course resources are normative, with course names, course knowledge points, and course evaluations. However, there are many video resources that are not standardized and are uploaded spontaneously by individuals on the Internet. Therefore, when searching for learning resources, the search may be incomplete due to the irregular description of the video resources, the irregularity or lack of naming, so it is

X. Zhang et al. (Eds.): CloudComp 2019/SmartGift 2019, LNICST 322, pp. 341–348, 2020.
https://doi.org/10.1007/978-3-030-48513-9_28

increasingly important to identify the courses name from the video for us to effectively use the Internet learning resources.

Identifying course names from video is a category of knowledge discovery, and knowledge discovery is the process of identifying effective, novel, potentially useful, and ultimately understandable knowledge from the data [1]. At present, most researches on knowledge discovery focus on text documents. For example, Wang et al. [2] proposed a convolutional neural network event mining model using distributed features, which uses word embedding, triggering word types, part of speech characteristics and multiple features of topic model to conduct event mining in text. Li et al. [3] used gated recurrent neural network (GRU) with attention mechanism to identify events in texts. However, few people study video, audio and other multimedia files. Video and audio generally contain rich knowledge, especially courses video, which is not only rich in content but also related to knowledge. At present, there are a large number of courses video on the Internet, and these course resources have the phenomenon that the course name does not correspond to the content or lacks the course name. Research on how to identify the course name in video will help learners make better use of learning resources. In recent years, deep neural networks have made remarkable achievements in many machine learning problems, such as image recognition [4], image classification [5] and video classification. However, identifying course names from courses video is still a challenge.

Based on the above analysis, this study uses a deep neural network model to collect video fragments of different courses from MOOC of China University and input the pictures and audio of course video into the model for training. After the completion of convolution and pooling, a TI-pooling operation is added. The TI-pooling operation can automatically find the best "standard" instance for training input, reduce the redundancy of learning features, and reduce the parameters and training time of the model. Ti-pooling operation will be introduced in detail in Sect. 3.2. In terms of the selection of activation function, we choose FReLU activation function. Compared with traditional ReLU function, FReLU function has the advantages of rapid convergence, higher performance, low calculation cost and strong adaptability. To verify the effectiveness of the method we used, we compared it with only images, only audio, and with images and audio but no TI-pooling model. Experimental results show that the performance of our method is better than the other three methods. Generally, this study offers at least three contributions as follows.

1. The CNN is applied to the course name recognition of course video.
2. The images and audio of course video are used as the input of the model to identify the name of course video.
3. The course name is automatically recognized from the course video.

2 Related Work

Massive data and poor knowledge lead to the emergence of data mining and knowledge discovery research. Knowledge discovery originates from artificial intelligence and machine learning. It is a new interdisciplinary subject with strong adaptability formed by

the integration of machine learning, artificial intelligence, database and knowledge base. There are two main branches of knowledge discovery research at present, namely knowledge discovery based on database (KDD) and knowledge discovery based on literature (KDT).

Knowledge discovery based on database (KDD) can be defined as using data mining methods to identify valid, potentially useful, and ultimately understandable patterns from the database [7]. Knowledge discovery technology based on database is very mature and has been applied in many industries. For example, Wu Dan [8] used database knowledge discovery technology to predict employee turnover based on the basic information database of employees, and identified important factors that affect employee turnover, including the company's equity ownership, monthly salary, work environment satisfaction, work participation and so on. Xu et al. [9] developed the PhenoPredict system, which can infer the therapeutic effects of therapeutic drugs for diseases with similar phenotypes on schizophrenia from the knowledge base. Li Xiaoqing [10] studied bank data mining and knowledge discovery, and pointed out that data mining and knowledge discovery provide a basis for bank decision-making and customer relationship management. Knowledge discovery based on database has its limitation that it can only deal with structured data.

However, in the real world, knowledge does not all appear in the form of structured data in traditional databases, and quite a lot of knowledge is stored and presented in various forms, such as books, journals, newspapers, research papers, radio and television news, WEB pages, E-mail and so on. There is also a large amount of valuable information in these unstructured data sources. Therefore, data mining from these unstructured data sources to extract useful knowledge for users has become a new research hotspot in data mining, which is knowledge discovery based on text. For example, Kerzendorf [11] has developed a tool that can find similar articles based entirely on the text content of the input paper. By mining Web server logs, Novanto Yudistira et al. [12] found the correlation knowledge in the indicators of e-learning Web logs. Strong typed genetic programming (STGP) is used as a cutting edge technique to find precise rules and summarize them to achieve goals. The knowledge displayed may be useful to teachers or scholars, and strategies can be improved according to course activities to improve the use quality of e-learning. Enrique Alfonseca et al. [13] describes a combination of adaptive hypermedia and natural language processing techniques to create online information systems based on linear text in electronic formats, such as textbooks. Online information systems can recommend information that users may want based on their interests and background. Text-based knowledge discovery can process a variety of unstructured data. However, the current social data volume is growing exponentially. Traditional knowledge discovery technology based on database and opportunity text has been difficult to process massive data.

In recent years, deep learning technology has achieved good results in image recognition, image classification and audio processing, and promoted the application of knowledge discovery in video and audio. We use a two-channel convolutional neural network model to process the pictures and audio in the course video, and realize the automatic recognition of the course names without naming or non-standard naming of video from a large number of course video.

3 Methodology

3.1 The Network Architecture

For video knowledge discovery, CNN-related technology usually adopts multi-channel network structure, and has the following three main characteristics: first, weight sharing, second, local reception field (LRF), and third, pooling operation. CNN generally uses local information rather than global information.

The CNN model we use consists of two channels, picture and audio, which share parameters, The model consists of five convolution layers, each of which is followed by a maximum pooling layer after convolution. After the five convolution layers, a TI-pooling operation is conducted, and then the full connection layer is connected. The CNN model is shown in Fig. 1:

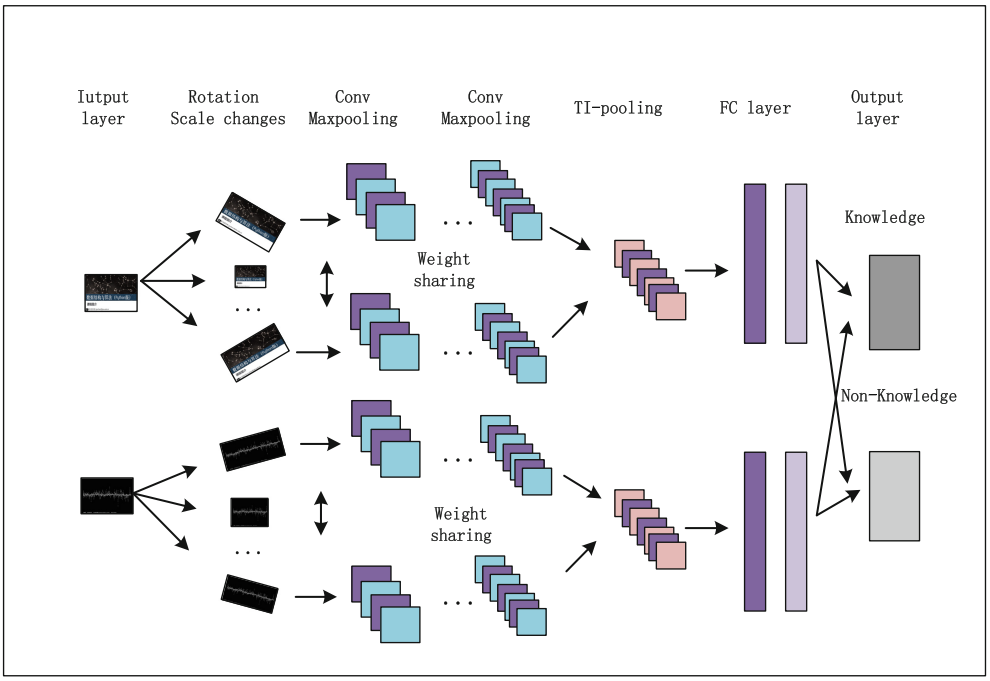

Fig. 1. CNN architecture

3.2 TI-Pooling Operation

In this study we represent features in a convolutional neural network as invariant transformations, which means that the machine learning algorithm only processes inputs that have not changed for some transformations. The most famous examples of general-purpose transformation-invariant features are SIFT (scale-invariant feature transform) [14] and its rotation-invariant modification RIFT (rotation-invariant feature transform) [15].

Because we did some processing on the sample before entering the data into the model, such as rotation, scaling and other changes to enhance the richness of the sample. The goal of TI-pooling is to carry out exhaustive search on the transformed samples to obtain the instance corresponding to the current response of the feature, and then only improve the performance of the feature with this instance.

As shown in Fig. 1, in the CNN model, the original sample and the transformed sample are input together. Instead of considering all the inputs as independent samples, but all the responses of the original sample and the transformed sample are accumulated and the maximum response is taken. Compared with data expansion, TI-pooling operation can learn fewer parameters without the disadvantage of losing relevant information after sample conversion, because it uses the most representative strength for learning.

Assume that, given a set of possible transformations Φ, we want to construct new features g_k (x) in such a way that their output is independent from the known in advance nuisance variations of the image x. We propose to formulate these features in the following manner:

$$g_k(x) = \max_{\phi \in \Phi} f_k(\phi(x)) \tag{1}$$

Where ϕ(x) is the input sample x according to a set of transform Φ transform after get the sample, $f_k\phi(x)$ is the input sample characteristics of the model, and TI-pooling ensures that we use the best instance ϕ(x) for learning.

3.3 Activation Function

ReLU is an activation function widely used in CNN, but due to the zero-hard rectification, it cannot obtain the benefits of negative values. ReLU simply restrains the negative value to hard-zero, which provides sparsity but results negative missing. The variants of ReLU, including leaky ReLU (LReLU) [16], parametric ReLU (PReLU) [17], and randomized ReLU (RReLU) [18], enable non-zero slope to the negative part. It is proven that the negative parts are helpful for network learning. In this paper we use a new activation function called flexible rectified linear unit (FReLU), FRELU extends the output state of the activation function, adjusts the output of the ReLU function by adjusting the rectifying point, captures negative information and provides 0 features. It has the advantages of fast convergence, high performance, low calculation cost and strong adaptability [19].

As shown in Fig. 2(a), the input is x and the ReLU function is:

$$relu(x) = \begin{cases} x \ \ if \ x > 0 \\ 0 \ \ if \ x < 0 \end{cases} \tag{2}$$

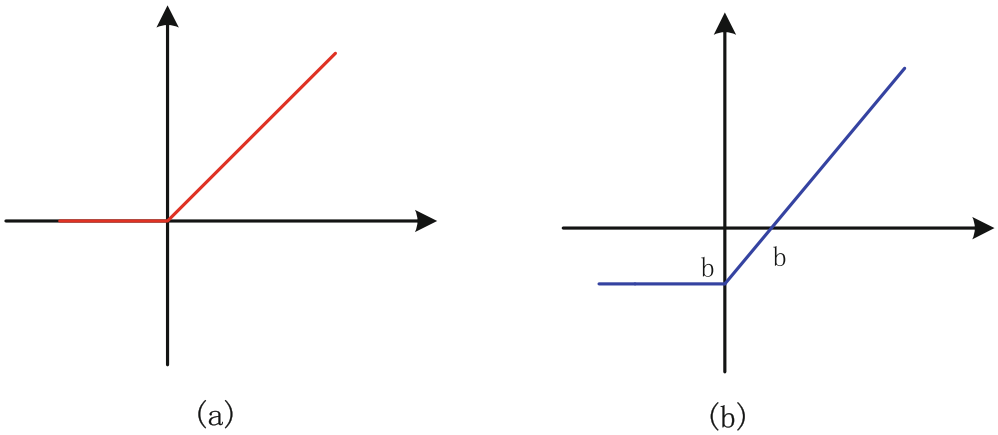

Fig. 2. ReLU and FReLU function images

The FReLU activation function we use is shown in Fig. 2(b). The function is:

$$frelu(x) = \begin{cases} x + b_l & if\ x > 0 \\ b_l & if\ x < 0 \end{cases} \tag{3}$$

where b_l is the l_{th} layer-wise learnable parameter, which controls the output range of FReLU. Note that FReLU naturaly generates ReLU when $b_l = 0$.

3.4 Loss Function

We choose the cross entropy function as the loss function of the training network. The specific function is:

$$\mathrm{C} = \frac{1}{n} \sum_{x} [ylna + (1 - y) \ln(1 - a)] \tag{4}$$

Where x is the input to the training, y is the output of the training, a is the actual output of each neuron, and n is the entire number of samples trained.

3.5 Back Propagation

Let $\nabla f_k(x)$ be the gradient of the feature $f_k(x)$ defined in Eq. 1 with respect to the outputs $\mathrm{O}(\cdot, \theta_j^{l-1})$ of the previous layer. This gradient is standard for convolutional neural networks and we do not discuss in details how to compute it [20]. From this gradient we can easily formulate the gradient $\frac{dg_k(x)}{df_k(x)}$ of the transformation-invariant feature $g_k(x)$ in the following manner:

$$\frac{dg_k(x)}{df_k(x)} = \nabla f_k(\phi(x)) \tag{5}$$

$$\phi = arg \max_{\phi \in \Phi} f_k(\phi(x)) \tag{6}$$

4 Experiments

The method we used is to input the images and audio of course video into the model. In order to verify the accuracy of the model, we conducted a comparative experiment with the model that only images, only audio, only images and audio but without TI-pooling. The detailed process of the experiment is shown below.

4.1 Data Set

We collected 15 video clips from MOOC of China University, processed the video into 324 pictures and 62 pieces of audio, and marked the picture and audio according to the course name. In order to increase the richness of the sample, we will make the picture and audio. After the rotation and scaling changes, 1296 pictures and 248 pieces of audio were obtained, and then 70% of the samples were selected into the training set, and 30% of the samples entered the test set.

4.2 Parameter Settings

The optimizer of the whole model uses the stochastic gradient descent method. The initial learning rate of the stochastic gradient descent method is set to 0.005, and the learning rate is attenuated by 1×10^{-6} after each update. The batch size of the data set read by the neural network during training is 16. The training data is transmitted to the neural network we use in the form of "sample-tag" for training the network model. The number of iterations is 10^3.

4.3 Experimental Result

To evaluate the effectiveness of the method we used, we compared the model using only images, using only audio, and using images and audio without increasing the TI-pooling operation. The experimental results show that the model we used is identified. Course names are more accurate than other methods. As shown in Table 1:

Table 1. Experimental result

Methods	Accuracy
Image only	61.3%
Audio only	57.7%
Image and Audio(without TI-pooling)	71.6%
Image and Audio(with TI-pooling)	77.4%

5 Conclusion

Identifying course names from a large number of non-naming or naming non-standard course videos can help learners improve the efficiency of resource retrieval and thus improve learning efficiency. In this paper we use a two-channel convolutional neural network model to process the image and audio signals of the course video. The framework adds a TI-pooling operation after all convolutional pooling layers. TI-pooling can Extract the most important features from the course video. The experimental results show that the CNN framework we use can better identify the course name from the course video, thus helping learners to better utilize the video learning resources on the Internet.

Acknowledgement. This work was financially supported by the Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (Z2016Z036), the Teaching Reform Research Project of Shandong University of Finance and Economics (jy2018062891470, jy201830, jy201810), Shandong Provincial Social Science Planning Research Project (18CHLJ08), Scientific Research Projects of Universities in Shandong Province (J18RA136).

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2018 9th International Conference on Information Technology in Medicine and Education

Design and Implementation of Family Doctor App on Android Platform

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***Abstract*—With the improvement of material living standards, the request of the people's health is also increasing paid attention. But the demand of hospitalization in traffic for patients and in space for hospital is heavy, causing overload of entity hospital. To reduce the problem of difficult medical, we develop a family doctor app for mobile medical health service. This system adopts mobile Internet technology, integrates the idea of service-oriented implementation and is based on Android mobile development technology, in which the function of self-diagnosis is implemented using decision tree classification algorithm. The system will provide online medical treatment and drug information service tools for family members, including consultation with famous doctors, self-diagnosis of symptoms, convenient drug purchase and case record, etc. After the completion of the system, all the functions of the system were tested, and its performance was evaluated. The results of the evaluation were generally in line with expectations. It can run on a variety of operating system platforms and can be flexibly configured and managed.**

Keywords- family doctor app; decision tree; doctors consultation self-diagnosis; android

I. INTRODUCTION

With the rapid development of economy in our country, and general improvement in people's income, people pay more attention to their health than ever before. Realizing the service that doctors can make appointments without going out, and provides diagnosis and service of purchase of medicine, which is closer to people's livelihood and convenient life. A mobile medical service platform was developed based on android and classification techniques. It can achieve self-diagnosis in a certain degree and assist the doctors to complete the diagnosis. It can provide a more convenient, more secure and more comfortable living environment based on information technology for patients seeking medical treatment. It forms a new management form of medical service based on information technology, intelligent management and service.

In this service platform, we have explored the automatic medical diagnosis system. This system aims to study a strong generalization performance of automatic diagnosis model, and uses classification algorithm to assist experts in the diagnosis of simple diseases. Machine learning has been widely used in the medical automatic diagnosis model. It has many advantages. It can make use of the acquired data information to make intelligent decision, and it can learn the potential information and data sets in the data and make classification decisions based on the probability distribution of the data.

II. KEY TECHNOLOGIES USED

The system mainly uses Android, machine learning and database technology. The front-end development uses the React-Native framework [1], and builds the server with node.js [2] to realize the interaction between the front-end and the back-end. The self-diagnosis function of symptoms is realized by using decision tree classification algorithm [3].

A. React-Native Development Framework

Although the traditional native (IOS, Android) development technology is mature, they have been unable to meet the development needs of the mobile Internet because of the limitation of development efficiency and cost. React-Native, with its simplicity, high speed, and cross-platform advantages, became popular quickly as a web development languages and layout technologies.

The home page, symptom self-diagnosis, login registration and other interfaces was written in Atom using the React-Native framework. Page layout, jump, rotation, and value transfer between servers are also implemented using the React-Native framework.

B. Node.js

Node.js is a development platform for JavaScript to run on the server side. It can serve users as a server and the programmer can develop directly on the front-end using Node.js.

User's page of login and registration and health file, and the CRUD operations are using the node.js platform to set up the server to transfer in the system.

C. Classification Algorithm—J48

J48 [4] is a decision tree algorithm implemented on C4.5 [5]. C4.5 is a series of supervised classification algorithms used in machine learning and data mining: given a data set, each tuple can be described by a set of attribute values, and each tuple belongs to a class in a mutually exclusive category. The goal of C4.5 is to learn to find a mapping from attribute values to categories, and this mapping can be used to classify entities that are unknown to new categories.

The self-diagnosis function is realized using C4.5 in weka [6] data mining platform.

2474-3828/18/$31.00 ©2018 IEEE
DOI 10.1109/ITME.2018.00038

III. SYSTEM ANALYSIS

System analysis includes feasibility analysis, demand analysis and use case analysis, and they are the basis of system design and system implementation.

A. System Feasibility Analysis

The purpose of feasibility analysis is to determine whether the problem can be solved, such as investigation and analysis of environmental quality, the scale of required equipment and demand of supply, and to forecast the economic and environmental benefits through the project. It is a systematic analysis method to determine whether the project can be invested and run. Feasibility analysis is a comprehensive analysis of the project, and it is important to the phase from management, technical to economic analysis of the project, to ensure the ultimate effect of investment profit. From the economic perspective, comprehensive analysis and research should be carried out. The economic benefits generated by the project should be estimated, and the reasonable choices should be made. Feasibility analysis mainly includes economic feasibility and technical feasibility.

(1)Economic feasibility. The family doctor app provides an agency for physician and patient. Patient is charged when they ask for doctors' consultation. On the one hand, it can attract doctors' registration and get support from regular hospitals. On the other hand, it can increase the input cost of the family doctor app and have fund to improve related functions and increase users' trust in the doctors involved. Another economic source of the family doctor app is the price difference when patients buy drugs, to provide high quality drugs with low price and improving the satisfaction of patients and sellers. In the early stage of development, there is not too much cost, and in the process of operation, it is necessary to improvement of related problems such as doctors and drugs which poses challenges to the developer. Good circulation is conducive to improve customer satisfaction further, and to bring economic benefits faster.

(2)Technical feasibility. The main goal of technical feasibility is to analyze whether the existing technical conditions can ensure the smooth completion of development, and whether the hardware and software conditions can meet the needs of developers. In addition, it is necessary to consider the developer's technique to guarantee the system's implementation. In software development, Android Studio is used mainly for code development, AXURE is used for front-end prototype diagram design and MySQL for back-end database development. The project is technically feasible and the existing software and hardware tools can ensure the implementation of the system.

B. User Demand Analysis

(1)System requirements description. The family doctor app mainly consists of four modules which include users, visitors, doctors and administrators.

Users can login according to their accounts, and can manage their personal information after logging in. They can browse the articles and the corresponding information pushed by the app, and buy OTC medicine they need. They also can consult with doctors online about some problems, and can make outpatient appointment according to their own needs in hospitals that using the app and even make a rough diagnosis of what sick they might suffer based on some of symptoms. Visitors can browse the articles, receive the information pushed by the app and register the account. Doctors can log in according to their accounts and can manage their personal information, browse the articles and receive information pushed by the app. They can receive patients' consultation information and questions, and then make further diagnosis. Administrators can log in according to their accounts, review and maintain users' and doctors' information of the system.

(2)Use case diagram. The use cases are visitors, users, doctors and administrators as shown in Figure 1.

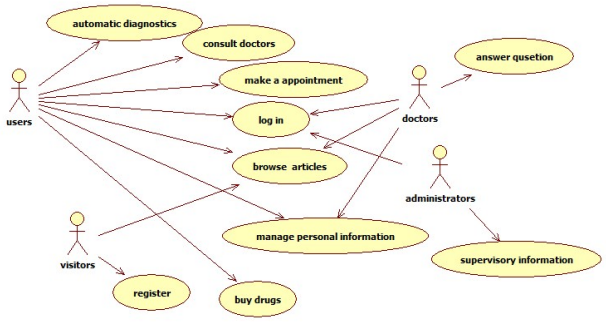

Figure 1. A use case diagram of the system

Where browse articles use cases is that users can browse scientific articles in the popular science interface after they access to the system. Register use cases is visitors register as system users. Login use case is users' and doctors' login to the family doctors system through their username and password. Make an appointment use case is the users can check the hospital's appointment number after login. Automatic diagnostics use case is the users can enter their specific symptoms and diagnose their illness according to the body part after login. Manage personal information use case is users can view and modify their account password and modify their personal health files after login. Buy drugs use case is users can browse, search and purchase drugs after login. Consult doctors use cases is users can consult a doctor online and ask about their illness through text, pictures, voice or video after they login. Answer question use case is a physician may login to answer a patient's question online according to their symptoms. Supervisory use case is the administrator reviews and maintains user' and doctor' information after login.

(3)Sequence diagram. The sequence diagrams include user's consultation, appointment and self-diagnosis.

The sequence of user's consultation with famous doctors is users enter the consultation interface of famous doctors, look for and select the desired doctors, then select the

consultation method and return the diagnosis information after the consultation, as shown in Figure 2.

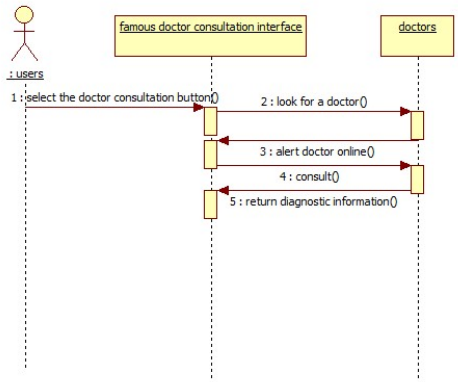

Figure 2. Sequence diagram of user's consultation with famous doctors

The sequence of user's outpatient appointment is users browse the outpatient appointment interface, browse and search the target hospital, select the target department and return the appointment successfully to the outpatient information, as shown in Figure 3.

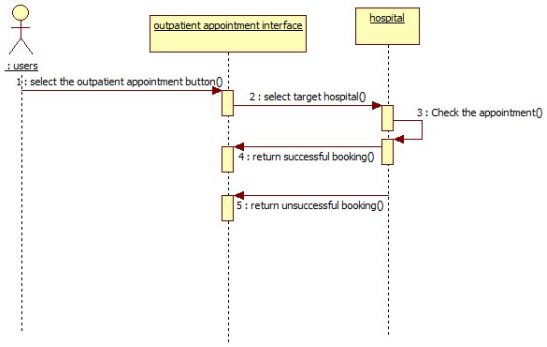

Figure 3. Sequence diagram of user's outpatient appointment

The sequence of self-diagnosis is users browse symptoms self-diagnosis interface, choose part what they want to diagnosis, submit relevant symptoms information, then the app return to the interface of diagnosis and the disease shows hints of a doctor, as shown in Figure 4.

C. *Classes Diagram*

This diagram divides entities into person which include users, visitors, doctors, and administrators, and medicines, hospitals, outpatient service details, personal health files, diseases, articles, and counseling details. Users' personal information is used to save the users' registration information, the users' health records included in the users' basic information and relevant medical history, the time of registration will be in the class attribute information added to the database, the operation of a class includes modify the users' information and delete users' information, the method of realize the corresponding operation. Drug, hospital, doctor, outpatient information, consultation information and other operations are similar to the users' personal information management. Outpatient information manages outpatient appointments, including appointment number, user name, hospital, time, etc. The historical consultation information category is to manage the consultation of famous doctors, including user name, doctor name, time, symptoms, and disease and so on. Diseases include disease sites and symptoms. The popular science article category includes the article content, the article title and the article category.

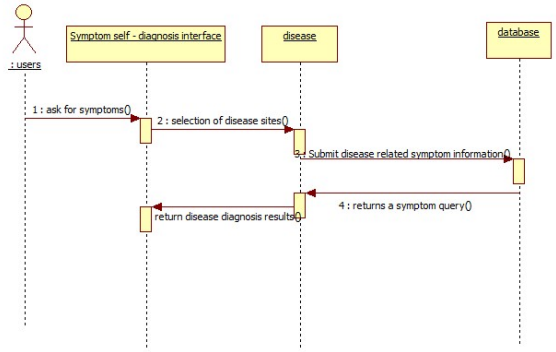

Figure 4. The automatic diagnostic sequence diagram

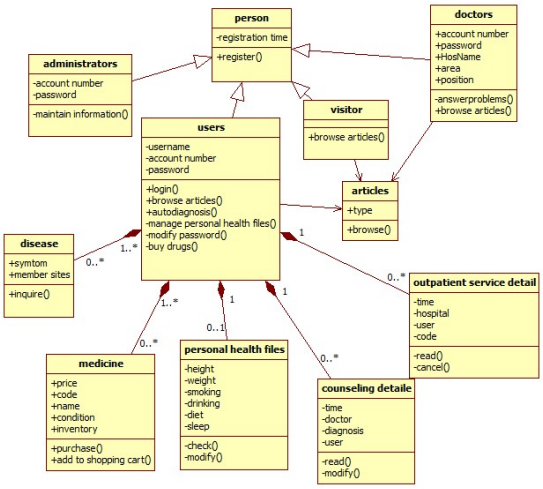

Figure 5. The general class diagram

IV. THE SYSTEM DESIGN

A. *Overall System Framework*

The family doctor app is aimed at visitors, users and doctors. The primary target is the users. The main functional modules for users are consult doctors, automatic diagnostics, buy drugs, personal information and browse articles. Where Consult doctors include communicates with your doctor and diagnoses your symptoms by submitting them to the users. Automatic diagnostics is matching the disease and determines the probability of getting a certain disease

through the collection and submission of symptom data. Purchasing drugs are users search for the drugs they need to buy, find them and purchase them. Personal information include login to the registration portal, modifying the users' personal health profile, changing the password, and viewing the contents of the collection.

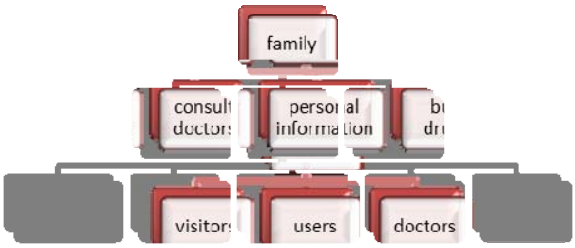

Figure 6. Overall system framework

B. *Design Instructions for Each Module*

The database design of symptom self-diagnosis module includes disease table. This table is used to record disease data. To record the number of the disease, the name of the disease, the location of the disease, and the characteristics of the disease. Disease_id is the primary key and the data type is integer, which is used to record the number of diseases.The data type of diseasename is varchar, which is used to record the name of the disease. Diseasearea data type is varchar, which is used to record the location of disease.The data type of feature is varchar, which is specifically used to record the specific characteristics of diseases.

Module	Introduce
popular science information	Including hot topics, lectures, life, nutrition, beauty, mother-baby information.
famous doctor consults	Communicate with your doctor and diagnose your symptoms by submitting them to the user
Quick to buy medicine	Users search for the drugs they need to buy, find them and purchase them.
Symptoms self-diagnosis	Through the collection and submission of symptom data, we can match the disease and determine the probability of getting a certain disease.

V. INTERFACE DESIGN

A. *The Homepage*

Both of visitors and users can browse the app homepage. The homepage contains the main function and popular science information, as shown in Figure 7.

B. *Online Consulting Module*

Users can click on the tab of online consultation, choose the doctor or choose the consultation, and then they can communicate with doctors through video, voice and text consulting, as shown in Figure 8.

Figure 7. Homepage interface

Figure 8. Online doctor selection interface

C. *Self -Diagnosis Module*

The user selects the body part and associated symptoms, and the system will displays the possible diseases and push relevant doctor information and popular science information on specific disease interface, see Figure 9. The self-diagnosis module is implemented by decision tree classification algorithm J48. We establish database of the types and characteristics of symptoms, and then using J48 classifier training disease data in the database, and then pass judgment disease characteristics and predict disease types, in order to achieve symptom self-diagnosis function.

D. *Purchasing Drug Module*

Users can choose specific diseases or directly search the drug name, to enter the drug interface and select purchasing drug function to jump to the third-party payment interface. After successful payment, the purchase is prompted to be successful, see Figure 10(a).

E. *Personal Health Archive Module*

The personal health archive module allows users to store their own basic information, which is then added by users and doctors, as shown in Figure 10(b).

The main code of classification is shown below:

Figure 9. Self-diagnosis interface and the specific disease interface

(a) (b)

Figure 10. Quick drug purchasing page and personal information file interface

```
import weka.classifiers.trees.J48;
import weka.core.Instances;
import weka.core.Utils;
import weka.core.converters.ConverterUtils.DataSource;
public class OutputClassDistribution {
  public String test() throws Exception {
    StringBuilder result = new StringBuilder();
    Instances train = DataSource
        .read("C:/weka/segment-challenge.arff");
    Instances test = DataSource.read("C:/weka/segment-
test.arff");
    train.setClassIndex(train.numAttributes() - 1);
    test.setClassIndex(test.numAttributes() - 1);
    if (!train.equalHeaders(test))
      throw new Exception("incompatible test and train
set" + train.equalHeadersMsg(test));
    J48 classifier = new J48();
    classifier.buildClassifier(train);
    result.append("no-actual-prediction-wrong-distribution");
    result.append("\n");
    for (int i = 0; i < test.numInstances(); i++) {
     double pred = classifier.classifyInstance(test.instance(i));
     double[] dist = classifier
         .distributionForInstance(test.instance(i));
       result.append((i + 1));
       result.append(" - ");
   result.append(test.instance(i).toString(test.classIndex()));
     result.append(test.classAttribute().value((int) pred));
       System.out.print(" - ");result.append(" - ");
        if (pred != test.instance(i).classValue()){
         result.append("yes");}
       else{
         result.append("no");}
     }
     return result.toString();
   }
```

VI. CONCLUSION

We have developed a family doctor app. With the big data support, the self-diagnosis can deduce the possible diseases according to the body part and characteristics of symptoms.There is still room for improvement in the interface beautification of the system. The system is also relatively crude in terms of purchasing drugs and technical restrictions. Online consulting interface design is not simple and beautiful enough, it can be further improved, and the communication between doctors and users also can also be more convenient and quick to achieve some chat software on the market for text speech video effect. The function of outpatient appointment is need permission from the hospital. The doctor version should be development and so on.

ACKNOWLEDGMENT

The research was financially supported by the Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (2015M110) and A Project of Shandong Province Higher Educational Science and Technology Program (Project No. J15LN56).

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Qiaohong Zu
Bo Hu (Eds.)
LNCS 10745
Human Centered Computing
Third International Conference, HCC 2017
Kazan, Russia, August 7–9, 2017
Revised Selected Papers
Springer

Contents

An Improved MST Clustering Algorithm Based on Membrane Computing 1
Ping Gong and Xiyu Liu

A Method for Correcting the Leaning of AR Two-Dimensional Codes Based on LSM 13
Chen Miao, Shufen Liu, and Zhilin Yao

The Associated Algorithm of Target Batch Number Based on Gaussian Mixture Clustering 23
Ning Liu, Shufen Liu, and Xinjia Zhang

Density Peaks Clustering Based on Improved RNA Genetic Algorithm 28
Liyan Ren and Wenke Zang

Local Homogeneous Weighted Spiking Neural P Systems 34
Mengmeng Liu and Feng Qi

Weight-Improved K-Means-Based Consensus Clustering 46
Yanhua Wang, Laisheng Xiang, and Xiyu Liu

A Novel Trace Clustering Technique Based on Constrained Trace Alignment 53
Pan Wang, Wen'an Tan, Anqiong Tang, and Kai Hu

A Fast Local Image Descriptor Based on Patch Quantization 64
Tian Tian, Fan Yang, Kun Zheng, Hong Yao, and Qian Gao

A Method of Large - Scale Log Pattern Mining 76
Lu Li, Yi Man, and Mo Chen

More Efficient Filtration Method for Big Data Order-Preserving Matching 85
Wenchao Jiang, Dexi Lin, Sui Lin, Chuanjie Li, and Aobing Sun

Blind Image Quality Assessment via Analysis of GLCM 95
Guanghui Yue, Chunping Hou, Tongtong Ma, and Yang Yang

An Improved Ranked K-medoids Clustering Algorithm Based on a P System 102
Bao Zhang, Laisheng Xiang, and Xiyu Liu

A Novel Inverse-Operation Based Group Undo/Redo Algorithm for Feature-Based 3D Collaborative CAD Systems 108
Yuan Cheng, Fazhi He, Xiao Lv, and Weiwei Cai

Two Steps Method Using Polarization to Resist Phase Noise for Self-interference Cancelation in Full-Duplex 118
Fangfang Liu, Xinyi Wang, Chunyan Feng, and Xiao Han

Sparse Linear Method Based Top-N Course Recommendation System with Expert Knowledge and L_0 Regularization 130
Jinjiao Lin, Haitao Pu, Yibin Li, and Jian Lian

The Research on the Container Truck Scheduling Based on Fuzzy Control and Ant Colony Algorithm 139
Meng Yu, Dawei Li, and Qiang Wang

Researches on the Analysis Framework of Application Layer Communication Protocol Based on SQLite 150
Wenyuan Xu, Hao Li, and Weifeng Xu

The Implementation of Growth Guidance Factor Diffusion via Octree Spatial Structures for Neuronal Systems Simulation 158
Almaz Sabitov, Fail Gafarov, Vlada Kugurakova, and Vitaly Abramov

Intelligent Perceptive QoS Based Centralized Admission Control for Route Computing 164
Xuejing Li, Yajuan Qin, Haohui Fu, Zhewei Zhang, and Xiaorong Lin

Research on the Shortest Path Problem Based on Improved Genetic Algorithm 173
Baoliang Wang, Susu Yao, Kaining Lu, and Huizhen Zhao

Semantic Web Languages for Policy Enforcement in the Internet of Things 183
Rustem Dautov and Salvatore Distefano

Network Traffic Prediction Based on Wavelet Transform and Genetic Algorithm 189
Xuehui Zhao, Wanbo Zheng, Lei Ding, and Xingang Zhang

Research and Optimization of the Cluster Server Load Balancing Technology Based on Centos 7 201
Lei Ding, Wanbo Zheng, Shufen Liu, and Zhian Han

Base Station Location Optimization Based on Genetic Algorithm in CAD System 208
Yanhua Wang, Laisheng Xiang, and Xiyu Liu

A Study of Optimal Multi-server System Configuration with Variate Deadlines and Rental Prices in Cloud Computing 215
Zhongfeng Kang and Bo Yang

A Composite Anomaly Detection Method for Identifying Network Element Hitches. 232
Duo Zhang, Yi Man, and Ligang Ren

D-SVM Fusion Clustering Algorithm Based on Indoor Location. 245
Zhongliang Deng, Jiachen Fan, and Jichao Jiao

Research on Evaluation of Sensor Deviations During Flight 252
Yuping Xiong, Shufen Liu, Sihua Gao, and Yemei Zhu

A Distributed Routing Algorithm for LEO Satellite Networks. 258
Jundong Ding, Yong Zhang, Ruonan Li, and Liang Zhao

Optimization of Smart Home System Based on Wireless Sensor Network 265
Xing Guo and Neng Hu

The Energy Efficiency Research of Traffic Offloading Mechanism for Green Heterogeneous Networks 274
Kaili Wu, Yifei Wei, Qiao Li, Da Guo, and Mei Song

A Game-Theoretic Approach for Joint Optimization of Sensing and Access in Cognitive Cellular Heterogeneous Networks 288
Changqing Pan, Ya'nan Xiao, Yinglei Teng, Weiqi Sun, and Xiaoqi Qin

Energy Harvesting Relay Node Deployment for Network Capacity Expansion. 301
Zhiqiang Zhang, Yifei Wei, Bo Gu, Xaojun Wang, and Mei Song

Parameters Optimization for KFKM Clustering Algorithm Based on WiFi Indoor Positioning 311
Zhengying Hu, Lujuan Ma, Baoling Liu, and Zhi Zhang

Energy Harvesting Time Coefficient Analyze for Cognitive Radio Sensor Network Using Game Theory. 318
Mengyu Zhao, Yifei Wei, Qiao Li, Mei Song, and Ningning Liu

Traffic Paralysis Alarm System Based on Strong Associated Subnet 330
Chen Yu, Shaohui Zhu, Hanhua Chen, Ruiguo Zhang, Jiehan Zhou, and Hai Jin

Fault Recovery Algorithm Based on SDN Network 342
Yi Zhang, Yifei Wei, Ruqin Huang, Bo Gu, Yue Ma, and Mei Song

Sensor Location Verification Scheme Based on Range-Free Localizations in WSNs 354
Chunyu Miao, Lina Chen, and Qingzhang Chen

Design and Development of Parametric System for Planetary Reducer 364
Yangpeng Chen, Menglun Tao, Dingfang Chen, Bo Li, Yanfang Yang, and Boting Chen

A Dynamic Double Threshold Based Cooperative Spectrum Sensing Strategy in Heterogeneous Cognitive Radio Networks 376
Chongxiao Peng, Yifei Wei, Bo Gu, Ligang Ren, and Mei Song

A Distributed Self-adaption Cube Building Model Based on Query Log 382
Meina Song, Mingkun Li, Zhuohuan Li, and Haihong E.

Property-Based Network Discovery of IoT Nodes Using Bloom Filters 394
Rustem Dautov, Salvatore Distefano, Oleg Senko, and Oleg Surnin

The Personality Analysis of Characters in Vernacular Novels by SC-LIWC 400
Yahui Yuan, Baobin Li, Dongdong Jiao, and Tingshao Zhu

Digging Deep Inside: An Extended Analysis of SCHOLAT E-Learning Data 410
Aftab Akram, Chengzhou Fu, Yong Tang, Yuncheng Jiang, and Kun Guo

Social Network Analysis of China Computer Federation Co-author Network 422
Chengzhou Fu, Weiquan Zeng, Rui Ding, Chengjie Mao, Chaobo He, and Guohua Chen

Detecting Postpartum Depression in Depressed People by Speech Features 433
Jingying Wang, Xiaoyun Sui, Bin Hu, Jonathan Flint, Shuotian Bai, Yuanbo Gao, Yang Zhou, and Tingshao Zhu

Research on Network Public Opinion Propagation Mechanism Based on Sina Micro-blog 443
Weidong Huang, Qian Wang, and Yixuan Wang

Scholar Recommendation Model in Large Scale Academic Social Networking Platform 453
Ming Chen, Chunying Li, Jiwei Liu, Dejie Meng, and Yong Tang

Research on Simulation for Fuel Consumption of UAV 465
Zongpu Jia, Yonghui Shi, Songyuan Gu, and Shufen Liu

Research on Meteorological Data Simulation 472
Zhenglun Wu, Shufen Liu, and Tie Bao

Anti-data Mining on Group Privacy Information 481
Fan Yang, Tian Tian, Hong Yao, Xiuyu Zhao, Tinggang Zheng, and Min Ning

Big Data Analysis of Reviews on E-commerce Based on Hadoop 492
Qiaohong Zu and Jiangming Wu

Analysis on Structural Vulnerability Under the Asymmetric Information 503
Mingshu He, Xiaojuan Wang, Jingwen You, and Zhen Wang

Combining Link and Content Correlation Learning for Cross-Modal Retrieval in Social Multimedia 516
Longtao Zhang, Fangfang Liu, and Zhimin Zeng

The Research on Touch Gestures Interaction Design for Personal Portable Computer 527
Qing Sheng, Ting Liu, Wenjun Hou, and Gengyi Wang

Research on Mobile User Dynamic Trust Model Based on Mobile Agent System 538
Weijin Jiang and Yuhui Xu

A Group Decision-Making Method Based on Evidence Theory in Uncertain Dynamic Environment 550
Weijin Jiang and Yuhui Xu

Analysis and Estimate the Effect of Knowledge on Software Reliability Distribution 561
Chunhui Yang, Yan Gao, Xuedong Kong, Dingfang Chen, Shengwu Xiong, and Jianwen Xiang

Development of Virtual Reality-Based Rock Climbing System 571
Yiming Su, Dingfang Chen, Congxing Zheng, Sihan Wang, Liwen Chang, and Jie Mei

Kinematics and Simulation Analysis of a 3-DOF Mobile Handling Robot Based ADAMS and MATLAB 582
Jingbo Hu, Dingfang Chen, Lijie Li, Jie Mei, Qin Guo, and Huafeng Shi

A New Type of 3D Printing Nozzle with PET Wire as Raw Material 588
Yawei Hong, Shaobo Li, Shupei Wu, Tianhao Huang, Guang Liu, Liwen Chang, and Yang Zhang

When Partitioning Works and When It Doesn't: An Empirical Study on Cache Way Partitioning 595
Hanfeng Qin

Track Maintenance Feedback Mechanism Based on Hadoop Big Data Analysis 608
Yong Zhu, Jiawei Fan, Guangyue Liu, Mou Wang, and Qian Wang

Crowdsourcing and Stigmergic Approaches for (Swarm) Intelligent Transportation Systems 616
Salvatore Distefano, Giovanni Merlino, Antonio Puliafito, Davide Cerotti, and Rustem Dautov

Research on Visual Feedback Based on Natural Gesture 627
Wenjun Hou, Shupeng Zhang, and Zhiyang Jiang

Information Security Technology and Application in Logistics Traceability System of Aquatic Products Based on QR Code 638
Qiaohong Zu and Rui Chen

Quantified Self: Big Data Analysis Platform for Human Factor Efficacy Evaluation of Complex System 648
Chaoqiang Li, Wenjun Hou, Xiaoling Chen, and Hao Li

Application of Speech Recognition Technology in Logistics Selection System 654
Tianzheng Fu and Bin Sun

Author Index 661

Sparse Linear Method Based Top-N Course Recommendation System with Expert Knowledge and L_0 Regularization

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Abstract. In this paper, we propose an approach of course recommender system for the subject of information management speciality in China. We collect the data relative to the course enrollment for specific set of students. The sparse linear method (SLIM) is introduced in our approach to generate the top-N recommendations of courses for students. Furthermore, the L_0 regularization terms were presented in our proposed optimization method based on the observation of the entries in recommendation system matrix. Expert knowledge based comparing experiments between state-of-the-art methods and our method are conducted to evaluate the performance of our method. Experimental results show that our proposed method outperforms state-of-the-art methods both in accuracy and efficiency.

Keywords: Course recommender system · Sparse linear method
Expert knowledge

1 Introduction

The emergence and rapid development of Internet have greatly affected the traditional viewpoint on choosing courses by providing detailed course information. As the number of courses conforming to the students' has tremendously increased, the above-mentioned problem has become how to determine the courses mostly suitable for the students accurately and efficiently. A plethora of methods and algorithms [2, 3, 11, 15] for course recommendation have been proposed to deal with this problem. Most of the methods designed for recommendation system can be grouped into three categories, including collaborative [1, 8], content-based [7, 14], and knowledge-based [5, 8, 17], which have been applied in different fields such as [4] proposed a collaborative filtering embedded with an artificial immune system to the course recommendation for college students. The rating from professor was exploited as ground truth to examine the results.

Inspired by the idea form [4] and the optimization framework in [9], we propose a sparse linear based method for top-N course recommendation with expert knowledge as the ground truth. This method extracts the coefficient matrix for the courses in the

Q. Zu and B. Hu (Eds.): HCC 2017, LNCS 10745, pp. 130–138, 2018.
https://doi.org/10.1007/978-3-319-74521-3_15

recommender system from the student/course matrix by solving a regularized optimization problem. The sparseness is exploited to represent the sparse characteristics of recommendation coefficient matrix. Sparse linear method (SLIM) [9] was proposed to top-N recommender systems, which is rarely exploited in course recommender systems. Due to the characteristics of course recommendation system in Chinese University, our method focuses on the accuracy more than the efficiency. It is different form the previously proposed SLIM based methods [6, 9, 10, 18], which mainly addresses the real-time applications of top-N recommender systems. The framework of our proposed course recommender system is shown in Fig. 1.

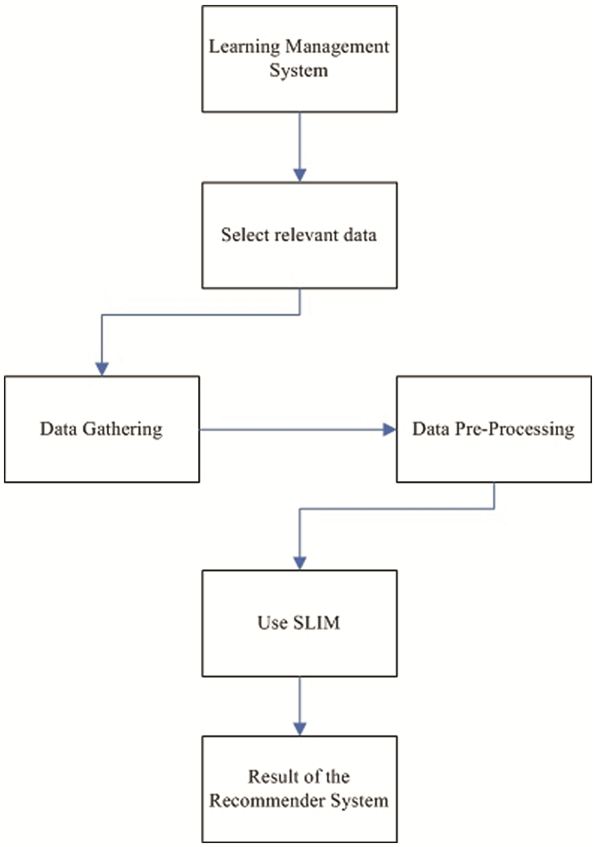

Fig. 1. The framework of our proposed course recommender system

According to our observation about common recommendation system matrix, most of the entries are assigned the same value (zero or one), and the gradients of neighboring entries also hold the same value (zero or one). Therefore, the sparse counting strategy of L_0 regularization terms [16] were included into the optimization framework of SLIM. The L_0 terms can globally constrain the non-zero values of entries and the gradients in the recommendation system matrix, which is the main contribution of our proposed method. Different from the previously proposed regularization terms (the L_1 and L_2 terms), the L_0 term can maintain the subtle relationship between the entries in recommendation system matrix.

After the process of data gathering as shown in Fig. 1, comparing experiments between state-of-the-art methods and our method are conducted. Consequently, both the

experimental results of state-of-the-art methods and our method are evaluated with the course recommendations presented by seven experts with voting strategy.

The rest of the paper is organized as follows. In Sect. 2, we describe the details of our proposed method. In Sect. 3 the dataset that we used in our experiments and the experimental results are presented. In Sect. 4 the discussion and conclusion are given.

2 Our Method

2.1 The Formation of the Method

In the following content, t_j and s_i are introduced to denote each course and each student in course recommender system, respectively. The whole student-course taken will be represented by a matrix A of size $m \times n$, in which the entry is 1 or 0 (1 denotes that the student has taken the course, 0 vice versa).

In this paper, we introduce a Sparse Linear Method (SLIM) to implement top-N course recommendation. In this approach, the score of course recommendation on each un-taken student/course item t_j of a student s_i is computed as a sparse aggregation of items that have been taken by s_i, which is shown in Eq. (1).

$$\overline{a_{ij}} = a_i^T w_j \tag{1}$$

where $\bar{a}$ is the initial course selection of a specific student and w_j is the sparse vector of aggregation coefficients. The model of SLIM with matrix is represented as:

$$\bar{A} = AW \tag{2}$$

Where *overlineA* is the initial value of student/course matrix, A denotes the latent binary student-course item matrix, W denotes the $n \times n$ sparse matrix of aggregation coefficients, in which $j - th$ column corresponds to w_j as in Eq. (1), and each row of $C(c_i)$ is the course recommendation scores on all courses for student s_i. The final course recommendation result of each student is completed through sorting the non-taken courses in decreasing order, and the top-N courses in the sequences are recommended.

In our method, the initial student/course matrix is extracted from the learning management system of a specific University in China. With the extracted student/course matrix of size $m \times n$, the sparse matrix W size of $n \times n$ in Eq. (2) is iteratively optimized by alternate minimization method. Different from the objective function previously proposed in [9] shown in Eq. (3), our proposed method is shown in Eq. (4).

$$\min_{W \geq 0} \frac{1}{2} \|A - AW\|_2^2 + \frac{\beta_1}{2} |W\|_F^2 + \lambda_1 \|A\|_1 \tag{3}$$

$$\min_{W \geq 0} \frac{1}{2} \|A - AW\|_2^2 + \frac{\beta_2}{2} |W\|_F^2 + \lambda_2 \|A\|_0 + \mu |\nabla A|_0 \tag{4}$$

Where $\|.\|_F$ denotes the Frobenius norm for matrix, $\|W\|_1$ is the item-wise L_1 norm, $\|W\|_0$ denotes the entry-wise L_0 norm that stands for the number of entries with zero

value. The data term $\|A - AW\|$ is exploited to measure the difference between the calculated model and the training dataset. The $L_F - norm$, $L_1 - norm$, and $L_0 - norm$ are exploited to regularize the entries of the coefficient matrix W, A, and ∇A, respectively. The parameters $\beta_1, \beta_2, \lambda_2$, and μ are used to constrain the weights of regularization terms in the objective functions.

In our proposed final objective function, the L_F norm is introduced to transfer the optimization problem into elastic net problem [19], which prevents the potential over fitting. Moreover, the L_1 norm in Eq. (3) is changed to L_0 norm in our proposed objective function. This novel norm L_0 [12, 13, 16] is introduced to constrain the sparseness of the A and ∇A.

Due to the independency of the columns in matrix W, the final objective function in Eq. (4) is decoupled into a set of objective functions as follows:

$$\min_{w_j \geq 0, w_j j=0} \frac{1}{2}\left\|a_j - a_j w_j\right\|_2^2 + \frac{\beta_2}{2}\left|w_j\right\|_F^2 + \lambda_2\left\|a_j\right\|_0 + \mu\left|\nabla a_j\right|_0 \tag{5}$$

where a_j is the *j-th* column of matrix A, w_j denotes *j-th* column of matrix W. As there are two unknown variables in each Eq. (5), which is a typical ill-posed problem. Thus, this problem need to be solved by alternate minimization method. In each iteration, one of the two variables is fixed and the other variable is optimized.

2.2 The Solver of Our Proposed Method

Subproblem1: computing w_j

The w_j computation sub-problem is represented by the minimization of Eq. (6):

$$\frac{1}{2}\left\|a_j - a_j w_j\right\|_2^2 + \frac{\beta_2}{2}\left\|w_j\right\|_F^2 \tag{6}$$

Through eliminating the L_0 terms in Eq. (5), the function Eq. (6) has a global minimum, which can be computed by gradient descent. The analytical solution to Eq. (6) is shown in Eq. (7):

$$w_j = F^{-1}\left(\frac{F\left(a_j\right)}{F\left(a_j\right) + \frac{\beta_2}{2}\left(F\left(\partial_x\right)^* \cdot F\left(\partial_x\right) + F\left(\partial_y\right)^* \cdot F\left(\partial_y\right)\right)}\right) \tag{7}$$

where $F(.)$ and $F^{-1}(\cdot)$ denotes the Fast Fourier Transform (FFT) and reverse FFT, respectively $.F()^*$ is the complex conjugate of $F(\cdot)$.

Sub-problem 2: computing a_j **and** ∇a_j

With the intermediate outcome of w_j, the a_j and ∇a_j can be computed by Eq. (8):

$$\frac{1}{2}\left\|a_j - a_j w_j\right\|_2^2 + \lambda_2\left\|a_j\right\|_0 + \mu\left\|\nabla a_j\right\|_0 \tag{8}$$

By introducing two auxiliary variables h and v corresponding to the column vector a_j and ∇a_j. The sub-problem can be transformed into Eq. (9):

$$\frac{1}{2}\left\|a_j - a_j w_j\right\|_2^2 + \lambda_2\left\|a_j - h\right\|_2^2 + \mu\left\|\nabla a_j - v\right\|_2^2 + \lambda\left(\|h\|_0 + \|v\|_0\right) \tag{9}$$

To testify the performance of our proposed method, comparing experiments between state-of-the-art methods and our method are carried out with gathered dataset and expert knowledge. In the following section, the experiments are described in detail.

3 Experimental Results

3.1 Datasets

In order to testify the performance of our proposed method and implement the method in practical scenarios, we gather the data from five classes of information management specialty for the learning management system of our University. The data records of the

Table 1. The initial dataset from the five classes

No.	SPSS	CH	Eng	LA	PT	DB	CC	PE	C	Acc	CS
1	1	1	1	0	1	0	1	1	0	1	0
2	0	1	1	0	1	0	1	1	1	1	0
3	0	1	1	0	1	1	0	1	0	1	0
4	0	1	1	0	1	1	0	1	1	1	0
5	1	1	1	1	1	0	0	1	1	1	0
6	1	1	1	1	1	0	0	1	1	1	1
7	0	1	1	1	1	0	0	1	1	1	1
8	1	1	1	1	1	1	0	1	0	1	1
9	1	1	1	0	1	1	1	1	0	1	0
10	1	1	1	0	1	1	1	1	0	1	0
11	0	1	1	0	1	0	1	1	0	1	0
12	0	1	1	0	1	1	0	1	0	1	1
13	0	1	1	1	1	0	1	1	0	1	1
14	1	1	1	1	1	1	1	1	0	1	1
15	1	1	1	1	1	1	1	1	0	1	1
16	0	1	1	0	1	1	1	1	0	1	1
17	1	1	1	1	1	1	1	1	0	1	1
18	0	1	1	1	1	0	1	1	0	1	0
19	1	1	1	0	1	1	1	1	0	1	0
20	0	1	1	1	1	0	1	1	0	1	1

courses and students were extracted from the Department of Management Information System, Shandong University of Finance and Economics and the Department of Electronic Engineering Information Technology at Shandong University of Sci&Tech. The most important information of the courses and students is mainly about the grades corresponding to the courses. All of the students from the information management specialty are freshmen in our University. Most of them have taken the courses of the first year in their curriculum except three students have failed to go up to the next grade. Thus, firstly we eliminate the records of the three students. Meanwhile, we collect the knowledge including the programming skill that they have mastered through a questionnaire. The courses that they have taken and the content that have grasped are combined in the final datset. A part of the dataset is shown in Table 1, where 1 denotes that the s_i student has mastered the t_j course, and 0 denotes the opposite.

After gathering the data of the students from the five classes, comparing experiments between state-of-the-art methods and our method are conducted. We choose several state-of-the-art methods including collaborative filtering methods itermkNN, userkNN, and the matrix factorization methods PureSVD.

3.2 Measurement

The knowledge from several experts on the courses in information management specialty are adopted as ground truth in the experimental process. To measure the performance of the comparing methods, we introduce the Hit Rate (HR) and the Average Reciprocal Hit-Rank (ARHR) in the experiments, which are defined as shown in Eqs. (11) and (12).

$$HR = \frac{\#hits}{\#students} \tag{11}$$

where *#hits* denotes the number of students whose course in the testing set is recommended by the expert, too. *#students* denotes the number of all students in the dataset.

$$ARHR = \frac{1}{\#students} \sum_{i=1}^{\#hits} \frac{1}{p_i} \tag{12}$$

Where p_i is the ordered recommendation list.

3.3 Experimental Results

In this section, the experimental results calculated from the practical dataset. Table 2 shows the experimental results of the comparing methods in top-N course recommendation.

Table 2. The performance of the comparing methods

Methods	HR_1	$ARHR_1$	HR_2	$ARHR_2$	HR_3	$ARHR_3$	HR_4	$ARHR_4$	HR_5	$ARHR_5$
itemkNN	0.18	0.13	0.19	0.14	0.20	0.13	0.18	0.13	0.19	0.14
Itempro b	0.21	0.15	0.19	0.16	0.21	0.14	0.19	0.12	0.17	0.13
PureSVD	0.09	0.11	0.10	0.12	0.12	0.12	0.17	0.14	0.18	0.15
SLIM	0.24	0.16	0.17	0.18	0.24	0.19	0.16	0.14	0.17	0.15
ours	0.27	0.17	0.19	0.17	0.25	0.18	0.20	0.14	0.19	0.15

Where HR_i, $ARHR_i$ denotes the performance for $class_i$, respectively. The experimental results shown in Table 2 demonstrate that our proposed method outperforms state-of-the-art methods in most of course recommendations both in the HR and ARHR. It shows that the sparse regularization term based on the prior knowledge from the observation in our method are suitable for solving the problem of course recommendation.

In order to illustrate the performance of our proposed method according to the number of courses and topics included in the experimental testing. It shows in Fig. 2 that a higher accuracy is obtained when the number of courses increases. Meanwhile, the courses included in our experiments are divided into 32 different topics, Fig. 3 shows that the accuracy is also higher when there are more relative courses.

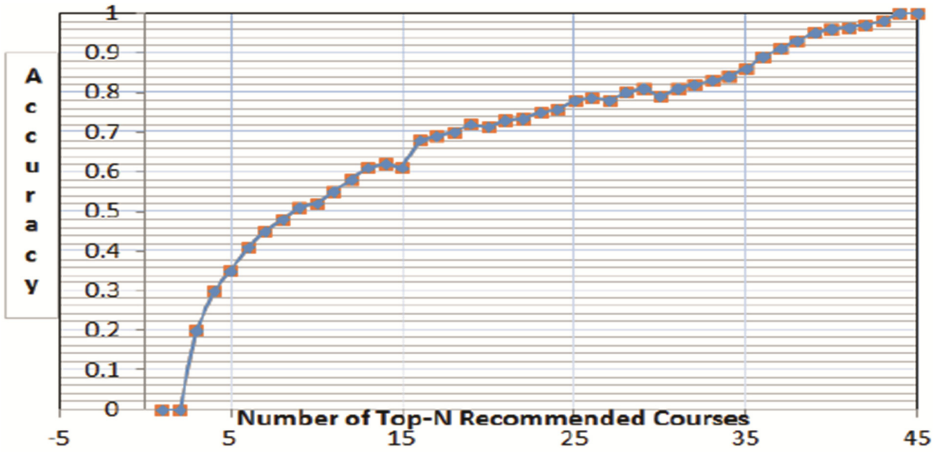

Fig. 2. Accuracy of our proposed recommendation system method due to the number of courses

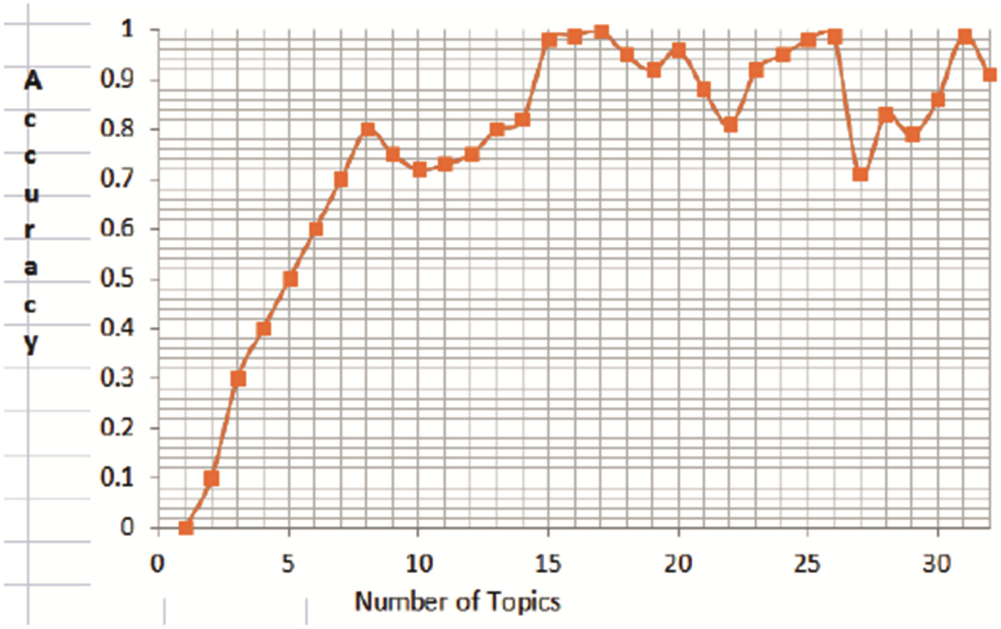

Fig. 3. Accuracy of our proposed recommendation system method due to the number of topics

4 Conclusion

In this paper, we propose an approach of course recommendation. In our method, the SLIM was introduced and a novel L_0 regularization term was exploited in SLIM. Meanwhile, the alternate minimization strategy is exploited to optimize the outcome of our method. To testify the performance of our method, comparing experiments on students from five different classes between state-of-the-art methods and our method are conducted. The experimental results show that our method outperforms the other previously proposed methods.

The proposed method was be mainly used to implement the course recommendation for the Universities in China. However, it also can b exploited in other relative fields. In the future, more applications of our approach would be investigated. Other future work includes the modification of the objective function in our method including the other regularization terms and different optimization strategy.

Acknowledgments. This work was financially supported by the Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (2015M111, 2015M110, Z2016Z036) and the Teaching Reform Research Project of Shandong University of Finance and Economics (2891470), Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (2015M136). SDUST Young Teachers Teaching Talent Training Plan (BJRC20160509); SDUST Excellent Teaching Team Construction Plan; Teaching research project of Shandong University of Science and Technology (JG201509 and qx2013286); Shandong Province Science and Technology Major Project (No. 2015ZDX X0801A02).

Disclosures. The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

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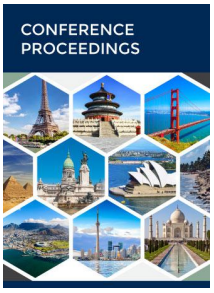

2016 8th International Conference on Information Technology in Medicine and Education (ITME)

Dec. 23 2016 to Dec. 25 2016

Fuzhou, China

Table of Contents

Message from the ITME 2016 General Chairs (/csdl/proceedings-article/itme/2016/07976420/12OmNCwlaeo)
pp. xviii-xviii

Message from the ITME 2016 Program Chairs (/csdl/proceedings-article/itme/2016/07976421/12OmNwkR5BQ)
pp. xix-xix

A Chronic Disease Self-Management System Based on OWL-Based Ontologies and Semantic Rules (/csdl/proceedings-article/itme/2016/3906a001/12OmNzSyChC)
pp. 1-6
by Chi Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Chi&surname=Zheng), Ling Gou (https://www.computer.org/csdl/search/default?type=author&givenName=Ling&surname=Gou), Yan-Xia Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Yan-Xia&surname=Zhao), Yao Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Yao&surname=Lu), Feng Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Feng&surname=Wang), Tian-Shu Zhou (https://www.computer.org/csdl/search/default?type=author&givenName=Tian-Shu&surname=Zhou), Jing-Song Li (https://www.computer.org/csdl/search/default?type=author&givenName=Jing-Song&surname=Li)

A Cost Sensitive and Class-Imbalance Classification Method Based on Neural Network for Disease Diagnosis (/csdl/proceedings-article/itme/2016/3906a007/12OmNxRWI38)
pp. 7-10
by Fei He (https://www.computer.org/csdl/search/default?type=author&givenName=Fei&surname=He), Huamin Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Huamin&surname=Yang), Yu Miao (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Miao), Rainbow Louis (https://www.computer.org/csdl/search/default?type=author&givenName=Rainbow&surname=Louis)

A Fast GPU Based High-Quality Three-Dimensional Visualization Method (/csdl/proceedings-article/itme/2016/3906a011/12OmNy87Qyq)
pp. 11-15
by Jinzhu Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Jinzhu&surname=Yang), Chaolu Feng (https://www.computer.org/csdl/search/default?type=author&givenName=Chaolu&surname=Feng), Wenjun Tan (https://www.computer.org/csdl/search/default?type=author&givenName=Wenjun&surname=Tan), Dazhe Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Dazhe&surname=Zhao), Nan Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Nan&surname=Chen)

A Modified Distance Regularized Level Set Evolution for Masseter Segmentation (/csdl/proceedings-article/itme/2016/3906a016/12OmNx4yvz9)
pp. 16-19
by Qiu Guan (https://www.computer.org/csdl/search/default?type=author&givenName=Qiu&surname=Guan), Bingyu Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Bingyu&surname=Zhang), Haixia Long

(https://www.computer.org/csdl/search/default?type=author&givenName=Haixia&surname=Long), Haigen Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Haigen&surname=Hu), Xiahai Zhuang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiahai&surname=Zhuang), Ying Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Ying&surname=Hu)

A Multi-objective Framework for Brain MRI Threshold Segmentation (/csdl/proceedings-article/itme/2016/3906a020/12OmNyv7mjX) pp. 20-24
by Wenting Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Wenting&surname=Zhao), Lijin Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Lijin&surname=Wang), Yuxiao Shi (https://www.computer.org/csdl/search/default?type=author&givenName=Yuxiao&surname=Shi), Xiaoming Xi (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoming&surname=Xi), Yilong Yin (https://www.computer.org/csdl/search/default?type=author&givenName=Yilong&surname=Yin), Yuchun Tang (https://www.computer.org/csdl/search/default?type=author&givenName=Yuchun&surname=Tang)

A New Registration Algorithm Combined MRF with BBR (/csdl/proceedings-article/itme/2016/3906a025/12OmNxE2mTe) pp. 25-29
by Junyi Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Junyi&surname=Yan), Jinzhu Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Jinzhu&surname=Yang)

A Novel Baicalin-Loaded Polyelectrolyte Nanoparticle Formulation (/csdl/proceedings-article/itme/2016/3906a030/12OmNwM6A3m) pp. 30-34
by Yuling Fan (https://www.computer.org/csdl/search/default?type=author&givenName=Yuling&surname=Fan), Jie Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Jie&surname=Zheng), Jiarui Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jiarui&surname=Liu), Xiangyu Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Xiangyu&surname=Meng)

A Quality Assessment Method of Single-Lead ECG Signal Based on Spectral Analysis (/csdl/proceedings-article/itme/2016/3906a035/12OmNrAMEK5) pp. 35-38
by Liping Li (https://www.computer.org/csdl/search/default?type=author&givenName=Liping&surname=Li)

A Real-Time Force-Displacement Detection and Evaluation System for Wearable Hand Exoskeleton Based on Multi-sensors (/csdl/proceedings-article/itme/2016/3906a039/12OmNrAMEN8) pp. 39-43
by Meng Qingyun (https://www.computer.org/csdl/search/default?type=author&givenName=Meng&surname=Qingyun), Meng Qiaoling (https://www.computer.org/csdl/search/default?type=author&givenName=Meng&surname=Qiaoling), Yu Hongliu (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Hongliu), Cao Wujing (https://www.computer.org/csdl/search/default?type=author&givenName=Cao&surname=Wujing), Zhu Ming (https://www.computer.org/csdl/search/default?type=author&givenName=Zhu&surname=Ming)

A Study on the Kinetic Parameters of Pushing Manipulation with One–Finger and Its Significance (/csdl/proceedings-article/itme/2016/3906a044/12OmNwNeYC2) pp. 44-49
by Li Li (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Li), Zhen Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Zhen&surname=Zheng), Jinling Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Jinling&surname=Wang), Zhiyong Fan (https://www.computer.org/csdl/search/default?type=author&givenName=Zhiyong&surname=Fan), Qiang Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Qiang&surname=Tian), Rusong Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Rusong&surname=Guo), Shuhua Lai (https://www.computer.org/csdl/search/default?type=author&givenName=Shuhua&surname=Lai), Zhenbao Li (https://www.computer.org/csdl/search/default?type=author&givenName=Zhenbao&surname=Li), Shan Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Shan&surname=Wu)

A Web-Based Mobile Medical Image Reading System (/csdl/proceedings-article/itme/2016/3906a050/12OmNyuPKUR) pp. 50-53
by Bing-Jin Liang (https://www.computer.org/csdl/search/default?type=author&givenName=Bing-Jin&surname=Liang), Yan-Jun Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Yan-Jun&surname=Lin)

Acupuncture for Generalized Anxiety Disorder: A Systematic Review (/csdl/proceedings-article/itme/2016/3906a054/12OmNBUAvUw) pp. 54-60

by Rui Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Rui&surname=Ma), Ding Luo (https://www.computer.org/csdl/search/default?type=author&givenName=Ding&surname=Luo), Yue Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Yue&surname=Liu), Lu Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Lu&surname=Lu), Shujun Xu (https://www.computer.org/csdl/search/default?type=author&givenName=Shujun&surname=Xu), Qian Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Qian&surname=Wu), Yefei Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Yefei&surname=Huang), Wenbin Fu (https://www.computer.org/csdl/search/default?type=author&givenName=Wenbin&surname=Fu)

Aging Related White Matter Tracts Detection Based on 42 Clinically Healthy Subjects (/csdl/proceedings-article/itme/2016/3906a061/12OmNBziB9v) pp. 61-65

by Shuihua Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Shuihua&surname=Wang), Yi Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Yi&surname=Chen), Meng-Meng Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Meng-Meng&surname=Yang), Hai-Nan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Hai-Nan&surname=Wang), Xue-Yan Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Xue-Yan&surname=Wu), Bin Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Liu), Ming Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Ming&surname=Yang), Yudong Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yudong&surname=Zhang)

An Accurate Passive Shimming Method (/csdl/proceedings-article/itme/2016/3906a066/12OmNvwTGFA) pp. 66-69

by WenJu Tang (https://www.computer.org/csdl/search/default?type=author&givenName=WenJu&surname=Tang), Hui Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Hui&surname=Wang), Yi Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yi&surname=Li), XuCheng Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=XuCheng&surname=Zhu), ChaoQun Niu (https://www.computer.org/csdl/search/default?type=author&givenName=ChaoQun&surname=Niu), Yang Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Hu), MingDa Gao (https://www.computer.org/csdl/search/default?type=author&givenName=MingDa&surname=Gao)

An Automatic Method to Extract Brain Tissue in CT Data (/csdl/proceedings-article/itme/2016/3906a070/12OmNx8wTr5) pp. 70-72

by Jinzhu Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Jinzhu&surname=Yang), Lin Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Lin&surname=Lu), Shuang Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Shuang&surname=Ma), Wenjun Tan (https://www.computer.org/csdl/search/default?type=author&givenName=Wenjun&surname=Tan), Dazhe Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Dazhe&surname=Zhao), Nan Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Nan&surname=Chen)

An Efficient Training Strategy for Face Detector in Specific Scenes (/csdl/proceedings-article/itme/2016/3906a073/12OmNAY79hk) pp. 73-77

by Ming-Yi Lei (https://www.computer.org/csdl/search/default?type=author&givenName=Ming-Yi&surname=Lei), Song-Zhi Su (https://www.computer.org/csdl/search/default?type=author&givenName=Song-Zhi&surname=Su), Shao-Zi Li (https://www.computer.org/csdl/search/default?type=author&givenName=Shao-Zi&surname=Li), Guo-Rong Cai (https://www.computer.org/csdl/search/default?type=author&givenName=Guo-Rong&surname=Cai)

Analysis and Design of Multi-pattern Retrieval Scheme of Regional PACS System Based Medical Images (/csdl/proceedings-article/itme/2016/3906a078/12OmNC3FGod) pp. 78-82

by Yanli Wan (https://www.computer.org/csdl/search/default?type=author&givenName=Yanli&surname=Wan), Hongpu Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Hongpu&surname=Hu), Chen Quan (https://www.computer.org/csdl/search/default?type=author&givenName=Chen&surname=Quan), Minjiang Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Minjiang&surname=Guo), Yan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Wang)

Analysis of Heart Rate Variability between Rest and Exercise States in Hypoxic Environment Using Fuzzy Measure Entropy (/csdl/proceedings-article/itme/2016/3906a083/12OmNylsZFo) pp. 83-89

by Zhengtao Cao (https://www.computer.org/csdl/search/default?type=author&givenName=Zhengtao&surname=Cao), Yuanyuan Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Yuanyuan&surname=Liu), Chengyu Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Chengyu&surname=Liu), Jun Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Jun&surname=Yang), Chenyu Luo

(https://www.computer.org/csdl/search/default?type=author&givenName=Chenyu&surname=Luo), Binhua Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Binhua&surname=Wang), Haitao Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Haitao&surname=Wang), Yanyan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yanyan&surname=Wang), Mengsun Yu (https://www.computer.org/csdl/search/default?type=author&givenName=Mengsun&surname=Yu)

Application of Music Therapy Combined with Computer Biofeedback in the Treatment of Anxiety Disorders (/csdl/proceedings-article/itme/2016/3906a090/12OmNBIofQX) pp. 90-93
by Fei Li (https://www.computer.org/csdl/search/default?type=author&givenName=Fei&surname=Li), Yaokun Xiong (https://www.computer.org/csdl/search/default?type=author&givenName=Yaokun&surname=Xiong)

Applying Kano's Model and QFD in User Interface Research of Shoulder and Neck Pains Examining Software (/csdl/proceedings-article/itme/2016/3906a094/12OmNvSKNCE) pp. 94-98
by Shuo-Fang Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Shuo-Fang&surname=Liu), Ming-Hong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Ming-Hong&surname=Wang), Yann-Long Lee (https://www.computer.org/csdl/search/default?type=author&givenName=Yann-Long&surname=Lee), Yu-Ren Cheng (https://www.computer.org/csdl/search/default?type=author&givenName=Yu-Ren&surname=Cheng)

Automated Quantitative Image Analysis of Hematoxylin-Eosin Staining Slides in Lymphoma Based on Hierarchical Kmeans Clustering (/csdl/proceedings-article/itme/2016/3906a099/12OmNBKEysY) pp. 99-104
by Peng Shi (https://www.computer.org/csdl/search/default?type=author&givenName=Peng&surname=Shi), Jing Zhong (https://www.computer.org/csdl/search/default?type=author&givenName=Jing&surname=Zhong), Rongfang Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Rongfang&surname=Huang), Jianyang Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Jianyang&surname=Lin)

Clinical Research of Regular Pattern of Cervical Lymph Node Metastasis in CN0 Papillary Thyroid Carcinoma (/csdl/proceedings-article/itme/2016/3906a105/12OmNyRPgK5) pp. 105-109
by Jia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jia&surname=Liu), Qun Li (https://www.computer.org/csdl/search/default?type=author&givenName=Qun&surname=Li), Peiyou Ren (https://www.computer.org/csdl/search/default?type=author&givenName=Peiyou&surname=Ren), Rui Li (https://www.computer.org/csdl/search/default?type=author&givenName=Rui&surname=Li), Shuai Xue (https://www.computer.org/csdl/search/default?type=author&givenName=Shuai&surname=Xue), Xianying Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Xianying&surname=Meng), Renzhu Pang (https://www.computer.org/csdl/search/default?type=author&givenName=Renzhu&surname=Pang), Su Dong (https://www.computer.org/csdl/search/default?type=author&givenName=Su&surname=Dong)

Coexistence of Medullary Carcinoma and Papillary Carcinoma in the Same Lobe of the Thyroid: A Rare Case Report (/csdl/proceedings-article/itme/2016/3906a110/12OmNCzsKH6) pp. 110-111
by Qiang Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Qiang&surname=Zhang), Yaoqi Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yaoqi&surname=Wang), Xianying Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Xianying&surname=Meng), Renzhu Pang (https://www.computer.org/csdl/search/default?type=author&givenName=Renzhu&surname=Pang), Shuai Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Shuai&surname=Yang)

Comparative Chemical Composition of the Essential Oils from Hedyotis Diffusa WILLD and Its Adulterants Hedyotis Corymbosa Lam by GC-MS (/csdl/proceedings-article/itme/2016/3906a112/12OmNwoPtBz) pp. 112-116
by Wu Jian (https://www.computer.org/csdl/search/default?type=author&givenName=Wu&surname=Jian), Yang Tairan (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Tairan), Xu Ying (https://www.computer.org/csdl/search/default?type=author&givenName=Xu&surname=Ying), Xiang Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Xiang&surname=Zheng)

Comparison of Several Common Intelligent Fault Diagnosis Knowledge-Based Method under Nonlinear Small Sample Conditions (/csdl/proceedings-article/itme/2016/3906a117/12OmNwKGAnp) pp. 117-120
by Zhu Ning (https://www.computer.org/csdl/search/default?type=author&givenName=Zhu&surname=Ning)

Design and Development of a Readmission Risk Assessment System for Patients with Cardiovascular Disease (/csdl/proceedings-article/itme/2016/3906a121/12OmNyVes4Q) pp. 121-124

by Chun-Yan Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Chun-Yan&surname=Zhu), Sheng-Qiang Chi (https://www.computer.org/csdl/search/default?type=author&givenName=Sheng-Qiang&surname=Chi), Run-Ze Li (https://www.computer.org/csdl/search/default?type=author&givenName=Run-Ze&surname=Li), Dan-Yang Tong (https://www.computer.org/csdl/search/default?type=author&givenName=Dan-Yang&surname=Tong), Yu Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Tian), Jing-Song Li (https://www.computer.org/csdl/search/default?type=author&givenName=Jing-Song&surname=Li)

Differences in the Nasal Respiratory Function after the Treatment of Maxillary Cyst (/csdl/proceedings-article/itme/2016/3906a125/12OmNxaNGnp) pp. 125-128
by Li Ruiyu (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Ruiyu), Li Yve (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Yve), Ma Xueyu (https://www.computer.org/csdl/search/default?type=author&givenName=Ma&surname=Xueyu), Li Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Meng), Hou Jinjie (https://www.computer.org/csdl/search/default?type=author&givenName=Hou&surname=Jinjie), Guo Yunling (https://www.computer.org/csdl/search/default?type=author&givenName=Guo&surname=Yunling)

Discovery of Acupoints and Combinations for the Moxibustion Treatment of Cervical Radiculopathy: A Data Mining Analysis (/csdl/proceedings-article/itme/2016/3906a129/12OmNBDQbo7) pp. 129-132
by Rui Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Rui&surname=Ma), Ding Luo (https://www.computer.org/csdl/search/default?type=author&givenName=Ding&surname=Luo), Yue Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Yue&surname=Liu), Lu Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Lu&surname=Lu), Shujun Xu (https://www.computer.org/csdl/search/default?type=author&givenName=Shujun&surname=Xu), Qian Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Qian&surname=Wu), Wenbin Fu (https://www.computer.org/csdl/search/default?type=author&givenName=Wenbin&surname=Fu)

Discussion on the Application of CBL Teaching Method in the Teaching of the Kidney Disease in Internal Medicine Traditional of TCM (/csdl/proceedings-article/itme/2016/3906a133/12OmNAWYKIS) pp. 133-136
by Mei-Juan Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Mei-Juan&surname=Sun), Pei-Hua Xiong (https://www.computer.org/csdl/search/default?type=author&givenName=Pei-Hua&surname=Xiong), Ming-Gang Wei (https://www.computer.org/csdl/search/default?type=author&givenName=Ming-Gang&surname=Wei)

Effect of Conjugated Linoleic Acid on Metabolism and Lipogenic Gene Expression of Liver in Lactating Mice (/csdl/proceedings-article/itme/2016/3906a137/12OmNzYeAPd) pp. 137-139
by Pang Kun (https://www.computer.org/csdl/search/default?type=author&givenName=Pang&surname=Kun), Han Liqiang (https://www.computer.org/csdl/search/default?type=author&givenName=Han&surname=Liqiang)

Effect of JiangTangFangLong Prescription on Hs-CRP, ABI in Patients with Different Syndrome Types of Diabetes Deafness (/csdl/proceedings-article/itme/2016/3906a140/12OmNvxKu0B) pp. 140-143
by Li Ruiyu (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Ruiyu), Li Yve (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Yve), Ma Xueyu (https://www.computer.org/csdl/search/default?type=author&givenName=Ma&surname=Xueyu), Li Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Meng), Hou Jinjie (https://www.computer.org/csdl/search/default?type=author&givenName=Hou&surname=Jinjie), Guo Yunling (https://www.computer.org/csdl/search/default?type=author&givenName=Guo&surname=Yunling)

Effect of the Preclinical Small-Class Mode of Oral Medicine Teaching (/csdl/proceedings-article/itme/2016/3906a144/12OmNvAiStt) pp. 144-146
by Li Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Yang), Dan Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Dan&surname=Liu), Hui Li (https://www.computer.org/csdl/search/default?type=author&givenName=Hui&surname=Li), Qingzong Si (https://www.computer.org/csdl/search/default?type=author&givenName=Qingzong&surname=Si), Bin Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Liu)

Effects of Short Message Service on HIV Prevention Among Young College Students (/csdl/proceedings-article/itme/2016/3906a147/12OmNBV9Ijz) pp. 147-153
by Liangshun Deng (https://www.computer.org/csdl/search/default?type=author&givenName=Liangshun&surname=Deng), Wenkui Geng (https://www.computer.org/csdl/search/default?type=author&givenName=Wenkui&surname=Geng), Liping Song

(https://www.computer.org/csdl/search/default?type=author&givenName=Liping&surname=Song)

Experience Sharing of CT Findings and Pathological Features of Diffuse Sclerosing Variant of Papillary Thyroid Carcinoma (One Case) (/csdl/proceedings-article/itme/2016/3906a154/12OmNyqzM3U) pp. 154-158
by Ting Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Ting&surname=Zhang), Shuo Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Shuo&surname=Wang), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

Experience Sharing of Ultrasonic and Pathologic Features of Diffuse Sclerosing Variant of Papillary Thyroid Carcinoma (47 Cases Report) (/csdl/proceedings-article/itme/2016/3906a159/12OmNBQ2VXY) pp. 159-162
by Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Jia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jia&surname=Liu), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Yi Han (https://www.computer.org/csdl/search/default?type=author&givenName=Yi&surname=Han), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

Exploration of the Innovative Medical Talent Training Based on Problem-Based Learning in Digital Image Processing Teaching (/csdl/proceedings-article/itme/2016/3906a163/12OmNqIzhbS) pp. 163-167
by Zhang Jianwei (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Jianwei), Zhou Jifang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhou&surname=Jifang), Chen Tao (https://www.computer.org/csdl/search/default?type=author&givenName=Chen&surname=Tao), Liu Zhaohui (https://www.computer.org/csdl/search/default?type=author&givenName=Liu&surname=Zhaohui), Liu Qingtuan (https://www.computer.org/csdl/search/default?type=author&givenName=Liu&surname=Qingtuan)

Factor Analysis of Medical Expenses of the Hepatitis a Patients in Guangdong (/csdl/proceedings-article/itme/2016/3906a168/12OmNzID9fq) pp. 168-170
by Pei Shen (https://www.computer.org/csdl/search/default?type=author&givenName=Pei&surname=Shen)

FAP_HIS: A Simple Fuzzy-Vault Based Authentication Protocol for RFID-Enabled Healthcare Information System against Unauthorised Tracking (/csdl/proceedings-article/itme/2016/3906a171/12OmNzZWbGk) pp. 171-175
by Xiaoming Yao (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoming&surname=Yao), Xiaoyi Zhou (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoyi&surname=Zhou), Jixin Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Jixin&surname=Ma)

Four-Nucleotide and Six-Nucleotide Abortive Transcripts Can Inhibit Transcription (/csdl/proceedings-article/itme/2016/3906a176/12OmNqOffz2) pp. 176-181
by Shaowei Qin (https://www.computer.org/csdl/search/default?type=author&givenName=Shaowei&surname=Qin), Lifeng Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Lifeng&surname=Zhao)

Health Concerns: Self-Disclosure and Online Behavior Analysis (/csdl/proceedings-article/itme/2016/3906a182/12OmNwcUk3e) pp. 182-186
by Ting Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Ting&surname=Wang), Guangyu Piao (https://www.computer.org/csdl/search/default?type=author&givenName=Guangyu&surname=Piao), Julong Pan (https://www.computer.org/csdl/search/default?type=author&givenName=Julong&surname=Pan), Qun Jin (https://www.computer.org/csdl/search/default?type=author&givenName=Qun&surname=Jin)

Image Quality Comparison of Various Adaptive Beamforming Algorithms: A Survey Study of Adaptive Beamforming for Medical Ultrasonic Imaging (/csdl/proceedings-article/itme/2016/3906a187/12OmNzdGnsU) pp. 187-191
by Junying Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Junying&surname=Chen), Jinhui Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Jinhui&surname=Chen), Zhi Cheng (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Cheng), Huaqing Min (https://www.computer.org/csdl/search/default?type=author&givenName=Huaqing&surname=Min), Xiaohang Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaohang&surname=Wang)

Inference of Gene Regulatory Network Based on Legendre Neural Network (/csdl/proceedings-article/itme/2016/3906a192/12OmNrYCY0z) pp. 192-194
by Bin Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Yang), Sanrong Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Sanrong&surname=Liu)

Influence Factors of Serum Sodium and Prediction of Hyponatremia Using Back Propagation Artificial Neural Network Model (BP-ANN) Model in Cirrhosis Patients (/csdl/proceedings-article/itme/2016/3906a195/12OmNrAv3Km) pp. 195-198
by Chengliang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Chengliang&surname=Chen), Xing Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Xing&surname=Tian), Jian Jiao (https://www.computer.org/csdl/search/default?type=author&givenName=Jian&surname=Jiao)

Influence of Traditional Chinese Medicine Five-Element Musical Therapy on Depression Severity and Neurological Functional Deficit Scale in Patients with Post-Stroke Depression (/csdl/proceedings-article/itme/2016/3906a199/12OmNwvVrCX) pp. 199-208
by Fa-Cai Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Fa-Cai&surname=Lin), De-Hong Huang (https://www.computer.org/csdl/search/default?type=author&givenName=De-Hong&surname=Huang), Na-Na He (https://www.computer.org/csdl/search/default?type=author&givenName=Na-Na&surname=He), Yu-Hang Qin (https://www.computer.org/csdl/search/default?type=author&givenName=Yu-Hang&surname=Qin), Shou-Dong Li (https://www.computer.org/csdl/search/default?type=author&givenName=Shou-Dong&surname=Li), Yi-Huang Gu (https://www.computer.org/csdl/search/default?type=author&givenName=Yi-Huang&surname=Gu), Yun-Chuan Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Yun-Chuan&surname=Wu)

Inhomogeneous Weighted Spiking Neural P Systems with Local Homogeneous (/csdl/proceedings-article/itme/2016/3906a209/12OmNvqEvKo) pp. 209-213
by Mengmeng Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Mengmeng&surname=Liu), Feng Qi (https://www.computer.org/csdl/search/default?type=author&givenName=Feng&surname=Qi)

Intraoperative Parathyroid Hormone Monitoring in Parathyroidectomy for PHPT (/csdl/proceedings-article/itme/2016/3906a214/12OmNBDyAbj) pp. 214-218
by Yuanyuan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yuanyuan&surname=Wang), Xi Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Xi&surname=Zhang), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

Investigation and Analysis of Informatization Development Status of 1283 Traditional Chinese Medicine Hospitals (/csdl/proceedings-article/itme/2016/3906a219/12OmNCga1RS) pp. 219-226
by Yue Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yue&surname=Zhang), Hongyan Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Hongyan&surname=Liu), Aichao Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Aichao&surname=Zhang), Yan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Wang), Hongpu Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Hongpu&surname=Hu)

Lesion Recognition Method of Liver CT Images Based on Random Forest (/csdl/proceedings-article/itme/2016/3906a227/12OmNAndiyD) pp. 227-230
by Xinyu Jin (https://www.computer.org/csdl/search/default?type=author&givenName=Xinyu&surname=Jin), Ting Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Ting&surname=Zhang), Lanjuan Li (https://www.computer.org/csdl/search/default?type=author&givenName=Lanjuan&surname=Li), Haitao Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Haitao&surname=Wu), Bin Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Sun)

Maxillary Sinus Cyst Drug Combination in the Treatment of Maxillary Bone Cyst (/csdl/proceedings-article/itme/2016/3906a231/12OmNBSBkhF) pp. 231-233
by Li Ruiyu (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Ruiyu), Li Yve (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Yve), Ma Xueyu

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Multiple Recurrence Parathyroid Carcinoma One Case Report (/csdl/proceedings-article/itme/2016/3906a234/12OmNzhELi6) pp. 234-236
by Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Jia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jia&surname=Liu), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Yi Han (https://www.computer.org/csdl/search/default?type=author&givenName=Yi&surname=Han), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

New Biochip-Based Absolute Quantitative Detection System for Nucleic Acid Molecules: A Primary Assay (/csdl/proceedings-article/itme/2016/3906a237/12OmNxGja0F) pp. 237-239
by Jie Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Jie&surname=Gao), Zhao-Hua Ji (https://www.computer.org/csdl/search/default?type=author&givenName=Zhao-Hua&surname=Ji), Lei Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Lei&surname=Zhang), Zhong-Jun Shao (https://www.computer.org/csdl/search/default?type=author&givenName=Zhong-Jun&surname=Shao), Yong-Ping Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Yong-Ping&surname=Yan)

Non-recurrent Inferior Laryngeal Nerve: Clinical Manifestations, Surgical Outcomes, and Literature Review (/csdl/proceedings-article/itme/2016/3906a240/12OmNzd7brb) pp. 240-243
by Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Xianying Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Xianying&surname=Meng), Guimin Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Guimin&surname=Wang), Wei Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Wei&surname=Meng), Jia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jia&surname=Liu), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

Parathyroid Carcinoma: One Case of Multiple Metastases (/csdl/proceedings-article/itme/2016/3906a244/12OmNx3Hl2z) pp. 244-248
by Nan Li (https://www.computer.org/csdl/search/default?type=author&givenName=Nan&surname=Li), Yan Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Li), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

Research on Diagnosis Technology of Advanced Metering Infrastructure On-Site (/csdl/proceedings-article/itme/2016/3906a249/12OmNyUFfYT) pp. 249-253
by Aliaosha Ye (https://www.computer.org/csdl/search/default?type=author&givenName=Aliaosha&surname=Ye), Xuan Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Xuan&surname=Liu), Guoquan Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Guoquan&surname=Zheng), Zhe Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Zhe&surname=Liu)

Research on Influence Factors and Clinical Significance of Delphian Lymph Node Metastasis in Papillary Thyroid Carcinoma (/csdl/proceedings-article/itme/2016/3906a254/12OmNzTYBPi) pp. 254-259
by Lin Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Lin&surname=Ma), Yaoqi Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yaoqi&surname=Wang), Xianying Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Xianying&surname=Meng), Qiang Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Qiang&surname=Zhang), Shuai Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Shuai&surname=Yang), Renzhu Pang

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Research on Mobile Intelligent Medical Information System Based on the Internet of Things Technology (/csdl/proceedings-article/itme/2016/3906a260/12OmNyQGSiD) pp. 260-266
by Guoqiang Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Guoqiang&surname=Sun), Fan Yu (https://www.computer.org/csdl/search/default?type=author&givenName=Fan&surname=Yu), Xingyun Lei (https://www.computer.org/csdl/search/default?type=author&givenName=Xingyun&surname=Lei), Yan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Wang), Hongpu Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Hongpu&surname=Hu)

Research on the Rehabilitation of Autistic Children Based on Virtual Motion System (/csdl/proceedings-article/itme/2016/3906a267/12OmNwCaCt2) pp. 267-270
by Xiaoyan Jiang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoyan&surname=Jiang), Zuojin Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Zuojin&surname=Hu), Wei Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Wei&surname=Wang)

Screening and Identification of Conjugated Linoleic Acid-producing Lactobacillus plantarum (/csdl/proceedings-article/itme/2016/3906a271/12OmNqI04CX) pp. 271-274
by Li Fang (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Fang), Peng Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peng&surname=Wang), Zhi-Rui Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi-Rui&surname=Zhang), Zu-Hao Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Zu-Hao&surname=Wang), Wei-Hong Min (https://www.computer.org/csdl/search/default?type=author&givenName=Wei-Hong&surname=Min)

Segmentation of the Aortic Dissection from CT Images Based on Spatial Continuity Prior Model (/csdl/proceedings-article/itme/2016/3906a275/12OmNwEJ0Jn) pp. 275-280
by Duan Xiaojie (https://www.computer.org/csdl/search/default?type=author&givenName=Duan&surname=Xiaojie), Shi Meichen (https://www.computer.org/csdl/search/default?type=author&givenName=Shi&surname=Meichen), Wang Jianming (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Jianming), Zhao He (https://www.computer.org/csdl/search/default?type=author&givenName=Zhao&surname=He), Chen Dandan (https://www.computer.org/csdl/search/default?type=author&givenName=Chen&surname=Dandan)

Sharing Experience in the Treatment of Chylous Leakage in Thyroid Cancer Radical Resection and Central Lymph Node Dissection Patients (/csdl/proceedings-article/itme/2016/3906a281/12OmNC3Xhh4) pp. 281-285
by Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Yan Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Li), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

Slice Profile Experimental Comparison of Shinnar-Le Roux Pulse and SINC Pulse in Magnetic Resonance Imaging (/csdl/proceedings-article/itme/2016/3906a286/12OmNrJAegR) pp. 286-289
by Mingda Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Mingda&surname=Gao), Wenhui Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Wenhui&surname=Yang), Shufeng Wei (https://www.computer.org/csdl/search/default?type=author&givenName=Shufeng&surname=Wei), Wenju Tang (https://www.computer.org/csdl/search/default?type=author&givenName=Wenju&surname=Tang)

Smart Analysis Oriented Design of Health Statistics Data Model (/csdl/proceedings-article/itme/2016/3906a290/12OmNyTwRgH) pp. 290-298
by Minjiang Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Minjiang&surname=Guo), Hongpu Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Hongpu&surname=Hu), Lei Xingyun (https://www.computer.org/csdl/search/default?type=author&givenName=Lei&surname=Xingyun), Ma Hao (https://www.computer.org/csdl/search/default?type=author&givenName=Ma&surname=Hao), Wan Yanli (https://www.computer.org/csdl/search/default?type=author&givenName=Wan&surname=Yanli)

Study on the Infectious Regularity of Patients with Advanced Lung Cancer (/csdl/proceedings-article/itme/2016/3906a299/12OmNwDj1ib) pp. 299-301
by Zhiyuan Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Zhiyuan&surname=Chen), Weidong Xu (https://www.computer.org/csdl/search/default?type=author&givenName=Weidong&surname=Xu), Yong Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Yong&surname=Yang), Jie Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Jie&surname=Yan), Qingyong Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Qingyong&surname=Chen)

Supreme (TM) Largeal Mask Airway Size Choice in Anesthesthetic Practice for Chinese Adult Patients (/csdl/proceedings-article/itme/2016/3906a302/12OmNAThXTJ) pp. 302-305
by Su Dong (https://www.computer.org/csdl/search/default?type=author&givenName=Su&surname=Dong), Zhaoping Xue (https://www.computer.org/csdl/search/default?type=author&givenName=Zhaoping&surname=Xue), Yipeng Du (https://www.computer.org/csdl/search/default?type=author&givenName=Yipeng&surname=Du), Jia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jia&surname=Liu)

Technology and Methods of Improving the Success Rate of MSCT-Guided Puncture (/csdl/proceedings-article/itme/2016/3906a306/12OmNxG1yC0) pp. 306-309
by Zhiwei Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhiwei&surname=Huang), Bo Xiao (https://www.computer.org/csdl/search/default?type=author&givenName=Bo&surname=Xiao), Qian Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Qian&surname=Liu), Tian Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Tian&surname=Tian)

The Application of Information Technology in Neurobiology Education (/csdl/proceedings-article/itme/2016/3906a310/12OmNvRU0rU) pp. 310-313
by Xiufeng Li (https://www.computer.org/csdl/search/default?type=author&givenName=Xiufeng&surname=Li), Zongming Li (https://www.computer.org/csdl/search/default?type=author&givenName=Zongming&surname=Li)

The Combined Application of Low Molecular Dextran, Papaverine and Low Molecular Weight Heparin Sodium to Improve Testicle Survival Rate after the Detorsion of Testicular Torsion in Rabbits (/csdl/proceedings-article/itme/2016/3906a314/12OmNzxyiDB) pp. 314-318
by Fujun Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Fujun&surname=Wang), Zengnan Mo (https://www.computer.org/csdl/search/default?type=author&givenName=Zengnan&surname=Mo)

The Diagnostic Model of Neonatal Respiratory Distress Syndrome Based on Intelligent Algorithm (/csdl/proceedings-article/itme/2016/3906a319/12OmNxaNGi0) pp. 319-323
by Bin Jing (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Jing), Hai-Bin Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Hai-Bin&surname=Meng), Song-Chun Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Song-Chun&surname=Yang), Dong-Sheng Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Dong-Sheng&surname=Zhao), Xue-yi Shang (https://www.computer.org/csdl/search/default?type=author&givenName=Xue-yi&surname=Shang)

The Diagnostic Model of Obstructive Sleep Apnea Hypopnea Syndrome Based on Artificial Neural Networks (/csdl/proceedings-article/itme/2016/3906a324/12OmNzxgHtk) pp. 324-328
by Bin Jing (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Jing), Hai-Bin Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Hai-Bin&surname=Meng), Song-Chun Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Song-Chun&surname=Yang), Xue-Yi Shang (https://www.computer.org/csdl/search/default?type=author&givenName=Xue-Yi&surname=Shang), Dong-Sheng Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Dong-Sheng&surname=Zhao)

The Evaluation of a Wizard-Based Outpatient EMR in Oral and Maxilla Facial Surgery Department From the Aspects of Documentation Time and Record Quality — A Randomized, Cross-over Study (/csdl/proceedings-article/itme/2016/3906a329/12OmNxEBza7) pp. 329-332
by Hongwei Cai (https://www.computer.org/csdl/search/default?type=author&givenName=Hongwei&surname=Cai), Yongfeng Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yongfeng&surname=Li), Kaijin Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Kaijin&surname=Hu), Yu Cao (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Cao), Man Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Man&surname=Hu)

The Features of Lymph Node Metastasis of Differentiated Thyroid Carcinoma and the Choice of Lateral Neck Lymph Nodes Dissection (/csdl/proceedings-article/itme/2016/3906a333/12OmNBO3K3F) pp. 333-337
by Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Jia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jia&surname=Liu), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Yi Han (https://www.computer.org/csdl/search/default?type=author&givenName=Yi&surname=Han), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

The Influence of Panax Notoginseng Saponins and Tripterygium Glycosides on the TNF-1, IL-6, PAI-1 Level in CIA Rat Peripheral Blood and the MCP-1 Expression in Myocardium (/csdl/proceedings-article/itme/2016/3906a338/12OmNqJHFqx) pp. 338-342
by Li Ruiyu (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Ruiyu), Jiao Aijun (https://www.computer.org/csdl/search/default?type=author&givenName=Jiao&surname=Aijun)

The Research and Application of Technology in the Diagnosis of Lung Cancer Warning Association Rule Mining (/csdl/proceedings-article/itme/2016/3906a343/12OmNBDQbjZ) pp. 343-346
by Shaoyun Song (https://www.computer.org/csdl/search/default?type=author&givenName=Shaoyun&surname=Song), Yu Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Ma)

The Research History and Development Tendency of TCM Clinical Decision Support System (/csdl/proceedings-article/itme/2016/3906a347/12OmNwHhp3K) pp. 347-349
by Yang Tao (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Tao), Jiang Rongrong (https://www.computer.org/csdl/search/default?type=author&givenName=Jiang&surname=Rongrong)

Visualization of Microvascular that Assumes an Ultra-High Field MRI with High Precision Frequency Analysis (/csdl/proceedings-article/itme/2016/3906a350/12OmNzayNun) pp. 350-354
by Masaya Hasegawa (https://www.computer.org/csdl/search/default?type=author&givenName=Masaya&surname=Hasegawa), Shigeki Hirobayashi (https://www.computer.org/csdl/search/default?type=author&givenName=Shigeki&surname=Hirobayashi)

Weighted Spiking Neural P Systems with Structural Plasticity Working in Maximum Spiking Strategy (/csdl/proceedings-article/itme/2016/3906a355/12OmNAOsMQD) pp. 355-359
by Mingming Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Mingming&surname=Sun), Jianhua Qu (https://www.computer.org/csdl/search/default?type=author&givenName=Jianhua&surname=Qu)

A Denial of Service Attack Method for an IoT System (/csdl/proceedings-article/itme/2016/3906a360/12OmNAle6Bx) pp. 360-364
by Lulu Liang (https://www.computer.org/csdl/search/default?type=author&givenName=Lulu&surname=Liang), Kai Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Kai&surname=Zheng), Qiankun Sheng (https://www.computer.org/csdl/search/default?type=author&givenName=Qiankun&surname=Sheng), Xin Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Xin&surname=Huang)

A Hybrid Computer Interface for Robot Arm Control (/csdl/proceedings-article/itme/2016/3906a365/12OmNrHjqOB) pp. 365-369
by Jingsheng Tang (https://www.computer.org/csdl/search/default?type=author&givenName=Jingsheng&surname=Tang), Zongtan Zhou (https://www.computer.org/csdl/search/default?type=author&givenName=Zongtan&surname=Zhou), Yang Yu (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Yu)

A Method of Fire and Smoke Detection Based on Surendra Background and Gray Bitmap Plane Algorithm (/csdl/proceedings-article/itme/2016/3906a370/12OmNxbEtMN) pp. 370-374
by Li Jinlan (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Jinlan), Wang Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Lin), Zhang Ruliang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Ruliang), Huang Chengquan (https://www.computer.org/csdl/search/default?type=author&givenName=Huang&surname=Chengquan), Rao Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Rao&surname=Yan)

A Mobile Social App for College Students Based on Perceived Similarity and Trust (/csdl/proceedings-article/itme/2016/3906a375/12OmNy68EFP) pp. 375-379

by Liu Jianglong (https://www.computer.org/csdl/search/default?type=author&givenName=Liu&surname=Jianglong), Xiong Min (https://www.computer.org/csdl/search/default?type=author&givenName=Xiong&surname=Min)

A New Calibration-Free Gaze Tracking Algorithm Based on DE-SLFA (/csdl/proceedings-article/itme/2016/3906a380/12OmNBbsieg) pp. 380-384
by Song Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Song&surname=Wang), Junning Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Junning&surname=Wang), Hongming Peng (https://www.computer.org/csdl/search/default?type=author&givenName=Hongming&surname=Peng), Shuping Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Shuping&surname=Gao), Di He (https://www.computer.org/csdl/search/default?type=author&givenName=Di&surname=He)

A Novel O2O Teaching Model Using Mobile Social Network APP to Combine Online and Offline Teaching (/csdl/proceedings-article/itme/2016/3906a385/12OmNvkGW0D) pp. 385-389
by Wen-Qiang Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Wen-Qiang&surname=Zhu)

A Novel Personal Health Assessment Based on Mobile Telecom Data (/csdl/proceedings-article/itme/2016/3906a390/12OmNBVrjIS) pp. 390-393
by Xiaoting Cheng (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoting&surname=Cheng), Xiaoxiang Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoxiang&surname=Wang), Dongyu Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Dongyu&surname=Wang), Xiaokai Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaokai&surname=Liu)

A Reciprocal Recommender System for Graduates' Recruitment (/csdl/proceedings-article/itme/2016/3906a394/12OmNzlly23) pp. 394-398
by Yanhui Ding (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhui&surname=Ding), Yongxin Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yongxin&surname=Zhang), Lin Li (https://www.computer.org/csdl/search/default?type=author&givenName=Lin&surname=Li), Weizhi Xu (https://www.computer.org/csdl/search/default?type=author&givenName=Weizhi&surname=Xu), Hu Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Hu&surname=Wang)

A Research on the Transformation and Upgrading Path of the Internet Economy of the Metallurgical Industry in Inner Mongolia (/csdl/proceedings-article/itme/2016/3906a399/12OmNzVoBHQ) pp. 399-403
by Zhao Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Zhao&surname=Yan), Ba Ting-Ting (https://www.computer.org/csdl/search/default?type=author&givenName=Ba&surname=Ting-Ting)

A Study on the Strategy of Virtue Machine Load Equality in the Cloud Environment (/csdl/proceedings-article/itme/2016/3906a404/12OmNqFa5oN) pp. 404-406
by Nie Qingbin (https://www.computer.org/csdl/search/default?type=author&givenName=Nie&surname=Qingbin), Pinghua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Pinghua&surname=Li)

A Subdirect Product and Several Sufficient Conditions about a Strong Semilattice of Inverse Semigroups (/csdl/proceedings-article/itme/2016/3906a407/12OmNzUPpry) pp. 407-409
by Zhaoying Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Zhaoying&surname=Chen)

A Survey for Information Technology Based Roll Call Methods in University Education (/csdl/proceedings-article/itme/2016/3906a410/12OmNxH9X7c) pp. 410-413
by Tigang Jiang (https://www.computer.org/csdl/search/default?type=author&givenName=Tigang&surname=Jiang), Xiaodan Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaodan&surname=Zheng)

An Analogous Teaching Method for Computer Organization Course Design (/csdl/proceedings-article/itme/2016/3906a414/12OmNxzuMF2) pp. 414-418
by Zhigang Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Zhigang&surname=Gao), Huijuan Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Huijuan&surname=Lu), Hongyi Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Hongyi&surname=Guo), Yanjun Luo (https://www.computer.org/csdl/search/default?type=author&givenName=Yanjun&surname=Luo), Yunfeng Xie (https://www.computer.org/csdl/search/default?type=author&givenName=Yunfeng&surname=Xie), Qiming Fang (https://www.computer.org/csdl/search/default?type=author&givenName=Qiming&surname=Fang)

An Improved Denoising Algorithm of Feather and Down Image Based on KSVD (/csdl/proceedings-article/itme/2016/3906a419/12OmNvTTc9N) pp. 419-423
by Xiaofei Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaofei&surname=Yan), Bin Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Yang), Wei Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Wei&surname=Zhang), Caixia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Caixia&surname=Liu), Yanqiu Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yanqiu&surname=Wang)

Application of a 3D Haptic Virtual Reality Simulation System for Dental Crown Preparation Training (/csdl/proceedings-article/itme/2016/3906a424/12OmNrAMEPv) pp. 424-427
by Fu Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Fu&surname=Wang), Ying Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Ying&surname=Liu), Min Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Min&surname=Tian), Yumei Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yumei&surname=Zhang), Shaofeng Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Shaofeng&surname=Zhang), Jihua Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Jihua&surname=Chen)

Application of Computer Statistics in the Research on the Relationship between Professional Commitment and Learning Efficacy of Preschool Education Students (/csdl/proceedings-article/itme/2016/3906a428/12OmNy9Prgn) pp. 428-431
by Chen Shuiping (https://www.computer.org/csdl/search/default?type=author&givenName=Chen&surname=Shuiping), He Zhifang (https://www.computer.org/csdl/search/default?type=author&givenName=He&surname=Zhifang)

Application of Educational Information Technology in the “Fundamentals of Computer” Curriculum Reform (/csdl/proceedings-article/itme/2016/3906a432/12OmNzaQowi) pp. 432-435
by Zhou Gang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhou&surname=Gang), Guo Fuliang (https://www.computer.org/csdl/search/default?type=author&givenName=Guo&surname=Fuliang)

Application of the SPOC Teaching Mode in Courses of Computer Network in the Post-MOOC Period (/csdl/proceedings-article/itme/2016/3906a436/12OmNBa2iC7) pp. 436-440
by Li-Hui Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Li-Hui&surname=Zhang), Fei Li (https://www.computer.org/csdl/search/default?type=author&givenName=Fei&surname=Li)

Application Research of the Microlecture Teaching Model in the Higher Vocational Education and Teaching Reform (/csdl/proceedings-article/itme/2016/3906a441/12OmNzwZ6on) pp. 441-444
by Xiaohong Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaohong&surname=Liu), Kaiming Li (https://www.computer.org/csdl/search/default?type=author&givenName=Kaiming&surname=Li)

Applying Docker Swarm Cluster into Software Defined Internet of Things (/csdl/proceedings-article/itme/2016/3906a445/12OmNxzuMOa) pp. 445-449
by Yuan Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Yuan&surname=Gao), Haoxuan Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Haoxuan&surname=Wang), Xin Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Xin&surname=Huang)

Automatic Measurement and Analysis of Antenna Radiation Characteristics for Wireless Sensor Networks (/csdl/proceedings-article/itme/2016/3906a450/12OmNwp74Mg) pp. 450-454
by Chunmei Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Chunmei&surname=Wang), Yong Fu (https://www.computer.org/csdl/search/default?type=author&givenName=Yong&surname=Fu), Liang Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Liang&surname=Zhu)

CloudPss-An Energy Internet Modeling and Simulation Tool in the Cloud (/csdl/proceedings-article/itme/2016/3906a455/12OmNAolGXw) pp. 455-458
by Guodong Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Guodong&surname=Zhang), Haitao Pu (https://www.computer.org/csdl/search/default?type=author&givenName=Haitao&surname=Pu)

Construction and Application of New Intelligent MOOC Teaching System Based on Deep Learning Neural Network in Remote Sensing Course (/csdl/proceedings-article/itme/2016/3906a459/12OmNyk3005) pp. 459-462

by Jian-Min Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jian-Min&surname=Liu), Xiang Yu (https://www.computer.org/csdl/search/default?type=author&givenName=Xiang&surname=Yu), Min-Hua Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Min-Hua&surname=Yang)

Construction of a System of Experiment Assessment of Medical Laboratory Technologies (/csdl/proceedings-article/itme/2016/3906a463/12OmNrJiCXJ) pp. 463-465
by Yundong Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Yundong&surname=Zhao), Limei Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Limei&surname=Liu), Mingcheng Li (https://www.computer.org/csdl/search/default?type=author&givenName=Mingcheng&surname=Li), Ailin Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Ailin&surname=Wang), Liyuan Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Liyuan&surname=Sun)

Construction of Open Teaching Platform Based on Cloud Computing for Computer Education (/csdl/proceedings-article/itme/2016/3906a466/12OmNqIhFNV) pp. 466-469
by Huijuan Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Huijuan&surname=Lu), Ke Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Ke&surname=Yan), Zhigang Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Zhigang&surname=Gao), Yanqiu Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Yanqiu&surname=Liu), Boyong Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Boyong&surname=Gao)

Cultivation of Students' Learning Strategies in Network Environment (/csdl/proceedings-article/itme/2016/3906a470/12OmNroijf1) pp. 470-472
by Zhang Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Lin), Jin Xueke (https://www.computer.org/csdl/search/default?type=author&givenName=Jin&surname=Xueke)

Design and Development of Digital and Innovative Anatomy Museum (/csdl/proceedings-article/itme/2016/3906a473/12OmNB8kHXg) pp. 473-477
by Qi Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Qi&surname=Zhang), Dan Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Dan&surname=Chen), Jian-Guang Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Jian-Guang&surname=Hu), Ai-Hua Pan (https://www.computer.org/csdl/search/default?type=author&givenName=Ai-Hua&surname=Pan)

Design and Development of Experiment for Intelligent Single-Slit Diffraction (/csdl/proceedings-article/itme/2016/3906a478/12OmNCga1NO) pp. 478-481
by Yan-Rong Tong (https://www.computer.org/csdl/search/default?type=author&givenName=Yan-Rong&surname=Tong), Fang Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Fang&surname=Zhao), Gui-Lei Li (https://www.computer.org/csdl/search/default?type=author&givenName=Gui-Lei&surname=Li), Meng Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Meng&surname=Zhang)

Design and Development of SCORM-Based Mobile Learning System (/csdl/proceedings-article/itme/2016/3906a482/12OmNzh5z5b) pp. 482-485
by Yu Wei (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Wei), Kuang Rongrong (https://www.computer.org/csdl/search/default?type=author&givenName=Kuang&surname=Rongrong), Xing Ruonan (https://www.computer.org/csdl/search/default?type=author&givenName=Xing&surname=Ruonan)

Design and Implementation of College Science and Technology Innovation Contest Management System Based on NET Platform (/csdl/proceedings-article/itme/2016/3906a486/12OmNz5apEw) pp. 486-489
by Yuan Jiugen (https://www.computer.org/csdl/search/default?type=author&givenName=Yuan&surname=Jiugen), Xing Ruonan (https://www.computer.org/csdl/search/default?type=author&givenName=Xing&surname=Ruonan)

Design and Implementation of Efficient User Interface in a Synchronous E-Learning System (/csdl/proceedings-article/itme/2016/3906a490/12OmNxGALfD) pp. 490-494
by Mingrui Luo (https://www.computer.org/csdl/search/default?type=author&givenName=Mingrui&surname=Luo), Shuhai Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Shuhai&surname=Zheng), Yalei Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yalei&surname=Zhang)

Design and Implementation of Mobile Terminal Voice Communication System (/csdl/proceedings-article/itme/2016/3906a495/12OmNvxKtZ3) pp. 495-498
by Yang Shulin (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Shulin), Hu Jieping (https://www.computer.org/csdl/search/default?type=author&givenName=Hu&surname=Jieping), Yang Nan (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Nan), Wang Guyang (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Guyang)

Design and Implementation of Traditional Chinese Medicine Education Visualization Platform Based on Virtual Reality Technology (/csdl/proceedings-article/itme/2016/3906a499/12OmNxw5Bw8) pp. 499-502
by Youliang Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Youliang&surname=Huang), Xing Zhai (https://www.computer.org/csdl/search/default?type=author&givenName=Xing&surname=Zhai), Sajid Ali (https://www.computer.org/csdl/search/default?type=author&givenName=Sajid&surname=Ali), Renquan Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Renquan&surname=Liu)

Design and Practice of "Data Structure" Teaching Class Based on BOPPPS Model (/csdl/proceedings-article/itme/2016/3906a503/12OmNzmLxRx) pp. 503-506
by Qing Li (https://www.computer.org/csdl/search/default?type=author&givenName=Qing&surname=Li), Weiwei Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Weiwei&surname=Chen), Lei Shi (https://www.computer.org/csdl/search/default?type=author&givenName=Lei&surname=Shi)

Design of a GPS-Based Mobile Application for Campus Social Interaction (/csdl/proceedings-article/itme/2016/3906a507/12OmNxbW4Qd) pp. 507-512
by Xian Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Xian&surname=Zhu)

Design of Adaptive Electrician Learning System Based on User Model (/csdl/proceedings-article/itme/2016/3906a513/12OmNyoSbb0) pp. 513-516
by Yan Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Zhu), Song Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Song&surname=Liu), Han Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Han&surname=Guo), Shuaijun Jin (https://www.computer.org/csdl/search/default?type=author&givenName=Shuaijun&surname=Jin)

Design of HR Online Work Service Hall Based on Workflow Engine (/csdl/proceedings-article/itme/2016/3906a517/12OmNAndijl) pp. 517-520
by Xie Suping (https://www.computer.org/csdl/search/default?type=author&givenName=Xie&surname=Suping), Chen Huaichu (https://www.computer.org/csdl/search/default?type=author&givenName=Chen&surname=Huaichu), Yin Shixue (https://www.computer.org/csdl/search/default?type=author&givenName=Yin&surname=Shixue), Xiao Ping (https://www.computer.org/csdl/search/default?type=author&givenName=Xiao&surname=Ping)

Design of Workflow Cloud Platform and Its Application in Business Systems (/csdl/proceedings-article/itme/2016/3906a521/12OmNqGiu2v) pp. 521-525
by Xie Suping (https://www.computer.org/csdl/search/default?type=author&givenName=Xie&surname=Suping), Chen Huaichu (https://www.computer.org/csdl/search/default?type=author&givenName=Chen&surname=Huaichu), Di Xianghua (https://www.computer.org/csdl/search/default?type=author&givenName=Di&surname=Xianghua), Yin Shixue (https://www.computer.org/csdl/search/default?type=author&givenName=Yin&surname=Shixue)

Discussion on Static calculation and Regulatory Process of a Combination Mooring System (/csdl/proceedings-article/itme/2016/3906a526/12OmNAS9ztG) pp. 526-529
by Zhaoying Dang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhaoying&surname=Dang), Yan Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Liu), Ting Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Ting&surname=Wu), Jinchao Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Jinchao&surname=Zhao)

Discussion on the Teaching Method of Network Security Course with Students as the Center (/csdl/proceedings-article/itme/2016/3906a530/12OmNBqdrab) pp. 530-533
by Xiaoming Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoming&surname=Hu), Wenrong Jiang (https://www.computer.org/csdl/search/default?type=author&givenName=Wenrong&surname=Jiang), Chuang Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Chuang&surname=Ma), Xiumei Wu

(https://www.computer.org/csdl/search/default?type=author&givenName=Xiumei&surname=Wu), Taozhi Si (https://www.computer.org/csdl/search/default?type=author&givenName=Taozhi&surname=Si), Jian Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Jian&surname=Wang)

Evidence Theory Fusion Method Based on Variable Granulation Rough Set (/csdl/proceedings-article/itme/2016/3906a534/12OmNB8TUgX) pp. 534-538
by Peiyu Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Peiyu&surname=Liu), Xiao Pan (https://www.computer.org/csdl/search/default?type=author&givenName=Xiao&surname=Pan), Min Ren (https://www.computer.org/csdl/search/default?type=author&givenName=Min&surname=Ren), Lin Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Lin&surname=Lv)

Experimental Case Design of “Mobile Device Programming” for Specialty of Information Management and Information System (/csdl/proceedings-article/itme/2016/3906a539/12OmNC17hVR) pp. 539-543
by Yang Xiao (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Xiao)

Exploration and Construction of Practice Teaching System in Local Engineering Colleges (/csdl/proceedings-article/itme/2016/3906a544/12OmNzSQdoS) pp. 544-548
by Yunming Du (https://www.computer.org/csdl/search/default?type=author&givenName=Yunming&surname=Du), Lina Gai (https://www.computer.org/csdl/search/default?type=author&givenName=Lina&surname=Gai), Qingjun Shi (https://www.computer.org/csdl/search/default?type=author&givenName=Qingjun&surname=Shi), Jing Li (https://www.computer.org/csdl/search/default?type=author&givenName=Jing&surname=Li)

Explore Operational Mechanism and Management for Open Laboratory in High Education Based on Information Technology (/csdl/proceedings-article/itme/2016/3906a549/12OmNvmowUd) pp. 549-551
by Zhang Lei (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Lei), Wang Xinghua (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Xinghua), Lu Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Lu&surname=Lu)

Face Alignment Based on Incremental Learning for Bayonet Surveillance (/csdl/proceedings-article/itme/2016/3906a552/12OmNs59K39) pp. 552-556
by Huifang Feng (https://www.computer.org/csdl/search/default?type=author&givenName=Huifang&surname=Feng), Guorong Cai (https://www.computer.org/csdl/search/default?type=author&givenName=Guorong&surname=Cai), Shuili Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Shuili&surname=Chen), Yundong Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Yundong&surname=Wu), Dongxiao Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Dongxiao&surname=Zhang)

Fine-Grained Sentiment Analysis Based on Sentiment Disambiguation (/csdl/proceedings-article/itme/2016/3906a557/12OmNvAiSl5) pp. 557-561
by Xiao-Hong Cai (https://www.computer.org/csdl/search/default?type=author&givenName=Xiao-Hong&surname=Cai), Pei-Yu Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Pei-Yu&surname=Liu), Zhi-Hao Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi-Hao&surname=Wang), Zhen-Fang Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Zhen-Fang&surname=Zhu)

HOGG: Gabor and HOG-Based Human Detection (/csdl/proceedings-article/itme/2016/3906a562/12OmNyTwRgy) pp. 562-566
by Fan Guojuan (https://www.computer.org/csdl/search/default?type=author&givenName=Fan&surname=Guojuan), Li Bo (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Bo), Mu Wanquan (https://www.computer.org/csdl/search/default?type=author&givenName=Mu&surname=Wanquan), Liu Xuqing (https://www.computer.org/csdl/search/default?type=author&givenName=Liu&surname=Xuqing)

Improved Ensemble Classification Method of Thyroid Disease Based on Random Forest (/csdl/proceedings-article/itme/2016/3906a567/12OmNwB2dVi) pp. 567-571
by Qiao Pan (https://www.computer.org/csdl/search/default?type=author&givenName=Qiao&surname=Pan), Yuanyuan Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yuanyuan&surname=Zhang), Min Zuo (https://www.computer.org/csdl/search/default?type=author&givenName=Min&surname=Zuo), Lan Xiang (https://www.computer.org/csdl/search/default?type=author&givenName=Lan&surname=Xiang), Dehua Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Dehua&surname=Chen)

Improved Feature Selection Algorithm Based on Maximal Nearest-Neighbor Rough Approximation (/csdl/proceedings-article/itme/2016/3906a572/12OmNyuPL3c) pp. 572-575
by Lin Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Lin&surname=Lv), Yongqing Wei (https://www.computer.org/csdl/search/default?type=author&givenName=Yongqing&surname=Wei), Min Ren (https://www.computer.org/csdl/search/default?type=author&givenName=Min&surname=Ren), Jing Yi (https://www.computer.org/csdl/search/default?type=author&givenName=Jing&surname=Yi)

Improving Efficiency of Authenticated OpenFlow Handshake Using Coprocessors (/csdl/proceedings-article/itme/2016/3906a576/12OmNBezSFL) pp. 576-580
by Andi Xu (https://www.computer.org/csdl/search/default?type=author&givenName=Andi&surname=Xu), Mi Li (https://www.computer.org/csdl/search/default?type=author&givenName=Mi&surname=Li), Jiaren Cai (https://www.computer.org/csdl/search/default?type=author&givenName=Jiaren&surname=Cai), Nian Xue (https://www.computer.org/csdl/search/default?type=author&givenName=Nian&surname=Xue), Jie Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Jie&surname=Zhang), Dawei Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Dawei&surname=Liu), Paul Craig (https://www.computer.org/csdl/search/default?type=author&givenName=Paul&surname=Craig), Xin Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Xin&surname=Huang)

Knowledge Building Community in Blended Learning Environments (/csdl/proceedings-article/itme/2016/3906a581/12OmNqyDjqv) pp. 581-583
by Tong Hui (https://www.computer.org/csdl/search/default?type=author&givenName=Tong&surname=Hui), Yang Yan-Jun (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Yan-Jun)

Management of University Endowment Fund Archives under the Background of Big Data (/csdl/proceedings-article/itme/2016/3906a584/12OmNwwMf1F) pp. 584-586
by Sui Jie (https://www.computer.org/csdl/search/default?type=author&givenName=Sui&surname=Jie), Dong Linqian (https://www.computer.org/csdl/search/default?type=author&givenName=Dong&surname=Linqian), Sun Jing (https://www.computer.org/csdl/search/default?type=author&givenName=Sun&surname=Jing), Hu Juan (https://www.computer.org/csdl/search/default?type=author&givenName=Hu&surname=Juan)

Maximum Gaussian Mixture Model for Classification (/csdl/proceedings-article/itme/2016/3906a587/12OmNwBT1mL) pp. 587-591
by Jiehao Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Jiehao&surname=Zhang), Xianbin Hong (https://www.computer.org/csdl/search/default?type=author&givenName=Xianbin&surname=Hong), Sheng-Uei Guan (https://www.computer.org/csdl/search/default?type=author&givenName=Sheng-Uei&surname=Guan), Xuan Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Xuan&surname=Zhao), Huang Xin (https://www.computer.org/csdl/search/default?type=author&givenName=Huang&surname=Xin), Nian Xue (https://www.computer.org/csdl/search/default?type=author&givenName=Nian&surname=Xue)

Methods and Practice of Training Schemes of Communication Engineering (/csdl/proceedings-article/itme/2016/3906a592/12OmNzfXauk) pp. 592-596
by Yang Feng (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Feng), Bai Rongxin (https://www.computer.org/csdl/search/default?type=author&givenName=Bai&surname=Rongxin), Sun Shuxian (https://www.computer.org/csdl/search/default?type=author&givenName=Sun&surname=Shuxian)

Mobile Leaning Knowledge Architecture Construction and Resource Integration in Information Management and Information System (/csdl/proceedings-article/itme/2016/3906a597/12OmNzXFowt) pp. 597-600
by Jinjiao Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Jinjiao&surname=Lin)

Model Checking of IoT System in Microgrid (/csdl/proceedings-article/itme/2016/3906a601/12OmNroijk3) pp. 601-605
by Lulu Liang (https://www.computer.org/csdl/search/default?type=author&givenName=Lulu&surname=Liang), Kai Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Kai&surname=Zheng), Zilong Wei (https://www.computer.org/csdl/search/default?type=author&givenName=Zilong&surname=Wei), Yanmei Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yanmei&surname=Wang), Sihan Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Sihan&surname=Wu), Xin Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Xin&surname=Huang)

Model Checking PV Energy System with Remote Reprogramming Function (/csdl/proceedings-article/itme/2016/3906a606/12OmNBa2iG0) pp. 606-610

by Sihan Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Sihan&surname=Wu), Kai Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Kai&surname=Zheng), Xin Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Xin&surname=Huang)

Model Checking Quantum Key Distribution Protocols (/csdl/proceedings-article/itme/2016/3906a611/12OmNxcdFXl) pp. 611-615
by Baichuan Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Baichuan&surname=Huang), Yan Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Yan&surname=Huang), Jiaming Kong (https://www.computer.org/csdl/search/default?type=author&givenName=Jiaming&surname=Kong), Xin Huang (https://www.computer.org/csdl/search/default?type=author&givenName=Xin&surname=Huang)

Mooc: A New Mode of Integrating and Sharing Knowledge Resources in Colleges and Universities (/csdl/proceedings-article/itme/2016/3906a616/12OmNzlD97s) pp. 616-620
by Liu Xiao Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Liu Xiao&surname=Yang), Xu Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Xu&surname=Yang), Zhao Zhijun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhao&surname=Zhijun)

Multi-combined Features Text Mining of TCM Medical Cases with CRF (/csdl/proceedings-article/itme/2016/3906a621/12OmNvq5jzQ) pp. 621-626
by Qi-yu Jiang (https://www.computer.org/csdl/search/default?type=author&givenName=Qi-yu&surname=Jiang), Hong-yi Li (https://www.computer.org/csdl/search/default?type=author&givenName=Hong-yi&surname=Li), Jia-fen Liang (https://www.computer.org/csdl/search/default?type=author&givenName=Jia-fen&surname=Liang), Qing-xiang Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Qing-xiang&surname=Wang), Xiao-mu Luo (https://www.computer.org/csdl/search/default?type=author&givenName=Xiao-mu&surname=Luo), Hui-ling Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Hui-ling&surname=Liu)

Ontology Reduction Based on Axiomatic Cognitive Model for Ontology Learning (/csdl/proceedings-article/itme/2016/3906a627/12OmNzxyiFJ) pp. 627-630
by Dehai Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Dehai&surname=Zhang), Naiyao Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Naiyao&surname=Wang), Zhonghao Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhonghao&surname=Yang), Bin Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Wang), Hang Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Hang&surname=Zhao)

Optimization and Effect of Power Parameters of Low-Frequency Superposition (/csdl/proceedings-article/itme/2016/3906a631/12OmNywfKF0) pp. 631-634
by Wei Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Wei&surname=Wang), Na Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Na&surname=Zhang), Wen Su (https://www.computer.org/csdl/search/default?type=author&givenName=Wen&surname=Su), Tianzheng Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Tianzheng&surname=Wang), Hua Yu (https://www.computer.org/csdl/search/default?type=author&givenName=Hua&surname=Yu), Xingting Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Xingting&surname=Liu)

Optimizing Correlation Measure Based Exploratory Analysis (/csdl/proceedings-article/itme/2016/3906a635/12OmNAnditG) pp. 635-639
by Shijia Hao (https://www.computer.org/csdl/search/default?type=author&givenName=Shijia&surname=Hao), Hui Li (https://www.computer.org/csdl/search/default?type=author&givenName=Hui&surname=Li), Xiaoping Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaoping&surname=Zhang), Mei Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Mei&surname=Chen), Ming Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Ming&surname=Zhu)

Optimizing Distributed Join for Array Database System (/csdl/proceedings-article/itme/2016/3906a640/12OmNCcKQKC) pp. 640-644
by Jing Li (https://www.computer.org/csdl/search/default?type=author&givenName=Jing&surname=Li), Hui Li (https://www.computer.org/csdl/search/default?type=author&givenName=Hui&surname=Li), Mei Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Mei&surname=Chen), Ming Zhu (https://www.computer.org/csdl/search/default?type=author&givenName=Ming&surname=Zhu)

Page File-Oriented Web Application Design (/csdl/proceedings-article/itme/2016/3906a645/12OmNzcPAva)

by Jian Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Jian&surname=Zhang), Huanmei Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Huanmei&surname=Wu) pp. 645-649

Parallel Registration of 3D Ear Point Clouds (/csdl/proceedings-article/itme/2016/3906a650/12OmNAtaRVZ)
by Xiaopeng Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaopeng&surname=Sun), Weiwei Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Weiwei&surname=Zhao) pp. 650-653

Predictors for Clinical Pregnancy in First ART Cycles in Western China (/csdl/proceedings-article/itme/2016/3906a654/12OmNqBbHJO)
by Zhao-Hua Ji (https://www.computer.org/csdl/search/default?type=author&givenName=Zhao-Hua&surname=Ji), Jie Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Jie&surname=Gao), Min Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Min&surname=Tian), Xiao-Hong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiao-Hong&surname=Wang), Zhong-Jun Shao (https://www.computer.org/csdl/search/default?type=author&givenName=Zhong-Jun&surname=Shao) pp. 654-656

Primary Exploration of Teaching Reform of Modern and Contemporary Chinese Literature (/csdl/proceedings-article/itme/2016/3906a657/12OmNynsbyj)
by Xuan Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Xuan&surname=Yang) pp. 657-661

Priority-Oriented Cloud Video Delivery Networks (/csdl/proceedings-article/itme/2016/3906a662/12OmNB9t6xi)
by Tianqi Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Tianqi&surname=Zhao), Dianjie Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Dianjie&surname=Lu), Xiangwei Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Xiangwei&surname=Zheng), Hong Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Hong&surname=Liu) pp. 662-667

Progressive Visual Secret Sharing for General Access Structure with Multiple Decryptions (/csdl/proceedings-article/itme/2016/3906a668/12OmNASILRt)
by Xuehu Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Xuehu&surname=Yan), Yuliang Lu (https://www.computer.org/csdl/search/default?type=author&givenName=Yuliang&surname=Lu), Lintao Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Lintao&surname=Liu), Song Wan (https://www.computer.org/csdl/search/default?type=author&givenName=Song&surname=Wan), Wanmeng Ding (https://www.computer.org/csdl/search/default?type=author&givenName=Wanmeng&surname=Ding), Hanlin Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Hanlin&surname=Liu) pp. 668-673

Prospects of Applying Pervasive Computing to the Construction of Network Interactive Modality in Foreign Language Classroom Discourse (/csdl/proceedings-article/itme/2016/3906a674/12OmNzSh16N)
by Yue-Li Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yue-Li&surname=Wang) pp. 674-677

Research of Vehicle Video Analysis System Based on SVM (/csdl/proceedings-article/itme/2016/3906a678/12OmNxETa54)
by Yanqiu Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Yanqiu&surname=Wang), Wei Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Wei&surname=Zhang), Bin Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Bin&surname=Yang), Caixia Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Caixia&surname=Liu), Xiaofei Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaofei&surname=Yan) pp. 678-680

Research on Application of BP Neural Network Based on Genetic Algorithm in Multi-objective Optimization (/csdl/proceedings-article/itme/2016/3906a681/12OmNrJAdY3)
by Zhipeng Hu (https://www.computer.org/csdl/search/default?type=author&givenName=Zhipeng&surname=Hu) pp. 681-684

Research on Cross Platform Digital Publishing Technology Based on HTML5 (/csdl/proceedings-article/itme/2016/3906a685/12OmNC1oT4u)
by Xuelei Ren (https://www.computer.org/csdl/search/default?type=author&givenName=Xuelei&surname=Ren), Shulin Yang (https://www.computer.org/csdl/search/default?type=author&givenName=Shulin&surname=Yang), Guyang Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Guyang&surname=Wang), Liping Ren (https://www.computer.org/csdl/search/default?type=author&givenName=Liping&surname=Ren) pp. 685-688

Research on Fuzzy Comprehensive Evaluation Model of English Listening Learning Websites (/csdl/proceedings-article/itme/2016/3906a689/12OmNqGRGkA) pp. 689-694
by Zhihui Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Liu), Jiaming Zhong (https://www.computer.org/csdl/search/default?type=author&givenName=Jiaming&surname=Zhong)

Research on Influencing Factors of Team Interactive Memory System (/csdl/proceedings-article/itme/2016/3906a695/12OmNrJ11GP) pp. 695-700
by Liu Rong (https://www.computer.org/csdl/search/default?type=author&givenName=Liu&surname=Rong), Yang Xiaodong (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Xiaodong), Tao Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Tao&surname=Yan)

Research on Innovation and Entrepreneurship Education for College Students of Electronic and Information Majors (/csdl/proceedings-article/itme/2016/3906a701/12OmNvjyy3j) pp. 701-704
by Yang Haigen (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Haigen), Fu Xiao (https://www.computer.org/csdl/search/default?type=author&givenName=Fu&surname=Xiao)

Research on Large-Sized Class Teaching of Sensing Technology Course (/csdl/proceedings-article/itme/2016/3906a705/12OmNzlD9hZ) pp. 705-709
by Guoping You (https://www.computer.org/csdl/search/default?type=author&givenName=Guoping&surname=You), Wanghui Zeng (https://www.computer.org/csdl/search/default?type=author&givenName=Wanghui&surname=Zeng)

Research on Moral Personality Health Education of Medical Students (/csdl/proceedings-article/itme/2016/3906a710/12OmNwoPtk7) pp. 710-713
by Zhifang He (https://www.computer.org/csdl/search/default?type=author&givenName=Zhifang&surname=He), Mengchun Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Mengchun&surname=Zhang)

Research on the Application System of Smart Campus in the Context of Smart City (/csdl/proceedings-article/itme/2016/3906a714/12OmNBWzHPU) pp. 714-718
by Shouyan Du (https://www.computer.org/csdl/search/default?type=author&givenName=Shouyan&surname=Du), Fansheng Meng (https://www.computer.org/csdl/search/default?type=author&givenName=Fansheng&surname=Meng), Baozhong Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Baozhong&surname=Gao)

Research on the Cognitive Model Artificial Fish Based on Virtual Marine Environment (/csdl/proceedings-article/itme/2016/3906a719/12OmNzmclG7) pp. 719-723
by Ying Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Ying&surname=Liu)

Research on the Implement Scheme of Reconfigurable Function Navigation Based on JAXB (/csdl/proceedings-article/itme/2016/3906a724/12OmNBSSVhW) pp. 724-727
by Yang Shulin (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Shulin), Yang Nan (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Nan), Hu Jieping (https://www.computer.org/csdl/search/default?type=author&givenName=Hu&surname=Jieping), Ren Xuelei (https://www.computer.org/csdl/search/default?type=author&givenName=Ren&surname=Xuelei)

Research on the Influencing Factors and the Promotion Measures of College Students' Information Literacy (/csdl/proceedings-article/itme/2016/3906a728/12OmNCgJe6b) pp. 728-732
by Xia Ouyang (https://www.computer.org/csdl/search/default?type=author&givenName=Xia&surname=Ouyang), Yuan Xiao (https://www.computer.org/csdl/search/default?type=author&givenName=Yuan&surname=Xiao), Jiaming Zhong (https://www.computer.org/csdl/search/default?type=author&givenName=Jiaming&surname=Zhong)

Research on the SPOC Literature Information Resources of Jianghan University Library (/csdl/proceedings-article/itme/2016/3906a733/12OmNrnJ6KP) pp. 733-736
by Shi Ruoyao (https://www.computer.org/csdl/search/default?type=author&givenName=Shi&surname=Ruoyao)

SDSEP: A Network Security Education Platform Based on Software-Defined Networking Technology (/csdl/proceedings-article/itme/2016/3906a737/12OmNwAt1E6) pp. 737-740

by Jun Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Jun&surname=Wu), Shen Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Shen&surname=Wang), Jianhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Jianhua&surname=Li), Yang Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Yang&surname=Wu)

Security Issue and Countermeasures of Campus Network (/csdl/proceedings-article/itme/2016/3906a741/12OmNwIYZCg) pp. 741-743
by Zhang Lin (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Lin), Wang Ning (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Ning)

Service Innovations of University Libraries in the MOOC Era (/csdl/proceedings-article/itme/2016/3906a744/12OmNqBtj4C) pp. 744-747
by Lu Yanxiang (https://www.computer.org/csdl/search/default?type=author&givenName=Lu&surname=Yanxiang)

Simulated CCU based on CRH380B Braking System (/csdl/proceedings-article/itme/2016/3906a748/12OmNvy2599) pp. 748-752
by Li Bo (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Bo), Jiang DongMing (https://www.computer.org/csdl/search/default?type=author&givenName=Jiang&surname=DongMing)

Simulation Research of the Influence of the Users' Download Behavior in Social Applications (/csdl/proceedings-article/itme/2016/3906a753/12OmNroij58) pp. 753-758
by Tian Shen (https://www.computer.org/csdl/search/default?type=author&givenName=Tian&surname=Shen), Xi Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Xi&surname=Chen)

Some New Statistics on Determine Network Models (/csdl/proceedings-article/itme/2016/3906a759/12OmNvqmUBk) pp. 759-762
by Jing Su (https://www.computer.org/csdl/search/default?type=author&givenName=Jing&surname=Su), Fei Ma (https://www.computer.org/csdl/search/default?type=author&givenName=Fei&surname=Ma), Bing Yao (https://www.computer.org/csdl/search/default?type=author&givenName=Bing&surname=Yao), Ming Yao (https://www.computer.org/csdl/search/default?type=author&givenName=Ming&surname=Yao)

Study on Internet Information Technology in English Teaching in Higher Vocational College (/csdl/proceedings-article/itme/2016/3906a763/12OmNyrIaC9) pp. 763-766
by Xiaofeng Ji (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaofeng&surname=Ji)

Study on the Construction of Wisdom Campus Based on University Resource Planning (URP) (/csdl/proceedings-article/itme/2016/3906a767/12OmNyqRnIx) pp. 767-772
by Xia Ouyang (https://www.computer.org/csdl/search/default?type=author&givenName=Xia&surname=Ouyang), Jiaming Zhong (https://www.computer.org/csdl/search/default?type=author&givenName=Jiaming&surname=Zhong), Jingmaiye Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Jingmaiye&surname=Liu)

Study on the Strategies of Improving Vocational Education Teachers' Ability Based on the "Internet+Education" Background (/csdl/proceedings-article/itme/2016/3906a773/12OmNwKYbu0) pp. 773-776
by Guiying Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Guiying&surname=Guo), Baishuang Qiu (https://www.computer.org/csdl/search/default?type=author&givenName=Baishuang&surname=Qiu), Li Li (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Li)

Study on VPN Solution Based on Multi-campus Network (/csdl/proceedings-article/itme/2016/3906a777/12OmNvnOwyf) pp. 777-780
by Shan Jing (https://www.computer.org/csdl/search/default?type=author&givenName=Shan&surname=Jing), Qi Qi (https://www.computer.org/csdl/search/default?type=author&givenName=Qi&surname=Qi), Runyuan Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Runyuan&surname=Sun), Qun Li (https://www.computer.org/csdl/search/default?type=author&givenName=Qun&surname=Li)

Teaching Research Driven by Specialty Directions for Postgraduate Course "Applied Mathematics" in Computer Science (/csdl/proceedings-article/itme/2016/3906a781/12OmNvT2oOa) pp. 781-785
by Shuai Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Shuai&surname=Liu), Renyong Guo (https://www.computer.org/csdl/search/default?type=author&givenName=Renyong&surname=Guo), Tieying Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Tieying&surname=Liu), Juan Wang

(https://www.computer.org/csdl/search/default?type=author&givenName=Juan&surname=Wang), Qiang Li (https://www.computer.org/csdl/search/default?type=author&givenName=Qiang&surname=Li)

Technique Improvement and Experience Sharing of Cannulation of the Mouse Submandibular Salivary Gland via the Wharton's Duct (/csdl/proceedings-article/itme/2016/3906a786/12OmNxWuisw) pp. 786-789
by Yanhua Li (https://www.computer.org/csdl/search/default?type=author&givenName=Yanhua&surname=Li), Zhihui Sun (https://www.computer.org/csdl/search/default?type=author&givenName=Zhihui&surname=Sun), Peisong Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Peisong&surname=Wang), Zhi Lv (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi&surname=Lv), Guang Chen (https://www.computer.org/csdl/search/default?type=author&givenName=Guang&surname=Chen)

The Application of Case Teaching Combined with Task-Driven Teaching Method in Obstetric Nursing Teaching (/csdl/proceedings-article/itme/2016/3906a790/12OmNx7G61b) pp. 790-794
by Lu Caixia (https://www.computer.org/csdl/search/default?type=author&givenName=Lu&surname=Caixia), Ge Yangyang (https://www.computer.org/csdl/search/default?type=author&givenName=Ge&surname=Yangyang), Shen Wangqin (https://www.computer.org/csdl/search/default?type=author&givenName=Shen&surname=Wangqin), Song Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Song&surname=Yan)

The Application of Crisscross Optimization Algorithm to Dynamic Traffic Assignment Problem (/csdl/proceedings-article/itme/2016/3906a795/12OmNqAU6Al) pp. 795-799
by Jingying Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Jingying&surname=Wang), Jianhua Qu (https://www.computer.org/csdl/search/default?type=author&givenName=Jianhua&surname=Qu)

The Design and Implementation of Cloud Notes System Web-Based (/csdl/proceedings-article/itme/2016/3906a800/12OmNzQzqit) pp. 800-801
by Yucheng Song (https://www.computer.org/csdl/search/default?type=author&givenName=Yucheng&surname=Song), Xue Dong (https://www.computer.org/csdl/search/default?type=author&givenName=Xue&surname=Dong), Jinhuai Li (https://www.computer.org/csdl/search/default?type=author&givenName=Jinhuai&surname=Li)

The Existence of Q-Rotaing Periodic Solutions for Second Order Nonlinear Dynamical Systems (/csdl/proceedings-article/itme/2016/3906a802/12OmNzzfToy) pp. 802-805
by Bingyu Kou (https://www.computer.org/csdl/search/default?type=author&givenName=Bingyu&surname=Kou), Pu Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Pu&surname=Wang), Lei Mao (https://www.computer.org/csdl/search/default?type=author&givenName=Lei&surname=Mao), Xinghu Teng (https://www.computer.org/csdl/search/default?type=author&givenName=Xinghu&surname=Teng)

The Information Technology Behavioral Model Construction of Kindergarten Teacher Based on TAM and TTF (/csdl/proceedings-article/itme/2016/3906a806/12OmNvjQ92d) pp. 806-810
by Zhang Liqin (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Liqin), Wang Mengmeng (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Mengmeng)

The Practice of a New Teaching Mode in the Teaching of Pathology (/csdl/proceedings-article/itme/2016/3906a811/12OmNyr8Ycp) pp. 811-812
by Zhang Junhui (https://www.computer.org/csdl/search/default?type=author&givenName=Zhang&surname=Junhui), Lu Linlin (https://www.computer.org/csdl/search/default?type=author&givenName=Lu&surname=Linlin), Kong Suiying (https://www.computer.org/csdl/search/default?type=author&givenName=Kong&surname=Suiying), Wang Guangliang (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Guangliang), Li Ruiyu (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Ruiyu)

The Preliminary Exploration of the Application of MOOC in College Oral English Teaching (/csdl/proceedings-article/itme/2016/3906a813/12OmNCmpcOA) pp. 813-816
by Li Ruolan (https://www.computer.org/csdl/search/default?type=author&givenName=Li&surname=Ruolan)

The Research of the Service Recommendation Model Based on SLA (/csdl/proceedings-article/itme/2016/3906a817/12OmNqJZgwy) pp. 817-821
by Yong-Sheng Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yong-Sheng&surname=Zhang), Yue-Qin Fan (https://www.computer.org/csdl/search/default?type=author&givenName=Yue-Qin&surname=Fan), Neng-Neng Li

(https://www.computer.org/csdl/search/default?type=author&givenName=Neng-Neng&surname=Li), Yuan-Jiang Jia (https://www.computer.org/csdl/search/default?type=author&givenName=Yuan-Jiang&surname=Jia)

The Study of Implementation of Intensity Modulated Arc Therapy (IMAT) for Thoracic Esophageal Carcinoma on Conventional Linac (/csdl/proceedings-article/itme/2016/3906a822/12OmNx3ZjkC) pp. 822-825
by Ruohui Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Ruohui&surname=Zhang), Wenwen Bai (https://www.computer.org/csdl/search/default?type=author&givenName=Wenwen&surname=Bai), Yulan Gao (https://www.computer.org/csdl/search/default?type=author&givenName=Yulan&surname=Gao), Zifeng Chi (https://www.computer.org/csdl/search/default?type=author&givenName=Zifeng&surname=Chi)

The Study of Internet Plus Continuing Education Pattern Based on Micro-Learning (/csdl/proceedings-article/itme/2016/3906a826/12OmNvA1hmQ) pp. 826-829
by Jia-Hua Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Jia-Hua&surname=Zhang), Yong-Sheng Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Yong-Sheng&surname=Zhang), Yuan-Jiang Jia (https://www.computer.org/csdl/search/default?type=author&givenName=Yuan-Jiang&surname=Jia), Zhi-Kang Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhi-Kang&surname=Zhang)

Third Parties' Emotional and Behavioral Responses to Workplace Incivility: The Role of Belief and Power (/csdl/proceedings-article/itme/2016/3906a830/12OmNzC5TjJ) pp. 830-834
by Yu Yan (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Yan), Zhenjia Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Zhenjia&surname=Zhang)

Ultrasound Medical Image Denoising Based on Multi-direction Median Filter (/csdl/proceedings-article/itme/2016/3906a835/12OmNBRbku6) pp. 835-839
by Xiaofeng Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Xiaofeng&surname=Zhang), Shi Cheng (https://www.computer.org/csdl/search/default?type=author&givenName=Shi&surname=Cheng), Hong Ding (https://www.computer.org/csdl/search/default?type=author&givenName=Hong&surname=Ding), Huiqun Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Huiqun&surname=Wu), Nianmei Gong (https://www.computer.org/csdl/search/default?type=author&givenName=Nianmei&surname=Gong), Rengui Cheng (https://www.computer.org/csdl/search/default?type=author&givenName=Rengui&surname=Cheng)

Using Information Technology to Integrate Pathology Course and Information Literacy as Part of Instruction (/csdl/proceedings-article/itme/2016/3906a840/12OmNzVXNTg) pp. 840-843
by Tieshan Teng (https://www.computer.org/csdl/search/default?type=author&givenName=Tieshan&surname=Teng), Dongdong Wu (https://www.computer.org/csdl/search/default?type=author&givenName=Dongdong&surname=Wu), Guoying Wang (https://www.computer.org/csdl/search/default?type=author&givenName=Guoying&surname=Wang)

Variation Features of Soil Physical Property of Different Forest Land Types in Southern Slope of Qilian Mountain (/csdl/proceedings-article/itme/2016/3906a844/12OmNx2QUJl) pp. 844-852
by Qi Yiying (https://www.computer.org/csdl/search/default?type=author&givenName=Qi&surname=Yiying), Cao Guangchao (https://www.computer.org/csdl/search/default?type=author&givenName=Cao&surname=Guangchao), Cao Shengkui (https://www.computer.org/csdl/search/default?type=author&givenName=Cao&surname=Shengkui), Tang Zhongxia (https://www.computer.org/csdl/search/default?type=author&givenName=Tang&surname=Zhongxia), Yu Min (https://www.computer.org/csdl/search/default?type=author&givenName=Yu&surname=Min), Yuan Jie (https://www.computer.org/csdl/search/default?type=author&givenName=Yuan&surname=Jie), Jiang Gang (https://www.computer.org/csdl/search/default?type=author&givenName=Jiang&surname=Gang), Fu Jianxin (https://www.computer.org/csdl/search/default?type=author&givenName=Fu&surname=Jianxin), Wang Lun (https://www.computer.org/csdl/search/default?type=author&givenName=Wang&surname=Lun), Wei Xingtao (https://www.computer.org/csdl/search/default?type=author&givenName=Wei&surname=Xingtao)

Virtual Network Mapping Based on the Prediction of Support Vector Machine (/csdl/proceedings-article/itme/2016/3906a853/12OmNCfjet2) pp. 853-858
by Hui Zhang (https://www.computer.org/csdl/search/default?type=author&givenName=Hui&surname=Zhang), Xiangwei Zheng (https://www.computer.org/csdl/search/default?type=author&givenName=Xiangwei&surname=Zheng), Jie Tian (https://www.computer.org/csdl/search/default?type=author&givenName=Jie&surname=Tian)

Web3D Online Virtual Education System for Historical Battle Teaching (/csdl/proceedings-article/itme/2016/3906a859/12OmNCfjeAW) pp. 859-863

by Chang Liu (https://www.computer.org/csdl/search/default?type=author&givenName=Chang&surname=Liu), Jinyuan Jia (https://www.computer.org/csdl/search/default?type=author&givenName=Jinyuan&surname=Jia), Lei Zhao (https://www.computer.org/csdl/search/default?type=author&givenName=Lei&surname=Zhao)

Word Segmentation in Japanese for Construction of Scientific Japanese Corpus (/csdl/proceedings-article/itme/2016/3906a864/12OmNvonIOb) pp. 864-868

by Xia Li (https://www.computer.org/csdl/search/default?type=author&givenName=Xia&surname=Li), Fei He (https://www.computer.org/csdl/search/default?type=author&givenName=Fei&surname=He)

2016 8th International Conference on Information Technology in Medicine and Education

Mobile Leaning knowledge architecture Construction and resource Integration in Information Management and Information System

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***Abstract*—As a novel learning method, mobile learning will definitely become one of the most important part of learning based society. In this paper, we firstly analyze the disadvantage of the traditional in-class teaching pattern, aiming at Information Management System to research the mobile learning based knowledge architecture construction and related resource integration. According to the current curriculum architecture, we systematically review all of the subjective courses and relative knowledge modules, which contributes in organizing whole relationship among all of the modules, constructing the connections and improving the whole knowledge architecture. Our proposed plan would be beneficial in solving the problem existing in traditional in-class teaching pattern.**

Keywords- Mobile learning; Information Management and Information System; Knowledge Architecture

I. INTRODUCTION

According to the current curriculum architecture, we systematically review all of the subjective courses and relative knowledge modules, which contributes in organizing whole relationship among all of the modules, constructing the connections and improving the whole knowledge architecture. Our proposed plan would be beneficial in solving the problem existing in traditional in-class teaching pattern.

Along with the development of computer networking and wireless communication, intelligent mobile terminal has greatly changed our living style and working method [1-2]. Based on the mobile learning technique, learning with the mobile terminal has been paid attention by more and more people, and mobile learning has become one of the novel learning methods in learning based society. In 2000 [3], the report D-learning. E-learning. M-learning presented by remote learning expert Desmond•Keegan was introduced into China, after that mobile learning has been one of the most popular research hotspot in China. Mobile Learning means to implement the Anyone, Anytime, Anywhere, and Any style (4A) freely learning, which can supply the learners with time-oriented, place-oriented, and person-oriented learning environment, and dynamically construct the brand new learning and teaching pattern.

There have been various successful mobile learning cases, such as [4]the project of MOBILearn in EU, and[5] the mobile education project presented by Chinese Ministry of Education, which theoretically and practically explore the teaching design, content development, platform implementation, architecture evaluation and business pattern of mobile learning architecture, respectively. On the other hand, the hand hold augmented reality simulation game project by MIT, America and the butterfly observation live learning support system project by National Tsing Hua University, focus on specific content based virtual reality, simulated game scene, they emphasize on the natural fusion of learning and substantial scenario. Their research content aims at making use of the facility of the mobile devices in functionality such as information acquisition and mutual discussion. The project presented in China, including the mobile education by Ministry of Education stress on the implementation of teaching supportive system, the commercial project by corporation such as the family of mobile learning by Nokia Inc., focuses on informal learning or casual learning of English and other fashion design. At present, the researches and projects in China hardly relate to the formal educating activity, especially the fusion with the courses of in-school courses, the width and depth of the mobile learning based teaching and practicing researches and projects need to be extended in the next following phases.

The content of Information Management and Information System covers up management and computer science, etc. It has obvious characteristics of inter-discipline, following with the rapid development of networking technique and micro-electronic technique, management, computer software and theory are interconnected with each other deeply and broadly, which all contribute in changing the theory and technique in Information Management and Information System.

Currently, most of the Universities in China are exploring how to cultivate and raise the creative talents of Information Management and Information System under the new era. In recent several years, some Universities are carrying out applied talent raising and extraordinary engineer plan based teaching researches and projects of different levels, aiming at this problem and combining with self practical condition we perform similar teaching reform exploration. The reform includes the talent raising pattern in Information Management and Information System, Curriculum architecture construction, curriculum optimization, practical teaching arrangement, etc. Some of the projects put forward utilizing the modern teaching method and constructing

978-1-5090-3906-7/16 $31.00 © 2016 IEEE
DOI 10.1109/ITME.2016.44

network based teaching platform, such as online learning and mobile learning both are remote educational patterns. Mobile learning emphasizes on the personal learning, which is the extension and development of online learning, can help the learners to realize the learning process anytime anywhere. At present, there are rarely this kind of researches and explorations especially in Information Management and Information System.

Nowadays, the construction of Information Management and Information System in each University of China usually follows as: from fundamental to professional, from simple to difficult, based on which the curriculum architecture of Information Management and Information System is divided into Common Fundamental, Specialty Fundamental, Specialty Optional, and Practical Section, etc. The courses in raising plan are systematically related with each other, but in the implementation process we commonly observed that the students are lack of systematical understanding and acquiring, meanwhile they have no knowledge about the relationship among the courses and the fundamental requirements, and they always present the problems that the knowledge are discrete and what can they do after graduation or where to find the job.

In this paper, according to teaching and analyzing of the author, we confirm that the existing problems relates to the constraint of traditional teaching pattern. Thus, we firstly analyze the constraint of traditional teaching pattern in Information Management and Information System, researching on the knowledge architecture construction and resource integration based on mobile learning, according to the current curriculum architecture, we systematically review all of the subjective courses and relative knowledge modules, which contributes in organizing whole relationship among all of the modules, constructing the connections and improving the whole knowledge architecture. With the learning requirement of students, getting rid of the textbook-centered teaching method, constructing the mobile learning based specialty knowledge learning resource, we emphasize on the forming process of teaching knowledge. Aiming at the different emphasizing directions of this specialty, we construct the web based knowledge architecture. Based on the intactness and practicality of specialty knowledge, guiding the students to carry out self learning, leaving them with free space of thinking, cultivating the creative thought and creative ability of the students with inspiring teaching. The implementation of the project can effectively solve the problems existing in traditional in-class teaching pattern.

II. EXISTING PROBLEMS IN TRADITIONAL CLASSROOM

The problems include:

(1) Under the traditional in-class teaching pattern, the teachers utilize the instructing and experimenting to teach the students relative knowledge of specific specialty. According to the abstract theory, dynamical process description, integration, and designing experiments of specialty courses in Information Management and Information System. The students have difficulties in understanding the content, lacking of practicality. With the mobile learning pattern , the teachers and students all can make use of the resource platform with different multimedia materials (animation, simulation, audio and video, etc) to learn specific knowledge module, the students can utilize the mobile devices to learn anytime and anywhere, which can effectively enhance the learning result.

(2) In traditional in-class teaching pattern, according to the constraint of semester arrangement, the time interval of some courses is extensively long. There are disconnections of preliminary and successive courses, omitting of the important knowledge points, thus the teachers always need to review, retrospect consistently, which affects the learning efficiency. Otherwise, with the current evaluation and feedback mechanism, after completing the course the students can only clearly understand self learning situation with the score of final exam, which makes them ignoring the knowledge points if they pass the exam, without successive guidance and lack of knowledge points the student cannot comprehend enough content. On the other hand, with the mobile learning based specialty knowledge architecture resource, the students and teachers can communicate with the same learning platform, the teacher can teach the students online, and according to the different requirement of different specialty and employment they can elaborate the knowledge differently. The students can choose the learning resource optionally anytime and anywhere, breading the wall of before class, in-between class, and after class and barrier between preliminary course and successive course.

(3) In traditional in-class teaching pattern, in order to satisfy the covering of knowledge in determining the raising plan, there are various specialty courses. But the students did not get enough guidance of choosing optional courses, which makes them lack of systematical understanding of the specialty learning. Mobile learning based knowledge architecture should be constructed with different directions and webbed knowledge architecture, guiding the students to clarify their own learning direction and carry out systematical learning, and effectively extend their knowledge.

(4) Because the teachers have to think about the employment and graduation of the students at the same time, they usually require the students to comprehend the knowledge points similarly, which is lack of personal guidance and unbeneficial to teaching according to personal requirement and condition. With the mobile learning platform, the teachers can broadcast the knowledge modules according to the different specialty and employing requirement, and the students can choose voluntarily. Exploiting the mutuality of the platform, the students and teachers can execute one by one learning and teaching procedures, which can realize the personal teaching and customizing teaching.

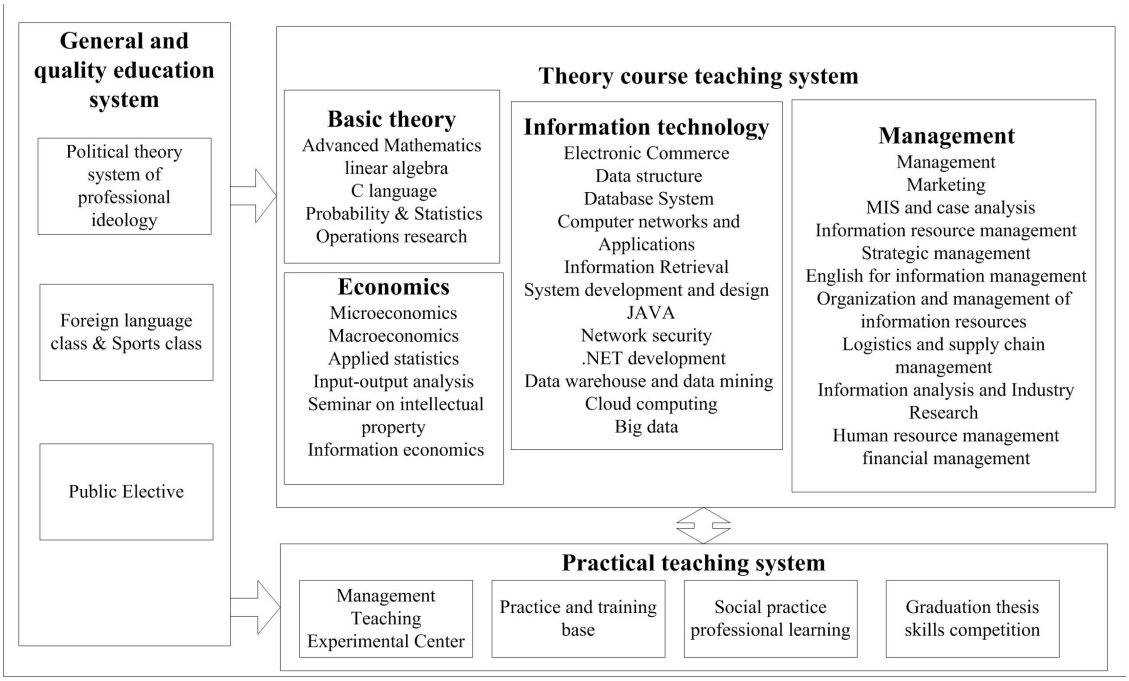

Figure 1. Information Management and Information System specialty teaching architecture.

Meanwhile, mutual learning and collaborative learning with the mobile terminals can transfer the passive learning into active learning, which can stimulate the interest and enthusiasm of the students, would be beneficial to the cooperation and creativity of the students. Through the research and exploration of this project, we can implement the fusion of foreign advanced teaching methods and resources, which can enhance the comprehensive ability of the student and the teaching research level of our University, finally it can improve the educating quality entirely.

III. INFORMATION MANAGEMENT AND INFORMATION SYSTEM SPECIALTY MOBILE LEARNING BASED RESOURCE CONSTRUCTION

Our University began to enroll the students of Information Management and Information System from 2005. According to the requirement of Shandong Province High School and social economy development, as a provincial school our University clearly presented that we should raise advanced practical and creative talents in our planning. Therefore, aiming at Information Management and

Information System we should stand up on the localization of our University, fully make use of the characteristics and advantage of our specialty, effectively utilize the inter-discipline characteristics of Information Management and Information System, to cultivate the students with ability of information technique and management, advanced practical talents for the area economy development would be our optimal arrangement and position.

During about one decade of development, we insist on the specialty construction guiding thought, which is based on cultivating the talent, integrating the knowing with practicing,

teaching researching, and serving the society in harmony. Oriented with the social requirement, organizing openly, creating talent raising pattern, based on the persons, chasing the personal development and fully development of the students, we continually accumulate and cultivate the specialty characteristics of Informative society requirement oriented, practical teaching and practical information system developing ability of the students emphasized, and the fusion of information technique and management. Figure 1 shows the specialty teaching architecture of Information Management and Information System in our University.

Figure 1 can demonstrate that the knowledge in Information Management and Information System is broad, meanwhile the development of information technique is rapid, the teaching tasks and quantity are heavy, and the time of teaching specialty courses is short. Therefore, aiming the shortage of in-class teaching pattern, combing with the specialty teaching architecture of Information Management and Information System, we research on the specialty talent raising objective of Information Management and Information System under new situation, and construct the mobile learning based specialty knowledge architecture. In above-mentioned architecture, the fundamental theory platform can construct mobile learning resource, which are chosen from foreign famous teachers, combined with traditional in-class teaching, increase the diversity of learning and decrease the dullness of theory learning for the students. For the information technique platform part, the updating of corresponding knowledge is rapid, so we should construct the resource as much as possible and not

constrained by the above listed content, we also should construct the resource based on the interest of the students, which would contribute to solve the problem that there is not enough individual teaching. The students can acquire the resource following their own requirement. We would increase practical cases of learning resource, which can impress the students directly and can benefit them further. Management and Economics platforms can construct the mobile learning resource with fundamental theory platform, but they all must combine with the traditional in-class teaching, if the mobile learning resource is independent there would be not good effect. Above all, the resource we construct is mainly exploited to support the in-class learning of the students.

The front-mentioned learning resource can be effectively used by the students. Under the traditional in-class teaching pattern, the students mainly make use of paper textbook, the material supplied by teachers, PPT, Flash and other video materials to learn. But in the mobile learning based pattern, the brand of the terminal, platform, monitor, processing ability and battery life time are different from each other, thus the mobile learning resource has the characteristics of intactness, conciseness, short but completeness, real time mutuality, and personality. Therefore, after fully researching and analyzing the characteristics of mobile learning based terminal and the requirement of mobile learning, with the fundamental units of knowledge module of mobile learning, adopting and introducing current foreign teaching methods and resource, we develop the knowledge module based visualized mobile learning resource, The content of very knowledge module is relatively complete and independent, they also have interior connection and logic. The mobile learning resources are diverse, including text, picture, audio, video, animation, document, experimental case, and learning app, etc.

To enhance the interest and enthusiasm of students, we supply them with online seminar, forum, group discussion, importance and difficulty analysis, online test, kinds of mutual learning, the students can communicate with the teachers about specific problem under one by one tutoring, the students can discuss, co-assistant, co-evaluate with each other, which all play important roles in the feedback during teaching and leaning.

IV. CONCLUSION

In this paper, after analyzing the existing problems in traditional in-class teaching and exploiting state of the art Internet and other relative techniques, we transfer the traditional Information Management and Information System education to Internet. First of all, According to the current curriculum architecture, we systematically review all of the subjective courses and relative knowledge modules, which contributes in organizing whole relationship among all of the modules, constructing the connections and improving the whole knowledge architecture. Secondly, focusing on the difference among individual mobile resource, we render the learning resources in diverse ways. And to motivate the interest and enthusiasm of the students, we supply them with multiple mutually learning methods. Our proposed plan would be effectively and efficiently in solving the problem existing in traditional in-class teaching pattern.

ACKNOWLEDGMENT

This work was financially supported by the Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (2015M111 ， 2015M110) and the Teaching Reform Research Project of Shandong University of Finance and Economics（2891470 ）

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2016 3th INTERNATIONAL CONFERENCE on
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August 2-3, 2016, Toronto, Canada
DEStech Publications, Inc.

2016 3rd International Conference on Information and Communication Technology for Education (ICTE 2016)
ISBN: 978-1-60595-372-4

The Construction and Implementation of Seminar Teaching Model for Information Management and Information System Specialty

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ABSTRACT: In our project, we focus on the information management and information system subject in our University, we propose the Seminar teaching model, the scientific definition of this model, the implementation principles of this model and we are practicing this model in reality. It should play an vital role in raising specialized talents with high quality and creative skill, and render important standardization meaning.

1. INTRODUCTION

Chinese higher education has already stepped into the Era of the Missification with rapid and overall development; Meanwhile, along with the development of national construction and economy, we do need more specialized talents with higher quality and ability (Lin, et al. 2014a, b, c）. Thus, how to reform the talents raising model under such development situation, and to seek advanced teaching skills have become one of the most important aspects that we should focus on. And exploring the raising model and teaching methods are playing vital roles in current time, they are valuable and meaningful for all of us.

In “Shi Shuo” from HanYu, it says “What are the main functions of teachers? They should at least consist of teaching, transmitting, and exploring.” It is simple but deep explanation of what a teacher should be and should do. It is also the refined summary of Chinese traditional teaching model from thousands of years ago. This model exists in modern Chinese education. It has played an crucial role in raising the socialism constructors with comprehensive knowledge in China. To understand this model fully, we can conclude that good teachers should speak out and speak well, and good students should learn well thoroughly. Above all are the fundamental requirements of our traditional education (He, 2002; Haidi, et al. 2008), they are also the basic content of current evaluation of teaching quality. We should not deny the advantages of this model, but we also can not avoid talking about the disadvantages of this model, either. And with the development of modern education, the disadvantages are affecting more severely. In this mode, the functions and roles of teaching are emphasized too much, and the activities of students have been neglected. Especially, with the development of modern society, more and more knowledge is accumulated to even explosion level. The knowledge that the students can learn in limited time has fallen behind the development of knowledge. And traditional education can not solve the inherent contradiction of itself. For example, teachers always complaining about insufficient time, incomplete content, meanwhile students complaining about overloaded content and fast teaching speed, tedious, and boring process, etc. But, somebody has done relative experiments and the results show that there is only 20 percent time of the students has been used to concentrate on learning the content from the teachers, and the results also tell us that the students can not tolerate the one direction teaching model, they are not interested in this kind of teaching any more, which is the main source of the above mentioned contradiction between teaching and learning. Specially, as the settlement of raising plan in our University, and the guideline to all subjects in our University, this is kind of contradictions would be more obvious than ever before. It is the important issue that we are facing to eliminate the contradiction. And the improvement and exploration of teaching model should be one of the effective ways to us. So in this paper, we propose one teaching model based on Seminars, and corresponding teaching plans for Information management and information system subject, the proposed model would render powerful meaning to raising talents with high quality, creative ability, and teaching standardization such as Figure1.

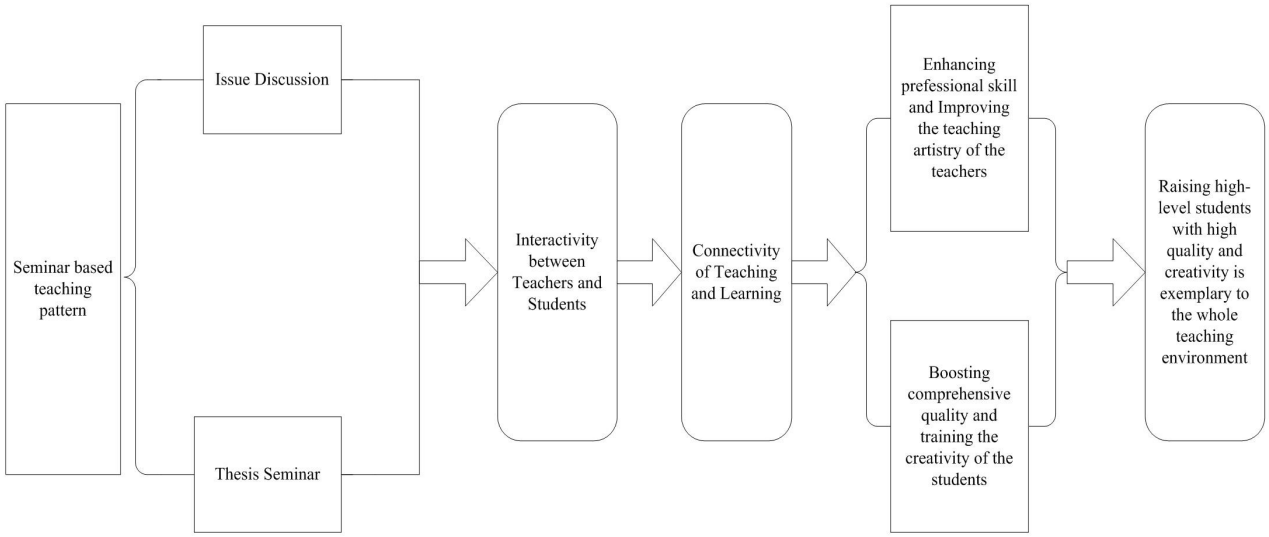

Figure 1. The powerful meaning to raising talents with high quality, creative ability, and teaching standardization.

2. GETTING STARTED RELATED WORKS

Among the teachers and students in Harvard, US, there is one famous saying, "the one real object of education is to have a man in the condition of continually asking questions (Zhu, 2008)." In China, because of the impacts of traditional education ideas, the teachers over emphasize on the teaching of knowledge itself. They turn the active, dynamic, interacting language related activities into tedious, boring broadcasting of knowledge. They do not encourage the students to bring problems, they also do not advocate the students to think or discuss independently, and finally they make the teaching into embarrassing situation. Under the dominance of this mode, the students are reluctant to raise new problems or discussion. In contrary, teaching model based on Seminars do encourage the students to ask questions, to think, to discuss, to explore, which all contribute to develop the students' talents and abilities, and it can help to form the active scenes of classrooms.

This mode is not one new teaching method. It had been adopted by western Europe from 17 century. Bruback (American Educator) presented that the most fabulous teaching art is encouraging the students to raise their own problems. From 50's of 20 century, Seminar has been adopted in China education system, but affected by the traditional education idealism, this model has not been utilized widely and thoroughly. In current years, plenty of primary school and middle school students of literature and history subjects have began to explored and practiced this mode, have achieved great effect, including some papers and practical experience, but the implementation of this model in Universities and colleges is still rare to see (Kirschner, et al. 2006).

Thus, how to effectively promote the application in Universities still need much more experiments and experiences, the effects also need to be evaluated in the future.

In our project, we focus on the information management and information system subject in our University, we propose the Seminar teaching model, the scientific definition of this model, the implementation principles o this model and we are practicing this model in reality. It should play an vital role in raising specialized talents with high quality and creative skill, and render important standardization meaning. After exploration, practicing of last two years, we have achieved considerable teaching experiences and operative teaching results, and it would achieve more satisfactory effect, meanwhile it would also help to guide relative teaching processes, and contribute in raising the learning interests, enhancing the creative ability, and comprehensive quality of the students.

3. CONSTRUCTION AND IMPLEMENTATION PLANING OF SEMINAR TEACHING MODEL - FOR INFORMATION MANAGEMENT AND INFORMATION SYSTEM SPECIALTY

Seminar based teaching model should include researching topics from the teachers or students, discussion, self-exploration, implementing the research plans, completing the objectives and learning plans, satisfying the requirements, enhancing the practical ability. In this paper, we propose two ways to implement the teaching model:

3.1 *Topic based Seminar: students into groups—assigning the topics by the teachers—browsing the relative materials by students(including learning and summarizing the relative knowledge, and writing out the topic reports)—discussion in groups—topic seminar—evaluating the students by the teachers.*

The teachers mush firstly analyze and plan the teaching content at macro level based on studying the curriculum and textbooks in prior, and they should be familiar with the corresponding theories and materials, based on the researching topics they can bring the advance researching results into teaching process, they must also determine the topic problems used in the Seminar scenarios, give out the subtle problems, assign the topic content, above mentioned issues all need plenty of energies and spirits. The teachers should create well designed contextual environments, and stimulate the students to explore actively with self motives, and help to supply with the supporting materials to the students. Discussion is the main stem of learning, it consists of three aspects: (1) learning relative content from the textbooks, to understand the problems through observing, analyzing, and experimenting. (2) exploring according to topics till satisfactory answers to the problems are found out. (3) practicing according to topic, including topic reports and self discussion. In the seminars, the group leader should pay attention to take the records. After the group leader(in turns) give the conclusion, the teachers can give supplement, based on the seminar process, the teachers can give conclusion and emphasis furthermore, and try to find out the inherent relationship among the discussions from higher level, and finally the teachers evaluate the topic reports and presentations of the students.

3.2 *Problem based Seminar: students into groups—teaching simply and instructing by the teachers—self learning the relative materials by students and proposing the relative problems—discussion in groups—concluding by the teachers—evaluating the students by the teachers.*

In this paper, we propose a novel teaching method, which theoretically is based on the constructivism of teaching-learning theory and cognitive tool theory, whose principal part is the students and guided by the teachers, it encourages independent researching and problem solving of the students. This method is comprised of following six aspects: a great deal of preliminaries taught by the teachers, sufficient considering time given to the students, problems raised by the students, the discussion with or without conclusion, the evaluation of the problems and the group members given by the academic advisor or teachers.

Thus our proposed teaching pattern not only pays attention to "what to know", it also concentrates on "how to know", it is mainly about teaching the students to mastering the knowledge and learning skills. Through the Initiative participation practical experience of the students to promote the dynamical construction of the science knowledge. The flow chart of our proposed teaching pattern is illustrated in Figure 2.

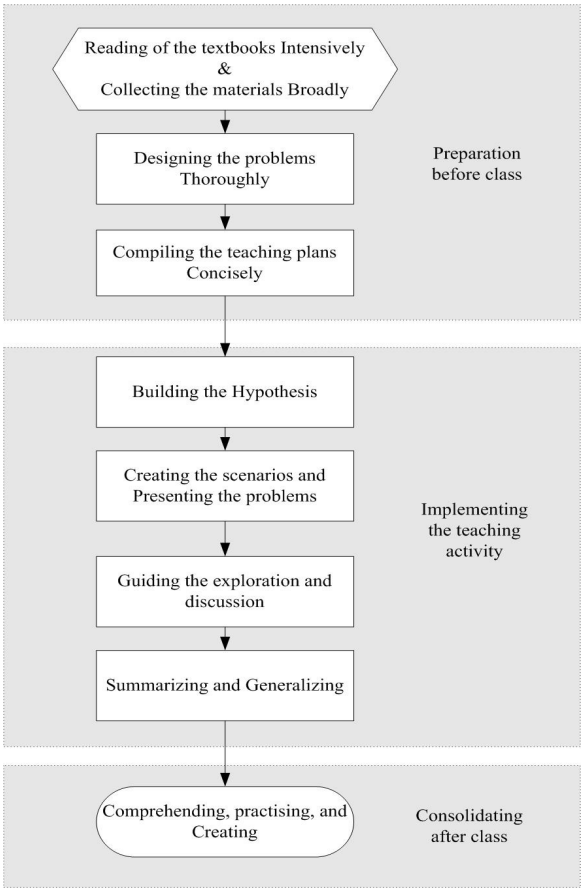

Figure 2. The flow chart of our proposed teaching pattern.

4. CONCLUSION

Problem based seminar teaching model is one teaching method that can be used to stimulate the interests and motives of the students to learn by themselves. The keynote of this model is to reform the framework of traditional teaching by innovations of curriculum and teaching processes, form one brand new teaching idealism, i.e. to instruct the students to explore and discuss by themselves. It emphasizes the interactions between teachers and students, guarantee the students to join in the teaching activities actively, it can develop the enthusiasm of the students and the teachers. In this paper, we try to explore the bilateral process of teaching and learning, we give specific implementation plans, which all can effectively enhance conscious activities of the students,

subjective initiatives of the teachers and activate the classroom atmosphere.

5. ACKNOWLEDGEMENTS

This work was financially supported by the Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (2015M111, 2015M110)

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2016 8th International Conference on Information Technology in Medicine and Education

Experimental Case Design of "Mobile Device Programming" for Specialty of Information Management and Information System

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***Abstract*—The teaching content of course "Mobile Device Programming" should be focus on different content for different specialty, because the course involves a wide range content but subject to the limitations of the class hour. In addition, since the curriculum knowledge update fast and have nature of strong practical, one to many teaching and Experimental cases are generally used in the course of teaching to improve the students' learning interest. Cases design is the key problem in case teaching practice. An experimental case of "Mobile Device Programming" for specialties of information management and information system and electronic commerce is proposed in this paper, which takes an e-commerce and medical platform for the old people as an example.**

Keywords-Experimental case; Mobile device programming; Course Reform

I. INTRODUCTION

Mobile Internet is one of the world's greatest potential industry, and it has become one important aspect influencing IT technology and industrial development of the five technology which are cloud computing, Internet of things, mobile Internet, big data and smart city [1]. In recent years, the mobile normalization construction of various e-commerce websites, enterprises, bank and sectors has moved into a period of rapid development, with mobile applications like "Taobao Client", "Mobile Government", "Mobile Tax" appearing through 3G and other mobile wireless network for data transmission. The emergence of these mobile applications allow users to complete shopping, administration and other related business with mobile phones or other mobile terminals unrestrained by place and space, which greatly improves the efficiency of trade and official business.

The rapid development of mobile Internet has brought new opportunities and challenges for the development and personnel training of the specialty of information management and information system. Nevertheless, the present courses of specialty of information management and information system, such as "Information system design and practice" and "Web information system development technology", mainly focus on the development and design of desktop or traditional Internet platform information system development, which is either basically fading away from the market or saturated the market demand.

There is a large market demand for mobile application developer and remuneration for mobile application developers is much more than other similar development technology for the scarcity of mobile developers. According to the investigation report research report [2], the starting monthly salary for graduates in first-line companies has exceeded 8,000 yuan while in famous enterprises like Huawei, ZTE and Tencent, it is 10,000 yuan or more than that. With the development of mobile Internet, mobile device programming provides a very good employment outlet for the students of specialty of information management and information system.

Mobile programming courses are mainly about the universality of mobile application development, such as image viewer development, contacts development, calculator development, jigsaw puzzle development, without content of information system development of mobile terminals for specialty of information management and information system.

The training target of specialty of information management and information system is bring up people who can in charge of information system planning, construction and management, or development and utilization of information resources who work at administrative agencies, the national industrial, commercial enterprises, financial institutions and management consulting agencies, or research institutions and other departments. Curriculum is mainly for the development of information systems. The key problem lies in the choice of teaching cases and experimental cases to make full use of the superiority of information management and information system to build the specialty of information management and information system considering the students' knowledge structure. We discusses the design of experimental cases for the specialty of information management and information system in this paper.

II. CASE-BASED TEACHING AND EXPERIMENT

In recent years, due to the "authenticity" and the ability of cultivating students' engineering quality, the case teaching and experiment has been gradually introduced into engineering specialty education .

As a kind of teaching and experimental method based on interaction and closely combined with practice, case-based teaching and experimental method can fully mobilize the enthusiasm of the students and maximize their learning potential, so it has been great success in teaching and

978-1-5090-3906-7/16 $31.00 © 2016 IEEE
DOI 10.1109/ITME.2016.123

experiment of business, management, law and medicine[3,4]. The case content has the ability of knowledge transfer, we can achieve the predetermined teaching goal through the case teaching process, causes the student to obtain the knowledge and enhances the ability, and the implementation process of case teaching and experiment is a process of communication, discussion and analysis, which can easily accepted by the students. Students' active learning can be promoted by the discussion.

The key problem of case teaching and experiment is choosing high quality cases. The case can come from the teacher's own engineering practice, or from actual project in cooperative enterprise, or provided by the related books. We should choose cases carefully to cover the whole course content and to form the knowledge system and consolidate the original knowledge. The case should have a certain size, and should not stay in the examples of the level, and can give thinking space to students.

III. MOBILE DEVICE PROGRAMMING

Course of mobile device programming mainly introduces the design and development process and method of mobile application software to the students. The pre curriculum of the mobile device programming mainly includes: computer networks, java, management information systems, databases, etc, shown in Figure 1.

The content of course covers a wide range of knowledge and the programming technique update fast. The content include Android application and development environment, Android application interface programming, event handling, multi-interface design, activity and fragment, graphics and image processing, data storage, content provider, service, broadcast receiver, multimedia application development, opengl and 3D development, telecommunication, sensor application development, GPS application development, etc[5].

A semester which include 36 plus 36 hours of class plus practice time is far from meeting the needs, so it is necessary to provide a selective content for different specialty. For example, specialty of digital media prefer the development of Flash plus Adobe Air and Android, game development and other related content[6]. Specialty of information management and information system should also focus on the development of mobile information systems, such as the choice of mobile office automation system, office assistant, student elective assistant, electronic commerce website, etc. So, students can have a good support from other professional courses in the teaching process, and there will not be too many obstacles for students in understanding in the learning process.

The course of mobile device programming is an application course with the focuses of practicality and engineering. Students will not know how to use the knowledge they learned without practice. Therefore, the course of mobile device programming requires teaching method of case teaching, which can be closely combined with engineering practice.

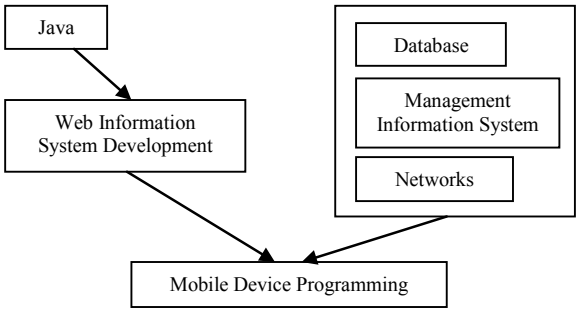

Figure 1. pre curriculum of Mobile device programming

IV. THE CASE DESIGN FOR SPECIALTY OF INFORMATION MANAGEMENT AND INFORMATION SYSTEM

When students in the specialty of information management and information system learn the design of information system, a management information system or electronic business website will be generally used. The experimental case for mobile device programming still needs to be an information system. To this end, the Android comprehensive experimental project can choose mobile information system, such as library mobile information service system [7], campus mobile information service system, student dormitory management system, online bookstore mobile service system, etc.

The practice of software development process specialty of information management and information system and the practice of Android development technology should be put emphasis on the design of android experimental case. From research projects and engineering practice, we choose twenty cases which can cover the whole course content and form a case of knowledge construction. In this paper, we take a beta version of elderly shopping platform from the smart senior care research group as a experimental case.

V. A CASE: ELDERLY SHOPPING PLATFORM

There are 22,182 thousand people over the age of 60 in China by the end of November 1, 2015, showed by the main data bulletin of 1% national population sample survey in 2015 [8]. This number increase 2.89 percentage compared with that of the sixth national census in 2010. China has entered the aging society since 1999, and the Chinese aging become a considerable proportion of the social groups. Influenced by information society, the elderly population have tried new things, such as consumption in the field of electronic commerce. Although the market is still in the stage of development, it is foreseeable that the elderly population will be an important portion in the electronic commerce.

The system "Longevity" is designed to provide a shopping service APP with hospital map positioning services and a certain capacity of information exchange. From system design to implementation, UML modeling, Android interface design, database, computer network technology, cloud resource acquisition and other technologies are involved in the development process. Students can understand and practice the whole process of knowledge flow system of

android through the development of the experimental case, and deepen the understanding of the curriculum they have learned before.

A. Functions Structure

The system "Longevity" include front-end APP and back-end server. The function of front-end APP include login and register, goods purchase, hospital institution location and retrieval, creating a new topic or view topics, etc. which shown in Figure 2.

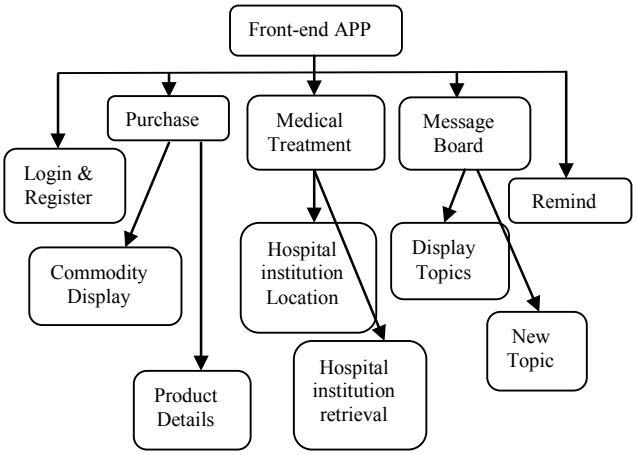

Figure 2. Functions Structure of front-end App

The function of back-end server is just like server in other information system, which include account management, product's information management, and message management, etc. which shown in Figure 3.

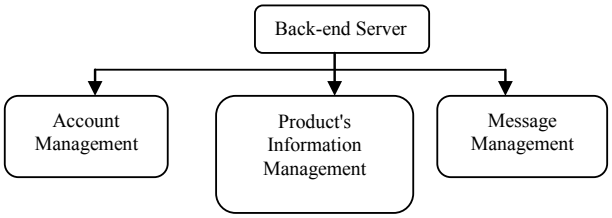

Figure 3. Functions Structure of back-end Server

B. User Case

Registered users have functions: logging in, viewing the list of goods, viewing product details, viewing the topic list, posting new topic, locating and retrieval surrounding hospitals, as shown in Figure 4.

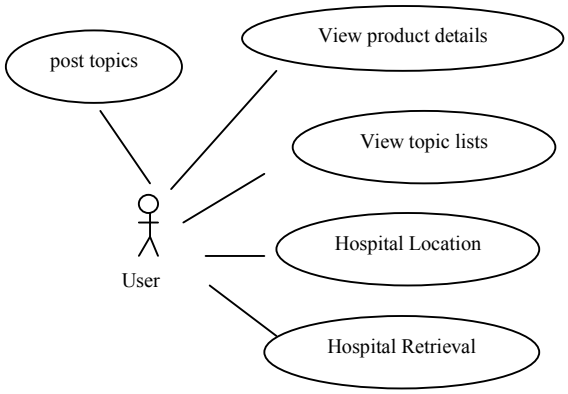

Figure 4. Use Case Diagram of Register

C. Interface Design

The part of Android interface design includes the use of a variety of widgets, multi-interface design, fragment and other content. For example, multi interface design include modules like "Login & Register", "Purchase", "Medical Treatment", "Message Board" and "Remind" can be switched using fragment, which is easily operational.

The main function of "Purchase" module is to display and provide the detailed information of various goods, where the user can collect goods, share goods and buy goods; "Medical Treatment" is a medical module for the old man finding near hospital without manual input. They will access to location they needed by clicking. "Filial piety" wall module provides a similar circle of friends as a platform for the exchange of information, to the topic as particles, can browse and publish new topic information of topic information. "Message Board" is a information exchange platform, which is similar to the circle of friends, provide the function browsing the topic information and releasing the new topic information, with the topic as the particle.

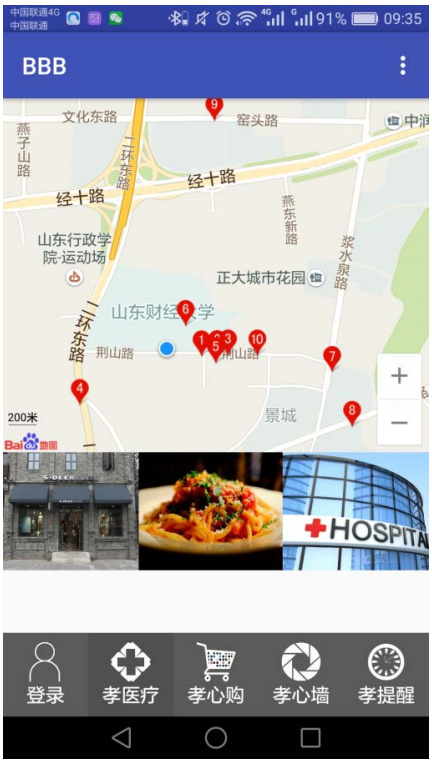

Figure 5. Map Interface Design of system "Longevity"

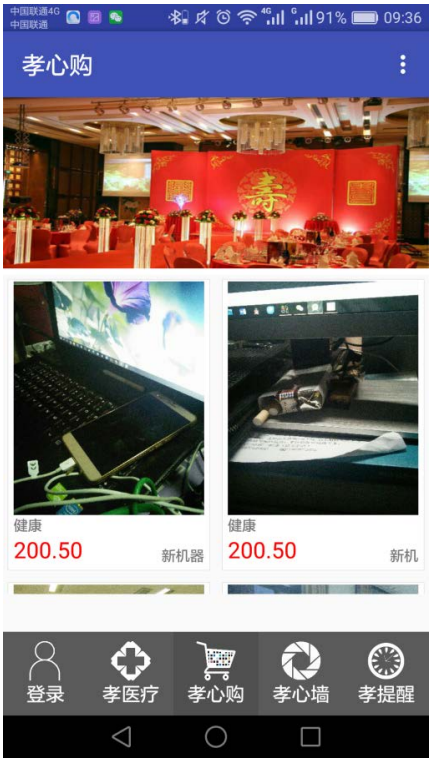

Figure 6. Goods Display of system "Longevity"

The techniques used in interface of the system include "ImageView", "Fragment", and "Asynchronous task", which can improve the system's response speed and making APP more smoothing.

D. Android Database Design

The database part of the project involves the local SQLite database and remote database hosting.

As the storage space of Android mobile client is constrained, the client end uses SQLite, which is an embedded lightweight database, and the server side using LeanClouds which is a cloud database, the two databases collaborative with each other. The private data is stored in the local machine's SQLite, for data privacy and non-network environment, and the public data and non-important data is stored in LeanClouds which is a remote cloud managed database to reduce the system size. The collaborative mechanism can enhanced data sharing and interaction design requirements.

SQLite is a commonly used database in embedded system. LeanClouds, as a cloud hosting database site, is currently widely used by some small and medium-sized developers. LeanClouds can provide data storage, data management, data analysis, SMS services, and it can provide a comprehensive data back-office system. It is suitable in data analysis for small APP in the lack of data analysis capabilities.

LeanClouds is an object-oriented database, and it is more suitable to the Android development. It effectively avoid code fragmentation problem when executing data manipulation, and its inherent multi-task asynchronous operation make it has a the ability to read and write data under good network environment and the ability to protect upload data under poor network environment. Its multiple authentication data security effectively protect the data privacy and improve the data security capabilities.

E. Map Location

We develope map positioning function by Baidu map in the project.Baidu map is one of the most popular map in China, which is easy to deploy and to use. Baidu map provides API interface of many functions for most kinds of the Android development. It provides the basic map, location map, route search and other complete functional modules. These functions are encapsulated into the SDK environment for developers to be used easily.

To meet the personalized needs of individual developers, Baidu map provides the reference documentation and source code, and only reserve the right of the core code. The developer can rewrite and revise according to their individual needs, and function can be developed to adapt to different needs of applications.

Compared with other maps, the Baidu Map SDK carry on different module development for different platforms, making the function code can be adapted to the appropriate platform, with higher efficiency and adaptability, which makes its SDK function more professional and easy to use.

VI. CONCLUSION

In this paper, we take a mobile programming of e-commerce system for old people an example, explains the principle of case design of mobile device programming for the specialty of information management and information system. We provides an example for the teaching and experimental case design of the specialty of information management and information system. This example can be extended to other similar specialty e-commerce, etc.

ACKNOWLEDGMENT

The research was financially supported by the Teaching Reform Research Project of Undergraduate Colleges and Universities of Shandong Province (2015M110, 2015M111, 2015M106) and A Project of Shandong Province Higher Educational Science and Technology Program (Project No. J15LN56).

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Course Reform of Mobile Device Programming for Information Management and Information System

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Keywords: Course Reform; Mobile Device Programming; Information Management and Information System

Abstract. Although the specialty of information management and information system has already started mobile development courses, the current course orientation is not clear, and therefore the teaching plan, teaching content and experiment plan are not targeted. Aiming at this problem,we studies the teaching purpose and content of the mobile development course for specialty of information management and information system, and designs the experimental case base of information management and information system. By proposing training program for mobile device information system design curriculum, we designs and improves information system case base for mobile device, making students majoring in information management and information system master the basic function of mobile development, and design and develop multiple system oriented information system client and server. For information management and information system majors who have good information system development capabilities, they need not to increase investment in hardware and software or modify other teaching content. They can easily transfer to mobile platform oriented information system design and development, integrating with other development technology course as a whole, so as to improve the current isolating situation of mobile development technology course.

Introduction

Mobile Internet is one of the world's greatest potential industry today, an important aspect influencing the five elements of IT technology and industrial development which are cloud computing, Internet of things, mobile Internet, big data and smart city. In recent years, the mobile normalization construction of various e-commerce websites, enterprises, banking and sectors has moved into a period of rapid development, with mobile applications like "Taobao Client", "Mobile Government", "Mobile Tax" appearing through 3G and other mobile wireless network for data transmission. The emergence of these mobile applications allow users to complete the related business with mobile phones or other mobile terminals thus making shopping, administration unrestrained by place and space, which greatly improves the efficiency of trade and official business.

According to "2014 Mobile Internet Industry Compensation Investigation Report" [1], in the next two years, almost all companies involved in the survey are in demand for mobile development talents, including a strongest demand for Android development engineer (more than 85.8% of the participating companies have a demand for such talents), followed by IOS engineers and Amazon architects.

The scarcity of mobile development talents caused a higher pay for mobile developers than other similar development technicians [2]. According to the research report [1], the starting monthly salary for graduates in first-line companies has exceeded 8,000 yuan while in famous enterprises like Huawei, ZTE and Tencent it is 10,000 yuan or more. Most small and medium-size enterprises offer more than 5,000, far outstripping other industries and enterprises.

Nevertheless, the present courses of specialty of information management and information system, such as "Information System Design and Practice" and "Object-oriented programming language", mainly focus on the development and design of desktop or traditional Internet platform information system development, which is either basically fading away from the market or saturated the market demand. The aging course leads to a disjunction between students' learning and social needs, resulting in a decrease of employment rate of information management and information system majors year by year [1]. While the development of mobile internet application for mobile Internet mobile terminals is in the ascendant, there is a large market demand. The rapid development of mobile Internet has brought new opportunities and challenges for the development and personnel training of the specialty of information management and information system. How to modify the teaching plan and teaching content to comply with the tide of mobile Internet and enhance the employability of students is a problem that needs to be solved urgently.

Specialty of mobile Internet is not included in the current general university education catalog, but mobile development courses have been opened. MOOC coursera has started iOS oriented Objective-C and Android system oriented Android mobile development courses. To set up mobile development courses have already become the norm, thanks to Google Android academic cooperation program initiated in 2011. But now mobile development courses are mainly about the universality of mobile application development, such as image viewer, address book development, calculator development, without information system development of mobile terminals for Information Management and Information System majors.

Related Works

Directed against the difficult employment situation of Information Management and Information System Majors, scholars have put forward a series of improvement actions: Zhang Yunpeng [3] analyzed the present situation of college information management and information system specialty construction; Li Hongxia [4] proposed a project-driven teaching mode of management information system; Xiao Yong [5] probed into the course arrangement of information management and information system specialty.

Niu Li et al. [6] investigated methods to cultivate innovative and entrepreneurial talents by school-enterprise integration in higher vocational colleges through IOS mobile development platform. Li Xinhui et al. [7] suggested that Android mobile application development course should follow "learning by doing": first fit knowledge and skill points into the actual program, and then allow students to practice after theory, to learn by doing. The above mentioned literature on mobile development course teaching reform mainly emphasizes how to improve students' ability from a practical point.

Since the market's demand for network-oriented B2C talents has been basically saturated, how to find employment opportunities for the Information Management and Information System majors is a key issue to be solved. Mobile terminals oriented information system development provides a very good way out for the Information Management and Information System students, which needs more originality than programming, and therefore more suitable for secondary college students such Yanshan College of Shandong University of Finance and Economics.

Course Design of Information Management and Information System Mobile Device Program Development

Teaching Content of Information Management and Information System Mobile Device Program Development

The training objective of the course is to cultivate information system development personnel on the smart mobile platform in order to meet the need of banks, enterprises and other mobile information system development requirements. To achieve this goal, it is necessary to make full use of current information system design course of the specialty of information management and information system, and create a unique mobile development course

For the current mobile development course lack pertinence, syllabus of the specialty of information system in domestic and foreign famous universities as well as MOOC cousera are investigated to bring in and transform the relevant teaching mode to adapt our students and the specific situation. In accordance with international standards, the course syllabus is fully updated to enable the course content completely conform to the forefront of industry standards.

Specifically, the teaching content includes the following aspects (Figure 1):

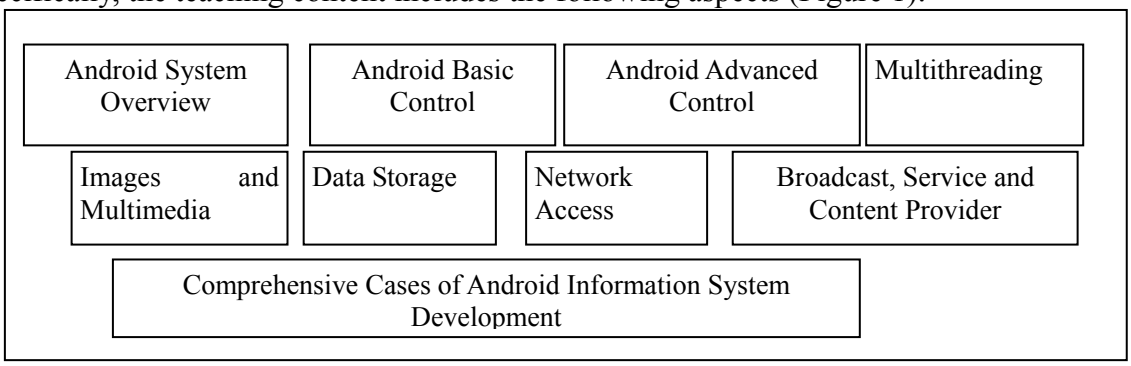

Figure 1. Course structure of mobile application development technology

(1) Android System Overview: structure of Android system, construction of Android development platform, four components of Android system.

(2) Android interface design: Use of Android basic control and advanced control, concept and application of monitor, ArrayAdapter, BaseAdapter and other adapters.

(3) Graphic design: how to draw two-dimensional graphics, how to draw the image in Android.

(4) Multi-threading: drawing dynamic graphics and images with threads and timers.

(5) Data storage: SharedPreferencen, SQLite and other data storage.

(6) BroadcastReceiver, Service and ContentProvider.

(7) Comprehensive Cases of Android Information System Development.

Because Android development platform can be developed in the Windows environment, the development tools Android Studio can be download for free. The low learning cost and the existing experimental condition can meet the basic needs of the general application development. With this mainstream mobile platform Android operating system as the starting point, through course and case study, students can master the basic characteristics, the basic process and basic methods of mobile Internet application development, and understand the operating system-based application development, deployment, management and other advanced smart phone software development technology. An information system development case, such as library management system, can serve as the main line to connect each knowledge point.

Construction of mobile device information system experimental case base

As a practical course, the experimental aspect is very important for the mobile development course. The appropriate project case design is a key issue in teaching content and lab experiment to enable students to understand the course content and carry out experiments. Gradual penetration of new knowledge in practice is required so that students can perceive the cause and process when specific technologies are applied in the actual scene. Teaching cases and experimental cases can have options of mobile libraries, mobile banking and other mobile office automation system, or student course selection assistant.

Projects and cases for teaching and experiments should be selected according to the students' ability of programming, and the workload should grow from small to large, from easy to difficult, handy and interesting. To be specific, at the beginning of the course teaching cases and experimental cases may include the following types:

UI interface and event handling: for teaching case, take a simple calculator as an example to tell about Android interface design and event handling; for experimental case, optional examples can be standard weight calculator, standard height calculator, the user login interface, questionnaires procedures.

Android Data Storage Technology: for teaching case, introduce SharedPreference by the example

of saving game score, or illustrate SQLite by giving example of mobile phone address book; for experimental case, optional examples can be improving mobile phone address book, moving diary or English test bank system.

Multi-threading and Android graphic design: for teaching cases, multithreading can be explained by examples of simple animation, drawing board, pinball game, Android drawing and event-based callback response; for experimental case, optional image rendering, drawing sine curve, drawing cosine curve, image browser, simple flight games. Teacher should provide the corresponding image material.

BroadcastReceiver, Service and ContentProvider: for teaching case, illustrate the usage of Service by the example of music player; for experimental case, multimedia player development, mobile phone alarm clock service, using ContentProvider to share mobile phone address book.

Students' course design is arranged in the late period of the course and teachers provide information system topics such as the library mobile information service system, campus mobile information service system, and online bookstore mobile service system. Students ought to integrate and apply the completed chapter assignment and then make appropriate expansion to complete the course design. Software project management can be used as the main line to manage every aspect in the entire mobile development process, from requirements analysis, design, coding, testing to the on-line acceptance check, which can enhance students' programming skills and at the same time, foster their project development synthesized accomplishment. After the initial exercise and training, competent students should be encouraged to participate in Android application Development Challenge of Chinese college students. Via autonomous and independent topic selection, students may pursue innovative and practical ideas to strengthen their hands-on ability and creative consciousness.

Establishment of Three-dimensional Assessment System

For programming and development courses, how to reduce or even prevent students' plagiarism behavior of the code is an unavoidable problem. Similarly, in the mobile application development course, the appraisal method to more accurately test the students' learning level is a real problem worthy of study.

In order to reduce the code plagiarism and other negative phenomena, improve students' learning initiative, this project builds a multi-dimensional assessment method, which takes students, teachers and student groups as multiple evaluation subject, learning attitude as multidimensional assessment content, and combines daily assignment, lab assignments, computer online exam as summative assessment and process assessment.

Assessment process is divided into three phases: examination preparation, project examination, project evaluation. Examination preparation phase needs assessing project design, students' team group, assessment environment preparation, assessment requirements and cautions announcement. In project appraisal stage teachers need to pay close attention to the students' state and performance, including the division of the organization, the team collaboration, project realization process and other aspects of students. The project assessment should not only base on the completion of project as the sole evaluation criterion.

Evaluation of the project includes the following aspects: (1) the accomplishment of the project, comprehensively testing students' master of knowledge and skills; (2) the completion of project design and document, comprehensively testing students' needs analysis and other aspects; (3) the arrangement of time, the shorter time the project is completed, the more rational organization and role assignment, the better member collaboration, the higher proficiency in knowledge and skills. In order to reduce students' plagiarism, questioning and answering can be adopted as course design scoring method.

Conclusion

By completing information system application program on Android mobile development platform, we aims to enable students to gradually master the latest and most popular smart mobile development technology and development skills. The implementation of information system

project-oriented experiment mode of operation can fully integrate students' software engineering project management ideas with information system design and practice courses, so as to enhance students' engineering accomplishment of communication, collaboration, division of labor and cooperation. Project outcomes also apply to other related specialties, such as training e-commerce mobile development talents or training computer science and technology talents.

Through participation in national academic conferences and exchange of experiences with other universities, the research results can be further perfected and expanded. Promotion of the project results will help improve the quality of mobile development talent training, solve the problem of disjunction between information management and information system specialty theory teaching and social needs, hence improve the quality of teaching and personnel training, and cultivate high-quality and innovative talents to meet the needs of society. The results of the project also have high reference and promotional value for colleges and universities of the same kind.

Acknowledgement

In this paper, the research was sponsored by by Teaching and Research Reform Program of Yanshan College of Shandong University of Finance and economics, A Project of Shandong Province Higher Educational Science and Technology Program (Project No. J15LN56).

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Jinjiao Lin, Minqu Fan, Haitao Pu, Jun Li, Jian Lian

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An Information Professional Personnel Training Mode Based on Social Requirement of Independent Colleges

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***Abstract*—In recent years, whether the graduate are needed by the society has become more and mor concerns. In this paper, combining the students of independent colleges and our education practice, the social requirement oriented training mode is proposed. we construct and improve the pattern both conforming the practical needs of current economic society and reflecting the training characteristics based on the social requirement for Information Management and Information System talents of different majors and levels.**

Keywords-information management and information system, personnel training mode, social requirement, independent college

I. INTRODUCTION

Personnel training mode, which determines the basic characteristics of the trained object, is the specific implement way of colleges and universities to train the students' knowledge, ability and quality structure. Personnel training mode based on social requirement enhances the pattern with social requirement oriented education construction and talent management, meanwhile implement the suitable principles and flexibility in the whole process.

In recent years, the employment for graduates has become one of the major concern of the society. Essentially, the problem is related to structure rather than quantity. And the main reason is that for these years, the major setup and training mode always follows the supply oriented principle, which causes the divorce between major setup and market requirement. Traditional Personnel training mode, knowledge structure and quality structure cannot satisfy the practical needs of our economic development. Therefore in order to solve the problem we should focus on making use of the information from labor market, construct and create the requirement oriented personnel training mode according to social requirement principle and improved high education system. In other words, the education department should adjust the content of subject, major and course in time, which can satisfy the market requirement, based on the dynamical market demand. Obviously, to construct the market signal generation mechanism, transmission mechanism and adjustment mechanism, we need the construction of requirement oriented education mechanism and creative personnel training mode.

At present, knowledge economy trains and develops rapidly with brand new gesture, and goes through explosive expansion. Following the hierarchically development of new technology revolution and continuous change of economy structure, even in rapidly developed information management field the employment situation of graduates is terrible now, and intense competition, overall quality and society adaptability have become the most important factors in information management talent requirement and competition[2]. Under the situation discussed above, the overall information management major talents who has complete knowledge structure, acute creative consciousness and spirit, perfect personality and strong society adaptability, can be competent the corresponding position and be accepted by the market. Therefore, in the education practice in financial colleges, we should pay attention to the economic development frontier and grasp the market requirement direction, which can help us to construct and improve the pattern in order to conform the practical needs of current economic society, reflect the training characteristics based on the social requirement for Information Management and Information System talents of different majors and levels.

II. RESEARCH STATUS

Currently, there have been plenty of discussion and researches relative to personnel training mode [3,4]. In general, the pattern includes three main factors: teaching principle, teaching pattern and culture environment. Most of the researches insist that the talent training in colleges and universities should focus on following aspects: to face the society reality, to stress interdisciplinary and ability, to enhance practice, to cultivate team spirit and creativity.

At present the problems in researches on information management and information system personnel training mode are:

A. Fuzzy professional positioning

In "Specialty catalog and introduction of undergraduate course of common colleges and universities" presented by Chinese Ministry of Education[1], the training objectives of information management and information system have been given thoroughly, but the content is highly generalized and broadly. Many professional teachers in universities would misunderstand the content in the making process of major training plan and teaching outline, which makes the students of this major especially the freshmen confused about the subject development and future occupation direction. At the same time, many teachers in information management and information system originally are from management major or computer major, so they usually they would start from the original major stand and divide the new major into management and computer parts. But practically, information management major not only needs computer based information technique courses but also stress the ability of management information system design and implementation.

In the professional talent training process, most of the plan and course architecture in colleges and universities have flaws. Firstly, the courses arrangement, most of which have not arranged the guide courses and subsequent courses as knowledge acquirement behavioral habit. Secondly, they do not pay attention to practice teaching, and neglect the interdisciplinary features of the major, which all make the students lack of the ability of knowledge application and necessary means of comprehensive ability. Thirdly, the connection between the major courses is not deep enough, especially between the fundamental theory and information technique courses, which make the students hard to apply their knowledge in design and implementation, confines the enhancement of their ability.

Analyzing from the practical perspective, information technology has been applied broadly in modern enterprise management, and the management concept, ideas and means have changed totally. Information technology has also deeply affected every aspect of the current economic society. So how to train students, who have rapid adaptability to science and technology development and conform to the society requirement, is one of the important projects in information management major talent train.

B. Chaos pattern

Now the information management major positioning mainly relates to three kinds of courses: the first kind is general education courses, such as: higher mathematics, foreign languages and political courses; the second kind is economy management courses, such as: Management, Economics, Accounting and Financial Management; the third kind is information technology courses, such as Programming, Operating System, Networking and Database, etc. And in this pattern there is no effective interdisciplinary professional course architecture, but the courses are simply meld, the connection between them is not solid and the knowledge architecture is incomplete, too. And the information management and information system major train plans of the colleges and universities are different from each other, and the perspective differs, too. In "Specialty catalog and introduction of undergraduate course of common colleges and universities" of 1998, the courses includes: Economics, Accounting, Marketing, Operation Management , Organizational strategy and behavior, Principle of Management, Application of mathematical statistics, Operation research , Computer system and software, Data structure and Database, Computer networking, Information Management, Information Organization, Information storage and retrieval, Management Information System analysis and design, etc[1]. And the courses should be divided into following modules: economics knowledge module, management knowledge module, computer knowledge module and information management knowledge module, each college and university has their own opinion to the plan.

In the plans, the colleges and universities have agreed that there should be fundamental quality knowledge module, modern information knowledge module, information management and information system major knowledge module and major background knowledge module in the final plan, through which we can understand that the main objective of major training is to construct the systematic structure of major knowledge.

C. Lack of laboratory fundamental condition and insufficient of labs and practical training

Information management and information system major has the characteristics of binding of theory and practice, which demands practical experience of the teachers. But nowadays most of the teachers graduating from University directly have no practical engineering experience. Because most of the teachers have no way to attain information implementation means in practice, and they can only carry our theory teaching, which makes the students lack of practical experience, either. And they cannot understand the importance information technology. Therefore, major teachers without knowledge renovation and practical experience are the most terrible problem now. And most of the persons incorrectly assume that the information management major belonging to management science, and misunderstand the major laboratory of the major. Actually, comparing to Science and engineering laboratory, lab of management major has more input and less output. Therefore, the University prefers to construct the former labs instead of

management major labs. And, some of the Universities treat the theory teaching staff and experiment staff differently in salary and other aspects, which severely damage the working enthusiasm of the lab staff. Because of the existing problems above, the construction of the information management labs obviously lags behind the society requirement to talent training, which makes it hard to carry out in talent training.

D. Reform plan design

We can find that the information management and information system major relates to many different fields, and because of the rapid development, hard work of teaching tasks and insufficient time of major courses, which all make creative major teaching reform and construction important.

1) Reform courses in information technology module

To carry out corresponding reform to courses in information technology module, this can help the students to make use of information technology effectively. Meanwhile we should adapt the knowledge learned from management courses into practical scenarios such as: reflecting the running situation of enterprise, management and decision, and combine the knowledge learned in mathematics courses within. And the combination of the several modules can be used to analyze and solve the problems.

2) Reform practical teaching segment

Surrounding the industry background and professional training objectives to build all kinds of practice teaching link，and combine them into practical teaching link, which can be used to enhance the basic practical ability, professional adaptability and creativity of the students, to improve and reform the present information management and information system major practical teaching objective architecture, practical teaching content architecture, practical teaching management architecture and practical teaching quality evaluation architecture.

3) Reform and create teaching methods

We should renovate teaching concept, motivate the students to think more, analyze more and enhance the practical ability of them. Making use of modern teaching methods and tools, we would attract initiative of the students. In course teaching process, we should pay more attention to foster self learning ability, creativity ability and independent thinking ability of the students. In class teaching process, we should insist on the combination of theory and engineering cases to enhance the comprehensive ability to apply the knowledge in practice of the students.

E. Solution methods

We present the following methods based on the reform plan above

1) Select the textbooks and reference books.

We should choose one set of textbooks and reference books which are suitable for the situation of our University and pay attention to the connection between the textbooks themselves. The selection of textbooks is important, and they would affect the students a lot in a course.Reform courses in information technology module

2) Emphasize on fundamental theory teaching , arrange curriculum schedule reasonably.

We should emphasize the fundamental courses, major core courses and lab courses, enhance the coaching answering s and paper correction, and choose the experienced teachers to teach the fundamental courses. According to decades of teaching experience, whether the student would become the talent that the market and society needs the first year is rather important. Besides public courses, the subject characteristics determines the freshmen should put most of the energy on fundamental courses such as mathematics, rather than computer operations, programming design, etc. Listening to the teachers carefully, reading, thinking hardly and experiencing deeply, which all need repeatedly boring learning, are the main parts of the freshmen. Many students have not gone through systematical and hard fundamental learning and training, which leads to Infineon when they enter higher grade. But once one student finish the fundamental learning process, even if his entrance scores is lower than other students, he would catch up the others definitely and he would feel easier in the following courses. The reason is that this kind of students have followed the requirement of the major and gone through fundamental training hardly.

3) Reform evaluation means. Information management and information system major has dual characteristics of theory and application, and the evaluation of core courses is important to students.

We should advocate better learning atmosphere, relying on scientific credit management principle, to embody the theory learning and knowledge application and make sure the fairness, objectivity and credibility.

4) Enhance the lab teaching process and standardize the experiment teaching process.

Based on fundamental courses teaching, targeted and scheduled to enhance the lab teaching in the major, and foster the combination ability of theory and practice.

III. CONCLUSION

Information Management and Information System is one of most necessary major in our information-base society, because we need information in all walks of life. In this paper we propose the personnel training mode for Information Management and Information System major through theory and practice. We hope that the pattern can enhance the society adaptability of students from this major.

ACKNOWLEDGMENT

This work has been supported by the Shandong Science and Technology Development Project (2012GGX10122, 2013G0021109), the Shandong Province Higher Educational Science and Technology Program (J11LG21, J13LN35), Jinan Science and Technology Development Project

(201202058), Teaching Reform of the Key Project of Shandong Province (2012073,2012552,2012033) and International Cooperation Program for Excellent Lecturers by Shandong Provincial Education Department, and Teaching Research Project of Shandong University of Science and Technology (qx2013286)

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Contents

Communication & Net

A GIS-based Power Transmission Management Information System ..... Er-kui CHEN, Li-fen WANG (1)

A New Method For Mitigation Of Cross Correlation In GPS Receiver ..... Shao-lei Yi, Hui Li (5)

The intelligent security system based on the public switch telephone network ..... Tian-fu Yuan (11)

BLET : Battery Lifetime Enhancement Technology ..... Yong-Ju Jang, Seongsoo Lee (15)

High Gain Patch Antenna for 2.4GHz using Metamaterial Superstrate ..... Kyu-Chang Lee, Seung-In Yang (19)

The design of monitoring communication system Based on Power line carrier ..... Wei-tao Mu, Jian-jun Hao (23)

A Design of Ultraphonic Tubulous Water Communication System Based on OFDM ..... Yu Feng, Wen-hong Lv (27)

Design and Implementation of embedded network based on LWIP ..... Xiao-qian Zheng, Yue Yuan (30)

A Remote Temperature Monitoring System Based on GSM ..... Yong-ming Li, Yin-jing Guo (34)

Controls & Robotics

The Conversion of a Zimbabwean Processing Plant from Manual to Smart Operation ..... Michael Collier, Ernest Bhero (38)

Design of Robots Monitoring System on the Basis of Kingview ..... Tao Sui, Zun-tong Du (43)

The Design of Inverted Pendulum System Based on Virtual Prototype Technology and PID Control .... Hong-bo Zheng, An-li Tao (46)

Design of Piston Air Compressor Unit Control System based Converter ..... Yi Wang, Hui-bin Liang (50)

Detecting Unstable Periodic Orbits in Hyperchaotic Systems Using Subspace Fixed-Point Iteration ..... Hidetaka Ito, Yusuke Mochida (53)

Decentralized supervisory control of continuous timed discrete event systems ..... Fei Wang, Fu-jiang Jin (57)

The implementation of Automatic Adaptive Equalizer Based on LMS Algorithm ..... Ping-xiang Jiang, Shou-shan Liu (62)

Research on mobile robot navigation based on gyro ..... Shi-guang Li, Hong-wei Zhang (66)

The control system of intelligent wheelchair ..... Ke-yong Li, Bing-hui Fan (69)

The Design of Digital Servo-Position Control System Based on LM629 ..... Kai-ru Zhang, Jian-xue Mou (72)

Implementation of Fuzzy-PID in Smart Car Control ..... Long-qi Chai, Mao-fa Gong (75)

Boiler level control system based on ControlLogix5550 PLC ..... Tao Sui, Bing Li (78)

Electric Circuit

The Measure of Cage Guide' transmutation Based on C8051F340 ..... Feng-long Zheng, Kai Zhu (82)

The Electromagnetic Compatibility Design of the Wireless Sensor Network Node ..... Bao-dong Guo, Xiao Lu (85)

Study on Hardware-in-loop Simulation of Twin-screw Extruder Experiment System ..... Yun-Zhou Li, An-li Tao (91)

The Design of A Kind of Electrical Appartus Based on FPGA ..... A-ying Wei, Chang-zhi Lv(95)

Design of RTU based on LPC2294 ..... Er-kui Chen, Wei Zhang (97)

A Programmable Timing System for Debating Training and Competitions ..... Michael Collier, Pamela Collier (101)

The Linearized Design Of Thermocouple Sensor ..... Xiang-zhong Li, An-li Tao (104)

Smart Resistance Thermometer Sensor Based on C8051F350 ..... Jun-guo Liu, An-li Tao (107)

Design to conditioning circuits of dynamic compensation of reactive power in the intelligence voltage controller ..... Yong-qin Wei, Yin-jing Guo (111)

Development of High-Thrust and Double-Sided Linear Synchronous Motor Module For Liquid Crystal Display Equipment ..... Myung-jin Chung, Sung-veon Hwang (114)
CMOS Direct-Injection Divide-by-3 Injection-Locked Frequency Dividers ..... Chia-wei Chang, Jhin-fang Huang (117)
Universal I/O Design for Customizing MCU ..... Jongsung Kim, Jungwhan Choi (121)
Development Of Multi-users Multi-function Watt-hour Meter Based On ATT7022B ..... Mao-fa Gong, Chang-lun Hu (123)
The study of linux's porting to S3C2410 ..... Dian-tao Li, Yin-jing Guo (126)

Signal Processing

Interface Design Of Digital Platform For Bio Signal Processing ..... Jongsik Park, Moonsu Jang (129)
Application of Fault Location Mode Based on Travelling Waves for Neutral Non-effective Grounding Systems ..... Tao Ji, Qian-qian Yuan (133)
The Research of ECG Signal Automatic Segmentation Algorithm Based on Fractal Dimension Trajectory ..... Yin-jing Guo, Qian Cao (139)
An efficient VLSI implementation of H.264/AVC entropy decoder ..... Jongsik Park, Jeonhak Moon (143)
Image Resolution Enhancement Using Spatially Invariant Point Spread Function ..... Kyel Ko, Myoung-Jin Kim (147)
A Simple Adaptive Rate Control for H.264/AVC ..... Myoung-jin Kim, Min-Cheol Hong (151)
A blood pressure measurement method based on synergetics theory ..... Hong-jin Guo, Jian-jun Hao (155)
Electrical Characterization of the through Via in Package-on- Package with Interposer using Parameter Extraction Method ..... Young-Min Yoon, No-Su Kim (160)
Lane Detection Based on Contrast Improvement in Foggy Road Image ..... Youngtak Kim, Namki Lee (164)
Efficient Dynamic Time Warping by Adaptively Controlling the Valid Warping Range ..... Seok-Woo Jang, Gye-Young Kim (168)
Study on the Gas Detonation Experimental System of Human Body Electrostatic Discharge ..... Xiu-jie Dong, Qiang Guo (173)

Intelligent System

Efficient and Flexible 3D Virtual Desktop System in the Windows Environment ..... Seungpyo Hong, Donsu Lee (178)
Cursor Control using Smartphone in Large Display Space ..... Sungbae Kim, Sungkuk Chun (182)
Research on Public Traffic Vehicles Dispatch Based on Improved Adaptive Genetic Algorithm ..... Chuan-xiang Ren, Zhen Li (186)
The Adaptation of Mobile Learning System Based on Business Rules ..... Jin-jiao Lin (190)
An Auto-configuration 4M Group Management using Wireless Sensor Networks for Reconfigurable Manufacturing System ..... Suk-Keun Cha, Jeong-Hoon Lee ,et al(192)
Research on the Optimization and Simulation of the Shortest Path Based on Algorithm of Dijkstra ..... Chuan-xiang Ren, Xin-gang Hao,et al (199)
The Control System Simulation of Variable-Speed Constant-Frequency Wind Turbine ..... Jin-yan Dou, Na Cao(202)

The Adaptation of Mobile Learning System Based on Business Rules

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***Abstract*—In the mobile learning system, it is important to adapt to mobile devices . Most of mobile learning systems are not quickly suitable for mobile devices. In order to provide adaptive mobile services, the approach for adaptation is proposed in this paper. Firstly, context of mobile devices and its influence on mobile learning system are analized and business rules based on these analysis are presented. Then, using the approach, the mobile learning system is constructed. The example implies this approach can adapt the mobile service to the mobile devices flexibly.**

Keywords*—*Mobile Learning System; Mobile Devices; Business Rules

Manuscript Number: 1674-8042(2010)supp.-0190-02
dio: 10.3969/j.issn1674-8042.2010.supp..50

1 Introduction

The rapid adoption of mobile computing devices with Internet capabilities, such as computers, smart phones and handheld devices, makes us work or study at any time, at any place. And mobile learning will complement and add value to the exiting learning models [1].

It is important for mobile learners to get education information and service, which meet their needs in an adaptive manner. However, in the mobile learning system, different mobile devices have different CPU speeds, memory capacity and power. This means that a mobile learning system created needs to adapt to different mobile devices.Currently, some researches about device independence in mobile learning system have been proposed. Xinyou Zhao proposed a device-independent architecture for mobile learning, which is composed of device detector and adapted content model [2][3]. That system detects the features by using user agent and analyzing the head of request. Anastasios A. Economides presented a framework for adaptive mobile learning in order to stimulate and support providing service [4]. The adaption engine is the core of the adaptive mobile learning system. By employing the learner's state L(t), the educational activity's state A(t), the infrastructure's state I(t) and the environment's state E(t), the system has the ability to detect the characteristics of device and learners. By employing the learning automata to reinforce a good decision and penalize a bad one, this system can provide the most appropriate service. But all before-mentioned system frameworks are not extended easily, because the formal model of context and adaption is not presented. When more and more new-style devices are used to mobile learning system, this shortage will be obviously.

In this paper, business rule approach is proposed to construct mobile learning system. It can detect mobile devices' context and adapt the service to the device, by considering the influence of context on service parameters.

2 Business rule

2.1 Context and its influence

Mobile learning system is composed of one server and mobile devices which access the server via different types of networks, for example, GSM, 3G, internet, Wi-Fi, or other networks. Mobile devices maybe are PDA, computer, mobile phone, laptop, digital TV, or other devices which have the ability to access the network, play audio and video program, and access the system server using browser which support standard communication protocol.

Mobile devices communicate with the mobile learning system server interactively. The device sends the request of service to the server. Then the server provides the mobile service, such as video on demand, to the learners' devices. The learner's devices can communicate with others through the server.. When providing the service, in order to adapt itself to several kinds of devices, the mobile learning system should adjust the parameters of information communication according to the context of devices. In this way, every user can obtain the mobile service automatically with the quality matching the ability of his device.

2.2 Business rule

Based on the analysise above, there are some rules in the mobile learning system. These rules have the same structure as 'IF conditions THEN adaption policy' in the codes. While the context match the condition, this rule will be triggered immediately, and the adaption policy will be implemented.

BR=(id; width, networktype; speed, size,color)

In this depiction,

BR is the symbol of an business rule.

Received: 2010-5-25
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Id is the rule identity,which is exclusive.
Width is the width of the mobile device.
Networktype is networktype of the mobile device.
Speed is the transmission speed to the mobile device.
Size is the displaying size in the mobile device.
Colour is the displaying colour in the mobile device.
For example:
BR=(001; 0.6×2Mbps,0.4×ADSL;15f/s)

3 The approach

On the basis of the discussion above, we utilize business rules to implement the dynamic part in the mobile learning system.Figure 1 shows the mobile learning system architecture based on business rules.

The context management module in the architecture employs the approach proposed by Henricksen in [5]. The context repository management module is responsible for collecting context, maintaining a set of context models and their instantiations. This module additionally provides the reasoning capacity between the low-level and high-level context and implements the query interface. The other modules in the architecture are our own work and will be discussed as follows. At present, the reasoning procedure has not been included in the business rules.

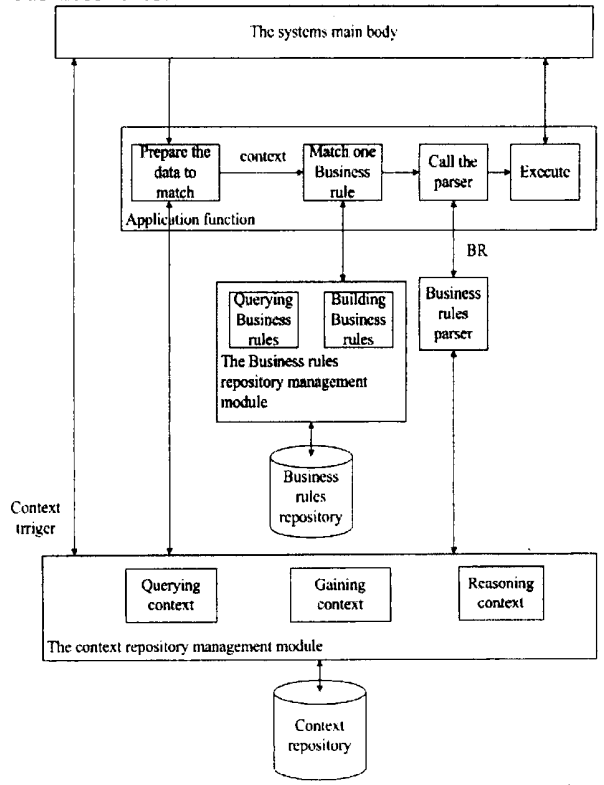

Figure 1 the mobile learning system architecture based on business rules

The traditional mobile learning system architecture consists of the system's main body and the context repository management module. The dynamic elements of the system's main body are encoded in the traditional architecture. In the new architecture shown in Fig.1, the system consists of the main body, the context repository management module and the implementation module for the dynamic element separated from the program code. When the system executes the dynamic element, a functionis invoked and implemented. Moreover, the variables of the invoked function are the parameters, their values easily being modified to suit the changing situation.

4 Example

In the mobile learning system,learners can get the video courseware resource by VOD service provided by this mobile learning system. They can get these video resources by many kinds of device, such as PDA, mobile phone, laptop and computer. The mobile learning system must apperceive the context of terminal device, and adjust the transmission policy to the different context.

In this example, the bandwidth, type of link, the vender and model of terminal, the size of screen are considered as the context of device.

Business rules are show in follow:
BR=(001; 0.6×2Mbps,0.4×ADSL;15f/s)
BR=(002; 0.6×1Mbps,0.4×ADSL;10f/s)
BR=(003; 0.6×10Mbps,0.4×LAN;25f/s)
BR=(004; 0.6×20Kbps,0.4×GPRS;5f/s)
BR=(005; 0.6×120Kbps,0.4×HSDP;7f/s)

The contexts of mobile device are detected by the context information server, and then according to the business rules above, some information transmission policy is carried out to ensure the quality of mobile learning,. Moreover, when more and more new-style devices are used to mobile learning system, we only add some business rules instead of modifying the codes.

5 Conclusion and expectation

In mobile learning environment, system should detect the context of mobile devices, and then adapt the service parameters to the context. In order to construct the mobile learning system that can adapt to mobile devices, business rule approach is presented. Using the approach, the mobile learning system is constructed. The example implies this approach can detect the contextual environment of mobile computing and adapt the mobile service to the mobile devices flexibly.

In future, the business rules repository will be researched and optimized, employing the method and theory of artificial intelligence.

(Continued on P.198)

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Research on University Information System Oriented Business Adaptability

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Abstract

University information systems should flexibly and quickly adapt to variable requirements. This paper proposed an university information system implementation method based on business rule to achieves information systems adaptability. Based on steady business pool consisting of business granules and business objects, variable factors on the business object aggregate business granule operates are separated from information systems codes and stored as business rule, which is implemented through the corresponding business rule engines. Therefore, university information systems based on this method can adapt to variable requirements flexibly and quickly through configuring business rule. Experiments and examples are provided to evaluate the feasibility of the proposed method.

***Keywords*:** *University Information System; Adaptability; Business Rule*

1. Introduction

In information society and knowledge economy era,it is the construction hot of university at home and abroad to build an information and digital campus. Nowadays, many of large and middle software corporations at home and abroad implemented university information systems. But, there is no system to adapt to many of university at home and abroad. The reason for this situation is the strong university regional, different management schema and very difficut containing all of functional department. According to above university difference and complex and variable university business, it is required that university information system implemented by information technology can support the difference and variable.

This paper proposed a business rule approach to implement university information systems. At present,business rule-oriented methodology to implement the information system attracts more and more attention in recent years. Irma Valatkaite [1-3] presented a conceptual graphs approach for business rule model, represented business rule in UML use case diagrams, and enforced automatically business rule as ADBMS triggers from conceptual graphs model. Based on above, the BR-Centric IS development framework was then presented. P. Kardasis[4] and W. M. N. Wan-Kadir[5] provided business rule elicitation, representation, mapping and implementation. Sequentially, they proposed MBRM development frame. All of these approaches proposed the structuring of business rule according to the ECA (Event Condition Action) paradigm or IF Else Then paradigm. As a result, these approaches had a limitation that they couldn't represent complex business rule. Besides, there are some commercial business rule management systems productions, such as Ilog's Jrules[6] and Fair issac's Blaze advisor[7]. It is a pity these productions are too complex for enterprise level. Accordingly, it is necessary for enterprises to abstract and implement their business rules in terms of their variable requirements.

This paper proposed a business rule approach to implement the configurable complex business logic of university information systems. Based on steady business pool consisting of business granules and business objects, variable factors on the business object aggregate business granule operates are separated from information systems codes and stored as business rule, which is implemented through the corresponding business rule engines. Therefore, university information systems based on this method can adapt to variable requirements flexibly and quickly through configuring business rule.

2. Information system framework based business rule

The information systems based on business rule consist of three components including business granule, business object and business rule[8].

978-1-4244-3930-0/09/$25.00 ©2009 IEEE

2.1. Business granule

Business granule is business atomic unit of business operations or operations sequence with the business goal in the special application domain. It has attributes, such as atom, independence and multi-instance. No subdivided business embodies the business granule atomic attribute and the least business executing unit embodies its independence. Its independence shows it couldn't depend on other business granules. Since the business granule is relatively stable, business functions can consist of these business granule sets by accumulation. Different accumulation or assembling styles represent different business logic.

2.2. Business object

Business object is the object that business granule operates. To the relatively stable business granule, its operating object is also relatively stable. But, the operating object instance set may be change. These variations come from user's requirements and represent the variable business logic.

2.3. Business rule

There are various classifications of business rule given by different researchers. Von Halle, Ron Ross and business rule group have their categories. Based on the variable requirements influencing business object instance set the business granule operates, we classify three categories: (1) constraint relations among variables (Variable Relation Constraint Rule VRCR); (2) the variable attribute value mandatory constraint (Attribute Mandatory Constraints Rule AMCR); (3) constraint relations among the variable attribute values(Attribute Relation Constraints Rule ARCR).

VRCR abstracts the related variables and joint relations among these variables. This class business rule can meet these variations: (1) the number of variables; (2) the name of variables (3) the joint relations among all variables; (4) the order of the variable attribute values. Following is its representation.

VRCR1=(Id, Application, Task, Rulesetname, Table, Variable, Order, Level)

VRCR2=(Id, Application, Task, Customed, Table, Variable, Value, Order1，Order2)

VRCR1 is the symbol of VRCR.

'Id' is the rule identity, which is exclusive.

Application is that the VRCR is applied.

Task is the business granule where the VRCR is valid.

Rulesetname is the name of the rule set that the VRCR belongs to.

Table is the operated table in the database by the VRCR.

Variable is the influencing factor the VRCR involved.

Order indicates the order of the influencing variable attribute value in the VRCR. Its value may be descending, ascending, random and customed. If the value is customed, there will be some new VRCRs which are represented by VRCR2. In VRCR2 expression, Value is the attribute value that the user customs, Order1 indicates the customed order of the attribute value and Order2 indicates the order of multi-attribute-value in the same order1.

Level indicates the joint relations among the influencing variables the VRCR involves.

AMCR abstracts mandatory attribute value constraint on business object set that business granule operates. Following is its representation.

AMCR=(Id, Application, Task, Rulesetname, Condition, Valid, Sequrence)

AMCR is the symbol of AMCR.

'Id' is the rule identity, which is exclusive

Application is that the AMCR is applied.

Task is the business granule where the AMCR is valid.

Rulesetname is the name of the rule set that the AMCR belongs to.

Condition is the mandatory constrain condition.

Valid indicates that the AMCR is valid

Sequence indicates the order the AMCR executes.

ARCR abstracts the constraint relation among the variable attribute values. The external user's requirements lead to the constraint relation among the business object instance sets consisting of all variable attribute values. Therefore, the ultima business object instance set makes up of these sets dependent on set operations. Following is its expression.

ARCR=(Id, Application, Task, Rulesetname, Condition, Setaction,)

ARCR is the symbol of ARCR.

'Id' is the rule identity, which is exclusive

Application is that the ARCR is applied.

Task is the business granule where the ARCR is valid.

Rulesetname is the name of the rule set that the ARCR belongs to.

Condition is the pre-condition that set actions execute.

Setaction is the set actions when condition is true.

3.University information system framework based on business rule

University information system framework based on business rule consists of three parts including

business rule management system(BRMS), database management system(DBMS) and function modules of university information system. In this framework, function modules of university information system implement basic functions university information system provided and DBMS manage the data of university information system. However, BRMS manage variable business requirement in the university information system. Its functions include:

·business rule repository definition

It includes business rule definition of logic structure, storing structure, secrecy and corresponding information format, etc.

·business rule repository management

It includes system control, rule storage, update and rule integrity, security control etc.

·business rule execution engine

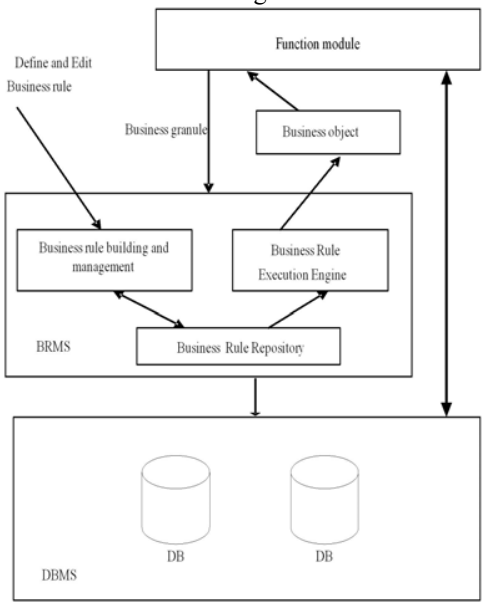

Figure 1 University information system framework based on business rule

This is a mechanism program that searches and implements business rule.

·business rule repository building and maintenance

This is a component that builds and updates business rule repository and maintains and restores structure of business rule repository.

Therefore, BRMS includes following components:

·business rule representation language and compiler

·business rule operation language and compiler

·business rule repository management program

Flow that university information systemexecutes is following: function modules of university information system provide BRMS with the requirement of business granule. Then BRMS picks up relevant rules from business rule repository, and business rule execution engine implements this rule set. At last, BRMS provides business object for the function modules of university information system to use. The specification is shown in Figure 1.

4.Example

The approach presented in this paper has been used in developing teaching affairs system of one university. During education, one student couldn't have two classes at the same time. Moreover, because teacher need tutor students and a teacher has limited energy, the number of tutored students must be limited. So, we need group teacher and students based on some constraints to form a suitable education grouping. This grouping can form automatically in terms of courses selected by students. So, we only consider that students select courses. What are analyzied in selecting courses are showed as follows:

Business granule: selecting courses

Business object:students, teacher, courses

Business rules:

(1)Student must be a student in this university

(2)course that student didn't select or pass before

(3)number of registered students of course is less than capacity of course

(4)course that student has pass its prerequisite course

(5)students haven't selected any course during this course

Above business rule can be expressed:

AMCR=(001, teachingaffair, selectingcourses, selectingcourses, xh=student.xh,valid,1)

AMCR=(002, teachingaffair, selectingcourses, selectingcourses, course<>student.selectedcourse,valid,2)

AMCR=(003, teachingaffair, selectingcourses, selectingcourses, registrationlist.size()<course.getminimum(),valid,3)

AMCR=(004, teachingaffair, selectingcourses, selectingcourses, course.getprerequisite()=student.haspassedcourse(),valid,4)

5.Conclusion

The above example shows that the implementation method based on business rule improve the flexible configuration and the expansibility of university information systems. At the same time, it also shows that the university information systems implemented by this method more adapt to the variable environment. Moreover, business rule is separated from the codes and stored in the repository, which reduces many codes and the complexity of the codes. The future work

should be done on the issues how to manage these business rules.

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半月刊

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目 次

会计研究 KUAIJI YANJIU

"营改增"对煤炭企业的影响及采取措施 / 闫素芹 / 4
浅析公立医院内控管理存在的问题及对策 / 齐新红 / 5
论电网工程前期费用管理 / 聂其兵 / 7
中小企业税收筹划存在的难点及对策 / 贾 丽 / 8
运用目标成本法控制病种费用的实践
——以扬州市妇幼保健院"经腹腔镜全子宫切除术"为例 / 宋长志 / 10
煤炭企业税收筹划问题探讨 / 周 莉 / 13
纳税筹划过程中可能面临的风险及风险应对研究 / 张 璇 / 14
营改增后不动产相关业务财税处理解析 / 田传礼 / 15
浅析房地产企业税收筹划 / 彭 辉 / 17
我国中小企业融资现状与政策分析 / 王园婷 / 18
差异征税下的公司理财策略探讨 / 张丹丹 / 19
恒瑞医药股权激励政策的实施效果分析 / 魏海鹏 / 21
K 证券股份有限公司治理的问题及思考 / 刘思培 / 22
房地产公司"现金为王"现象解析
——以万通地产为例 / 张玉馥 包前程 / 24
电子商务环境下审计的风险应对 / 吴圣恩 / 27
陕西航天动力高科技股份有限公司财务数据分析 / 王九洲 / 29
基于大数据的会计人员职业发展路径分析 / 李晓非 孙佩茹 / 31
浅析财务管理在企业内控体系中的核心作用 / 雍 轶 / 33
煤炭企业引入管理会计的重要性及措施探讨 / 秦文岗 / 34
会计职业判断在会计实务中的应用 / 宋 峰 / 36
浅谈煤矿财务管理中的内部控制问题 / 杨 勇 / 37
论行政事业单位的财务管理策略创新 / 王 贝 / 38
高校基建项目施工阶段委托跟踪审计质量的风险与控制
——以 R 项目为例 / 李艳婷 / 40
煤炭企业财务管理及成本控制探析 / 于春萍 / 41
煤炭企业会计信息失真解决措施 / 张燕燕 / 43
企业应收账款风险管理 / 牟 静 / 44
油田企业成本预算管理研究 / 朱阳凯 / 46
如何完善企业全面预算管理体系 / 施衍才 / 47
大型国有企业内部审计问题分析及解决对策 / 张 适 / 49
影响内部控制质量因素的文献综述 / 刘 丹 / 50

[期刊基本参数]CN 22-1359/ TP*1998*s*A4*256*zh*P*¥ 20.00*4600*127*2017-12-01

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在线 Q Q 770259850

地　　址 长春市人民大街4646号出版大厦9层

邮　　编 130021

印　　刷 长春第二新华印刷有限责任公司

国内发行 吉林省报刊发行局

邮发代号 12-175

订　　阅 全国各地邮政局(所)

国外发行 中国国际图书贸易总公司

国外代号 M5125

刊　　号 ISSN 1673-0194 / CN 22-1359/TP

广告登记证号 2200004000050

出版时间 每月1日、15日

定　　价 20.00元

公司财务报表短期偿债能力分析
——以苏宁电器股份有限公司为例 /肖舒予/ 52

会计信息化 KUAIJI XINXIHUA

会计电算化在煤炭企业中的应用 /赵　娜/ 53
ERP环境下现代企业成本管理分析 /刘阿千/ 55
大数据环境下审计方法创新的探索
——以中国石油天然气集团审计为例 /熊　祺/ 57
基于“互联网+”管理会计的高校财务信息化研究 /席燕玲/ 59
会计信息化对会计实务的影响与策略分析 /郑俊梅/ 60
大数据环境下的电子数据审计 /谢　天/ 62
审计信息化推动高校审计全覆盖的几点思考 /王　玥/ 63
ERP环境下高校后勤财务管理思考
——以云南某高校后勤为例 /熊　娜　康志红　王秋娜　田映红/ 65
财务信息模型研究 /邬保明/ 69
我国会计信息化发展研究 /陈立新/ 73

企业管理信息化 QIYE GUANLI XINXIHUA

大数据时代组织管理信息化架构的重构及其策略 /廖方宇　丛培民　及俊川/ 74
解析油田网络安全管理和防护建设 /杜克勋/ 78
个人工作平台——基于集成的待办捕获 /朱家山/ 79
电力企业信息管理中网络管理系统的应用分析 /蒲　敏/ 81

企业管理 QIYE GUANLI

电网企业固定资产管理的研究 /邹　琼/ 83
建筑装饰企业人力资源有效管理的相关思考 /申培军/ 85
中小企业发展困境与对策分析 /李龙平/ 87
做好办公室行政管理工作的探讨 /关伟强/ 88
基于新生代员工特点　构建和谐劳动关系 /古　映/ 90
沈阳英粉之家小微初创公司战略分析与选择 /张　颖/ 92
浅谈班组兼职安全员的管理 /王　涛　杨　举/ 93
谈高校学生食堂市场化运作的策略 /王　帆/ 95
电力企业物资计划库存管理探讨 /邓　毅/ 96
关于现代军事物流发展的思考 /张营军　苏英振　乔　磊/ 98
物流企业的市场营销策略选择 /李姜宇君/ 100
装备保障训练能力维度解构研究 /王继佳/ 102

金融与投资 JINRONG YU TOUZI

输配电价改革背景下电网投资风险分析
/尹　硕　王江波　蒋　炜　杨红旗　燕　景/ 105
山西省中小企业产业集群融资优势分析 /高　蕾/ 106
探秘山西省晋城市直销银行“小草银行”地方商业银行筹资转型 /徐晓婧/ 108
浅析金融杠杆成因及金融去杠杆方式 /陆　晶/ 110
广佛地区大学生校园贷使用情况的调研报告
/陈家桦　黄慧娟　罗颖薇　招兰香　梁凯琳　卢敏珊　林卓君/ 112

改进的 EGARCH-EWMA 金融时间序列预测模型 / 梅 杰 徐 玲 / 116
完善就业再就业资金管理的思考 / 曹菲菲 / 121

财政与税收 CAIZHENG YU SHUISHOU

关于深化预算绩效管理改革的思考 / 王海秀 范 帆 / 122
基于层次分析法的高校财政专项资金绩效评价研究 / 张巧华 / 126
不同生命周期科技型小微企业税收优惠政策实施情况分析
——基于常州 60 家企业问卷调查 / 赵红梅 李雅婷 / 129
经济技术开发区生态型财政绩效评价体系设计 / 王 锴 / 131

经济管理 JINGJI GUANLI

成都市住宅宗地价格影响因素研究 / 侯婉丽 / 134
贵州省城镇化发展特征与问题研究 / 袁永记 / 136
完善事业单位固定资产实物管理的创新思路研究 / 苏 雨 / 138
河南省电力负荷特性分析及预测 / 刘军会 王江波 白宏坤 邓方钊 何新荟 / 140
基于技术创新中介效应的产业结构优化与经济增长关系研究 / 杨 兵 戴淑芬 葛泽慧 / 142
冬奥背景下张家口城市宜居性满意度评价及对策研究
/ 贾慧慧 李春晓 张国兴 霍晓霞 陈秀丽 李艳芳 / 148

电子商务 DIANZI SHANGWU

“一带一路”互联网优先战略分析 / 蔡述斌 / 150

电子政务 DIANZI ZHENGWU

政务信息资源开放路径研究 / 杜 葵 闵旭蓉 / 151

信息管理 XINXI GUANLI

如何利用疾病编码在病案信息中的应用来统一医疗收费 / 康伟民 王思淼 / 153
畅销书对全民阅读的影响研究 / 赵 沫 / 155
“人本化”视角下高校图书馆馆员能力提升研究 / 易雪媛 龙兴跃 张沁兰 / 156
高校图书馆服务创新:科研出口端精准服务 / 邓艳明 / 158
高校图书馆学习共享空间的服务研究
——以爱荷华大学图书馆为例 / 刘佳佳 韩卫红 陈婧慧 / 162
浅谈图书管理信息化建设存在的问题与对策 / 李 媛 / 164
微博在企业竞争情报中的应用探索 / 孙德平 / 166

信息技术与应用 XINXI JISHU YU YINGYONG

油田注汽锅炉炉管结垢预警模型设计与应用 / 刘颖鹏 / 167
云南基层干部教育培训信息化建设的实践创新 / 汪善荣 杨金江 李明辉 顾泽鑫 / 169
高速公路路面养护决策支持系统研究 / 徐敏亚 杜树樱 / 171
视频监控专属存储技术分析 / 尚宝麒 / 174
图像纹理检测与特征提取技术研究综述 / 李秀怡 / 175
基于线结构光视觉技术的工件尺寸三维测量系统研究 / 汪小涵 赵 杰 / 178
医院自助服务平台的设计与应用 / 王伟伟 张彦彦 / 183

高校校园一卡通建设现状与趋势探究 / 范 媛 / 184
开发专业应用软件系统优化研究 / 宫 臣 / 186
面向物联网应用的人工智能相关技术研究 / 郑 华 / 187
基于数据资源整合平台的数据质量提升技术研究与应用 / 陈 武 / 189
新时期背景下对计算机网络安全技术及其防范策略的探析 / 李 骁 / 191
计算机数据库的管理应用技术研究 / 高 明 / 193
计算机数据库管理技术 / 单 宇 / 194
应用医诺管理软件实现放疗科放疗信息管理 / 初 铮 / 196
服务器虚拟化常见安全隐患及防范 / 韩 伟 / 197

公共管理 GONGGONG GUANLI

论新型智慧城市的核心价值导向 / 刁生富 姜德峰 / 199
中美两国 DRGs 应用回顾与现状对比研究 / 王思淼 / 201
新医改形势之下医院物价管理工作分析 / 苏会琪 / 202
国内外医养融合发展现状研究 / 管 灿 / 204
基于 SWOT 标准模型的扬州医养融合“特色”模式研究 / 常平平 / 207
关于博物馆消防工作网络体系化的可行性研究 / 蒋文礼 / 211
消费纠纷引发的群体性事件对策研究 / 王文静 / 213

教育教学研究 JIAOYU JIAOXUE YANJIU

基于移动互联网的混合式教学模式改革与实践 / 徐建华 / 214
大学生结构设计竞赛对土木工程专业大学生创新能力的培养 / 刘 健 陈英杰 朱海燕 / 216
大数据背景下信息管理与信息系统专业人才培养模式研究
——以山东财经大学为例 / 张 戈 张 新 王小斌 / 218
“互联网+”教育下的民办高校教师定位探析 / 王 晶 李吴松 / 221
当代大学生新媒体运用中的问题及对策 / 韩文献 / 222
面向“卓越计划”的计算机专业应用型校外实践教育基地建设研究 / 倪天伟 郭学俊 肖 文 / 225
基于产教融合的高职院校孵化器建设的思考 / 徐叶军 / 227
移动互联网背景下智慧后勤的建设实践与思考
——以重庆邮电大学建设实践为例 / 邓 杰 董春江 李国栋 / 229
就业视角下会计学专业人才培养反思 / 臧泽华 / 231
融入创新创业教育的电子信息工程专业人才培养模式研究 / 梁 策 曹立杰 宋维波 祝开艳 / 233
基于戴明理论的“PDDCEA”循环教学法在中职会计教学中的运用与思考 / 高 静 / 235
基于能力本位的信息管理与信息系统专业应用型人才培养模式研究
——以福州外语外贸学院为例 / 叶福兰 / 239
基于 MOOC 的 “混合式”教学模式实施情况分析与优化对策研究
——以苏州经贸学院为个案 / 杨毅红 / 241
基于课程改革视角的大学生创业协同教育模式探析 / 童源锋 / 244
社会转型背景下商务谈判与推销课程教学的思考 / 黄艳芳 / 246
从创建节约型高校略论学校水电节能对策 / 朱志明 / 247
关于高职会计教学若干问题的思考 / 李俊峰 / 249
以职业化为导向的职业教育课程体系设计
——以连锁经营管理专业为例 / 王 翠 / 251
高职“会计电算化”课程的项目化改革研究 / 谭晓红 王 晓 / 253
高校科研项目管理实施体系的构建 / 朱 斌 古 阳 / 255
现代学徒制下电子商务专业人才培养模式的创新研究 / 刘 丽 吴建洪 / 256

大数据背景下信息管理与信息系统专业人才培养模式研究
——以山东财经大学为例

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[摘　要] 基于大数据技术对信息管理与信息系统专业人才培养带来的挑战与机遇,山东财经大学信息管理与信息系统专业以"山东省高水平应用型专业(群)"建设为契机,进行分方向(开设财经大数据分析方向)培养,并在培养目标定位、课程体系模块化、师资队伍、实践教学环境等方面进行强化建设。

[关键词] 大数据;信息管理与信息系统专业;人才培养模式

doi:10.3969/j.issn.1673-0194.2017.23.109

[中图分类号] G40-051;G712.4　[文献标识码] A　[文章编号] 1673-0194(2017)23-0218-03

0　引　言

目前,大数据研究与应用已经成为信息管理领域中的热点。从信息技术层面看,复杂性度量、数据计算新范式、新兴的IT基础架构、数据的安全与隐私将成为研究大数据的核心问题;从商务管理层面看,由社会化的价值创造、网络化的企业运作以及实时化的市场洞察等多个视角出发考虑如何研究社会化网络环境中的行为机制与社会资本结构、企业网络生态系统及其协同共生机制、大数据环境下顾客洞察与市场营销策略,并由此生发出很多有价值的研究方向和应用领域。

因此,大数据作为继云计算、物联网之后信息产业又一次颠覆性的技术变革,已经在社会计算、商务智能、新媒体传播、信息系统架构等信息管理领域产生了巨大影响,同时也给信息管理与信息系统专业的发展和人才培养带来了新的机遇与挑战。

1　人才需求状况

大数据时代,需要处理的数据集合,不但在规模上急剧增长,数据类型也更趋复杂,对信息管理人员提出了更高的要求。TDWI(The Data Warehousing Institute)对大数据的分析报告指出,对现有数据进行分析和监测已经不能满足企业的需求,在日趋复杂的市场竞争中,对未来发展趋势的判断和预测能力成为企业的核心竞争力所在,未来的信息管理人员需要具备多方面的技能和素质以适应深度分析数据的需要,比如技术能力(工具、流程、专业知识)、管理能力(领导艺术、项目管理)、社会交往能力(交际、团队协作、解决问题)和系统能力(系统开发、企业规划)等。另外,对信息管理人员的需求量也在激增,据2011年麦肯锡全球研究所的一份报告预测,美国到2018年对具有良好信息素养的经理人才的需求量大约在150万,此外,还需要14万~19万数据分析方面的资深专家。我国相关部门预计3到5年内,来自政府、媒体、企业等方面的数据工程师和数据分析师的需求将达100万人左右,而目前的人才培养,无论是规模还是质量水平,都远远达不到要求。

2　国内外研究现状

为满足人才需求,美国政府率先行动,实施了一系列促进计划,以鼓励研究型大学设立跨学科的研究生专业课程,培养新一代数据科学家和工程师人才。例如向加利福尼亚大学伯克利分校的计算开发项目投资1 000万美元,该项目旨在集成3种数据转化信息方法(机器学习、云计算和众包),为"EarthCube"项目(旨在允许地球学家获取、分析和共享与地球相关的信息)提供第一阶段的资金支持;向一个研究培训小组(支持一项教授大学生如何利用图形和可视化工具解析复杂数据的培训计划)提供200万美元的资助;为一个由统计学家和生物学家组成的专业研究团体提供140万美元的研发资金;召集各个学科和领域的研究人员,共同探讨如何利用大数据转变

[收稿日期] 2017-06-15

[基金项目] 山东省2016年度省级教改重点项目(Z2016Z036);山东财经大学2014年度校级教学研究与教学改革项目(jy201438);山东财经大学燕山学院2016年教研教改项目"大数据背景下信息管理与信息系统专业课程体系改革与实践"。

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教育与学习模式等。美国已将发展大数据提高到国家战略高度，以求继续保持在国际上的科技领先地位。

国内的中国人民大学、北京大学、中国科学院大学、中央财经大学和首都经贸大学 5 所高校组建了一个协同创新平台，以“应用统计专业硕士”为载体培养大数据分析方面的人才，经过近一年的精心筹备，大数据分析硕士培养协同创新平台的第一期实验班已于 2014 年秋季学期开班。2016 年 2 月，教育部公布新增的“数据科学与大数据技术”专业，北京大学、对外经济贸易大学、中南大学成为首家获批高校。时隔一年，2017 年 3 月，教育部公布第二批“数据科学与大数据技术”专业获批的 32 所高校。到此为止，我国已有 35 所高校获批该专业。

3 对信息管理与信息系统专业的挑战

在大数据环境中，作为交叉学科的信息系统学科领域在应对大数据的过程中衍生出非常多的新技术、新手段、新方法，催生了很多创新产业，重构甚至颠覆了某些行业的传统产业链。复旦大学黄丽华教授在“第二届高等学校信息管理与信息系统专业人才培养与课程教学论坛（2013.11）”上对信息管理与信息系统专业人才培养也提出了很多新的有待解决的问题和需求：

第一，大数据概念，凸显出了当代信息技术应用的一种显着的社会性特征和应用需求，传统的信息获取、处理、实现方式将完全改变，对海量数据的分析不仅需要专业人员对一般数据规律和模型的把握，而且还应具备系统思维和全面把握的综合深入能力。

第二，大数据概念的产生，是人们对信息价值认知的巨大飞跃。获取数据已非难事，对这些富媒体化的数据处理尚待研究，处理方法、管理方法、科学范式将完全改变。

第三，大数据突破了过去信息技术和信息系统应用的领域、技术和科学范式，必然重塑信息系统学科和专业。因此，信息系统学科发展更应注重专业人才的培养。信息管理人才的需求不仅指一般的程序员和数据库工程师，更需要一大批包括数据分析师、首席信息官、社会网络学家等高端人才，这也是学科发展的基础。

4 大数据背景下山东财经大学信息管理与信息系统专业培养模式

4.1 专业概况

山东财经大学管理科学与工程学院的信息管理与信息系统专业沿自 1990 年原山东经济学院开始招生的经济信息管理专业，在长期的办学实践中形成了自身的优势和特色。目前，信息管理与信息系统专业每年招生规模在 4 个班 200 余人，在全国 600 余所开设信息管理与信息系统专业的高校中属于招生规模比较靠前。该专业在“九五”期间（1996 年，“经济信息管理”）及“十五”期间均被评为山东省重点学科，“十一五”、“十二五”期间山东省重点学科布局调整，该专业所在的一级学科——“管理科学与工程”又先后被评为山东省重点学科和特色重点学科；1996 年获得硕士学位授权点（“信息经济”），“管理科学与工程”学科 2013 年获博士学位授予权，信息管理与信息系统工程为第一研究方向；信息管理与信息系统专业教学团队 2008 年被评为省级教学团队，信息管理与信息系统专业 2007 年被评为山东省特色专业，2009 年被评为国家特色专业，2016 年被遴选为“山东省高水平应用型立项建设专业（群）”，2016 年所在学科“管理科学与工程”被遴选为“山东省一流学科”。如图 1 所示。

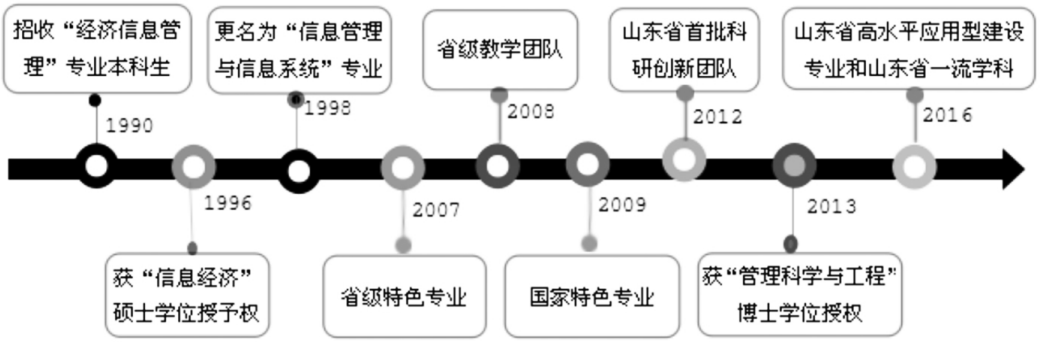

图 1 山东财经大学校信息管理与信息系统专业历史沿革及发展

4.2 培养目标

山东财经大学信息管理与信息系统专业培养学生具有扎实的管理学、经济学、计算机科学的理论基础，掌握计算机应用、定量分析理论及方法、信息系统分析与设计及大数据分析等方面的知识与能力，能在国家各级党政机关、工商企业、金融机构、管理咨询机构、科研单位等部门承担信息系统规划、建设和管理以及信息和大数据资源开发利用等工作，具备良好的人文素养和科学精神，基础扎实、知识面宽、适应能力强、富有实践能力和创新精神的高素质应用型人才。

4.3 课程体系改革

为了适应大数据环境对信息管理与信息系统专业的挑战和我校信管专业的培养目标，以及招生规模相对较大的情况，我校信管专业在制定 2017 版培养方案时进行了大胆改革，将信息管理与信息系统专业尝试进行分方向培养：企业信息化、信息系统开发以及财经大数据分析三个方向。

在设置培养方案课程体系时，坚持“通识性、大平台与分类

培养相结合”的基本原则，三个方向的通识课、学科基础课和专业课平台中课程设置没有差别，只是在专业选修模块和专业实践模块进行了分方向培养。

课程体系如图 2 所示。

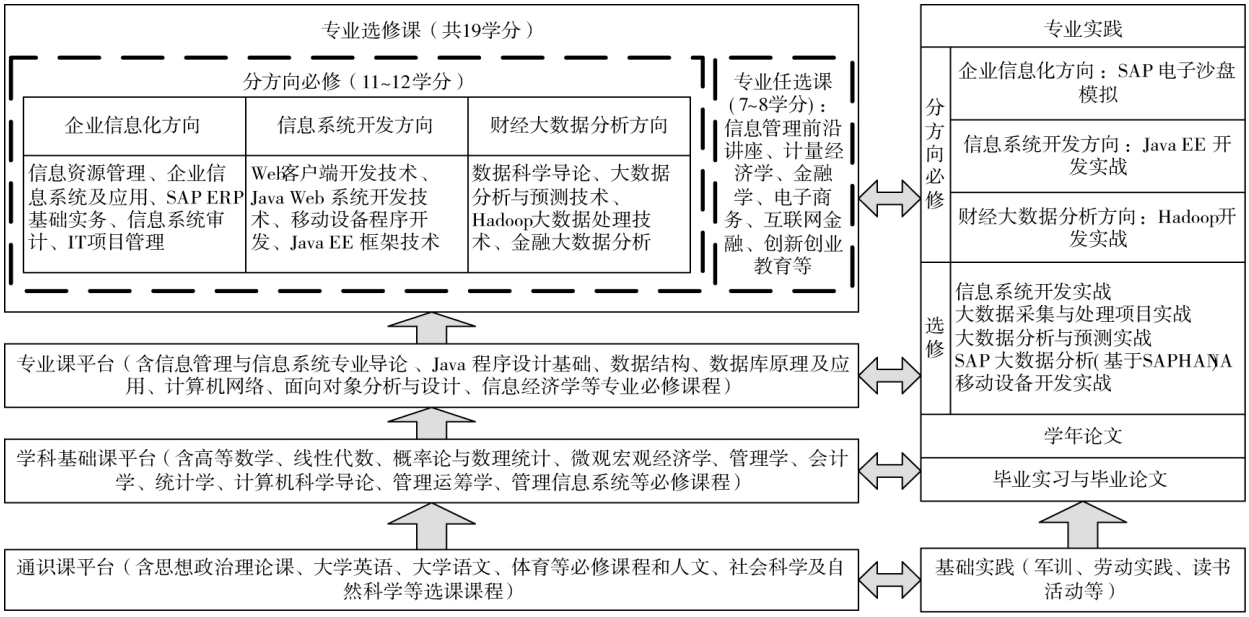

图 2　山东财经大学校信息管理与信息系统专业课程体系

4.4　师资队伍建设

作为山东省高水平应用型立项建设专业，首先要建设一支具有高水平实践教学能力的师资队伍，因此，学院与浪潮集团、中创软件以及齐鲁软件园驻园 IT 企业建立良好的师资培养合作关系，一方面每年委派 3~5 名青年教师到企业挂职学习，另一方面聘请企业优秀专业技术人才、管理人才和高技能人才 3~5 人作为专业建设合作带头人，专业技能课程聘用企业或行业专家担任兼职教师的比例达到 25%以上。

4.5　实践教学环境建设

4.5.1　巩固和强化校外实践教学基地

巩固、提升、适当调整已有的校外实践教学基地，不断加强校企合作，提升与行业、企业、研究机构的合作层次和水平，为学生提供合适的企业实习、见习机会。根据需要，继续开辟新的学生实习、实践基地建设，为学生提供良好的、更多的实践环境。

拓展和深化与企业的实质性合作，与相关企业开展产学研合作，采取联合项目立项的形式，加速已有和正在进行的具有较高水平的科学研究成果的转化。

4.5.2　加强校内实践基地的建设

依托济南市历下区与我校合作共建的“山东财经大学大学生创业园”，制定本专业本科生创业计划，实行学分制，允许学生休学创业，鼓励学生尝试在校进行创业实践，扶持已具备运营条件的创业项目在园区进行孵化，直至推向市场转为产业化应用。

4.5.3　加强专业实验室环境建设

学院近年来在原有实验室的基础上进行整合，累计投资 880 余万元，组建了教学实验中心，目前已经拥有 7 个专业实验室，可使用的实验室面积 1 200 平方米，实验教学及科研用设备及计算机 500 多台（套）。目前已建成并投入使用的实验室包括：信息系统工程实验室、云计算实验室、电子商务与供应链实验室、企业管理模拟实验中心。另外，在建研究用大数据与商务分析实验室、物联网与智慧养老实验室各一个，共 300 平方米。

5　总　结

随着以大数据、云计算、物联网、移动互联网为代表的新兴技术在组织运营和社会活动中的不断应用，对信息管理与信息系统专业人才培养提出了新的挑战与发展机遇。山东财经大学以“山东省一流学科”建设和“山东省高水平应用型专业”建设为契机，考虑本专业多学科知识交叉的特点，打通课程界限，实行分方向培养，进行模块化改革，创新人才培养模式。

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11 >
9 771673 019002
定价：12.00元

中国管理信息化

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2014 年第 17 卷第 11 期(总第 281 期)

目 次

会计研究 KUAIJI YANJIU

浅析国内企业环境会计核算 / 杨洪涛 / 2
从审查结论评价我国上市公司 2012 年年报质量 / 雷 虹 / 4
公允价值模式下的审计风险分析 / 赵 璐 / 6
股东控制权结构与其对公司绩效影响研究 / 李鸿渐 马 娜 / 7
应税消费品包装物的税务处理及税务筹划 / 刘纬纬 王国庆 / 9
车险成本控制策略分析 / 韩松涛 杨敬东 / 11
浅论电信企业财务风险及风险管理策略 / 叶学钰 / 12
关于企业建立内部控制制度的一点思考 / 张秋实 / 14
加强材料成本审计 促进企业效益提升 / 王 军 / 16
企业会计风险管理的有效方法探讨 / 周娜娜 / 17
高速公路建设项目内部审计的若干思考 / 李军涛 / 18
对当前审计环境的思考 / 徐 喆 / 20
浅谈事业单位的预算管理及改进 / 赵 玥 / 21
浅析企业会计信息失真的原因及其治理 / 段燕霞 / 22
转制型科研单位企业化管理后财务工作新特点和新措施 / 惠 茹 / 24
社区卫生服务中心财务管理现状及对策研究 / 苏学会 / 26
关于企业拆迁所涉税费征收的探讨 / 刘朝阳 / 27
关于强化高等职业院校固定资产管理的思考
——基于内部控制的角度 / 陈建华 / 28
固定资产进项税额抵扣管理相关问题的探讨 / 赵志辉 / 30
事业单位财务集中管理存在的问题及应对策略 / 梁丽玲 / 31
新会计制度下强化公路工程施工企业财务管理工作 / 吕志宽 / 32
浅谈基层卫生医疗机构财务管理 / 杨 飞 李晓涛 / 33

会计信息化 KUAIJI XINXIHUA

现代企业财务管理信息化研究 / 蔡鸿轩 / 34
XBRL 应用对会计信息质量的影响 / 谭丽华 / 36
浅谈计算机审计在医院审计业务中的应用 / 王锦玲 / 38
浅谈集团企业财务信息化建设 / 刘建洁 / 39

企业管理信息化 QIYE GUANLI XINXIHUA

基于 SSH2 框架的企业设备租赁管理系统的设计与实现 / 戴雯惠 翟高粤 / 40
基于条码技术的工厂供应链管理系统设计 / 陈小龙 张婧慧 杨 有 / 42
跨平台地震数据质量控制软件系统 / 王学军 韩文娜 / 44
基于 Web 的信息管理平台系统的设计与实现 / 胡小林 刘晓东 王晓林 / 47
基于 SOA 的战略新兴产业发展项目管理系统架构设计 / 任 斌 郑国勋 / 50
建筑施工企业档案信息化管理中的问题及解决思路 / 陆 华 / 51
基于 B/S 结构的厂级管理信息系统的架构设计与实现 / 陈 双 / 53

[期刊基本参数]CN 22-1359/ TP*1998*s*A4*112*zh*P*¥ 12.00*4600*72*2014-06-01

主　　编　吴文凯
执行编辑　周振新　刘　军
版式编辑　王　征
主　　管　吉林出版集团有限责任公司
主　　办　吉林科学技术出版社
编　　辑　《中国管理信息化》
　　编辑部
电　　话　(0431)85635173
　　(0431)86037903
传　　真　(0431)85635173
投稿信箱　xxh2005@VIP.sina.com
　　xxh2005@mail.jl.cn
在线 Q Q　770259850
出　　版　中国管理信息化杂志社
地　　址　长春市人民大街4646号
　　出版大厦9层
邮　　编　130021
第二编辑室
电　　话　(0431)89642119
印　　刷　吉林省东文印务有限公司
国内发行　吉林省报刊发行局
邮发代号　12-175
订　　阅　全国各地邮政局(所)
国外发行　中国国际图书贸易总公司
国外代号　M5125
刊　　号　ISSN 1673-0194
　　CN 22-1359/TP
广告登记证号 2200004000050
出版时间　每月1日、15日
定　　价　12.00元

市级区域卫生信息化建设探讨　/孔明军/ 54
基于OpenVPN的企业远程安全访问方案设计　/周　冰/ 56
GIS在炼化企业厂区外管道安全管理中的应用研究　/姜顽强　张静淑/ 57
网格计算对企业信息化建设的作用和影响　/牛伟丽　邹宏波　王　晶/ 59
商业银行前后台业务分离中的"云"思想　/李沛钊/ 60
车载GPS系统功能在安全管理中的运用　/何　锐/ 62
浅析微信营销的方式和实质　/孙大航/ 63

企业管理 QIYE GUANLI

基于关键词分析的组织创新管理研究现状　/Zennouche Mohamed　张　剑　张　玉/ 64
心理契约与组织公民行为的影响研究　/程志伟/ 67
提前订货下的供应链库存供需分散优化的研究　/李群霞　马风才　张　群/ 69
中小企业治理存在的问题及改进
——基于企业生命周期理论　/吴颂华/ 71
企业员工绩效的合理规划与制定解析　/郑琼娜/ 73
企业职务晋升的激励作用　/赵红冬/ 75
浅谈企业文化与人力资源管理紧密结合的重要性　/曹伟忠　杨文平/ 76
论市场经济下的多元化人力资源管理　/余　洋/ 77
基于绿色消费的绿色营销策略研究　/李余梅/ 78
高阶管理者心智模式对企业的影响　/李　颖/ 79

经济管理 JINGJI GUANLI

江西省奥体中心经营现状与发展对策研究　/孙　红　朱大军/ 81
对报纸广告经营业务管理的思考　/赵建和/ 82
呼和浩特市保障性住房建设面临的问题及对策研究　/李雪敏　武振国/ 83
低碳经济背景下企业转型战略研究　/许　林/ 85
城乡一体化建设中的土地管理策略研究　/韩　娜/ 86

电子政务 DIANZI ZHENGWU

河北省海洋信息管理
——基于3S技术采用C/S和B/S相结合结构网络报送方案/黄　淼　高志斌/ 87

信息管理 XINXI GUANLI

基于协同创新机制的学术社交网络平台研究　/吴正洋　陈先哲/ 89
图书资料管理人员综合素质提高的途径探讨　/李昊生/ 91
从管理角度谈高校档案信息资源建设　/陈　露/ 92
试析网络化图书馆管理员素质的提升　/亓晓娟　邵建春/ 94
医院图书馆精细化管理研究　/岳佳琦/ 95
关于我国档案管理体制改革的研究　/姚源玲/ 96

教育教学研究 JIAOYU JIAOXUE YANJIU

建立绩效工资制度　完善高校教师激励机制　/彭桂芳/ 97
高职院校外聘教师管理存在的问题及对策分析　/杨　琴/ 99
在"市场调研与预测"课程教学过程中运用项目导向法　/郭　丹/ 101
依托创业实践基地　培养学生创业能力　/方　瑜/ 102
J学院特色会计实践教学体系的探索　/杨　涛/ 103
"三改"管理会计教学　/周凤华/ 104
基于创业教育的经济管理类跨专业综合实验教学的探讨　/李文琴/ 105
高校知识管理的流程设计与技术支持　/余　乐　黄　曦/ 107
基于社会需求的信息管理与信息系统专业人才培养模式研究
/林金娇　樊铭渠　蒲海涛　李　军/ 110
地方财经院校"财务分析"课程的案例教学法新探　/梁毕明　于晓红/ 112

基于社会需求的信息管理与信息系统专业人才培养模式研究

林金娇[1],樊铭渠[2],蒲海涛[2],李　军[1]

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摘　要 近年来大学生就业问题成为社会关注的焦点之一,因此高校如何培养出能够满足社会需求的专业人才成为当前高校的研究热点。根据多年的教学实践,本文提出财经类院校在教学实践中,应关注经济发展前沿、把握市场需求导向,根据社会对信息管理与信息系统人才的多样化和层次化需求,着力构建与完善既符合当代经济社会实际需要,又体现各自培养特色的需求导向型培养模式。

[关键词] 信息管理与信息系统;人才培养;模式;社会需求

doi: 10.3969/j.issn.1673－0194.2014.11.071

[中图分类号] G642.0　　**[文献标识码]** A　　**[文章编号]** 1673-0194(2014)11-0110-03

0　引　言

“人才培养模式”是高等院校为被培养对象构建的知识、能力、素质结构以及实现培养功能的具体方式,它从根本上确定了被培养对象的基本特征。“基于社会需求的人才培养模式”是指在人才培养的整个过程中,以社会需求为导向开展教育教学建设及各项人才管理工作,同时实施与之相适应的规范与灵活并重的培养模式。

近年来大学生就业问题成为社会关注的焦点之一。本质上,大学生就业难的原因不是总量问题而是结构问题,主要原因在于长期以来,我国的高等教育学科专业设置与培养普遍遵循供给导向型原则,专业设置与市场需求出现脱节。传统的人才培养模式与人才知识结构、素质结构,已经不能适应我国经济发展的实际。因此,解决大学生就业难的问题,关键在于利用劳动力市场提供的信号,按照社会需求的规律改革与完善高等教育体制,构建与创新需求导向型人才培养模式。换言之,教育部门应根据市场人才供求的动态信息,及时地进行学科、专业和教学内容的调整,以较好地适应与满足市场的需求。显然,建立这样一种市场信号生成机制、传导机制和调整机制,需要需求导向型的教育机制与创新型人才培养模式的建立和完善。

当前,知识经济正以全新的姿态迅速兴起和发展,并爆发性地向全球扩张。伴随着新技术革命浪潮的层层推进和经济结构的不断变化,即使发展非常迅速的信息管理领域,毕业生就业态势也日趋严峻,竞争异常激烈,综合素质和社会适应能力已逐渐成为信息管理人才需求与竞争的焦点[1]。在这种形势下,具有完备的知识结构、敏锐的创新意识与精神、完善的人格与较强社会适应能力的信息管理与信息系统专业综合性人才,才能胜任相应的岗位,并必然会得到市场的青睐。因此,财经类院校在教学实践中,应关注经济发展前沿、把握市场需求导向,根据社会对人才的多样化和层次化需求,着力构建与完善既符合当代经济社会实际需要,又体现各自培养特色的需求导向型信息管理与信息系统人才培养模式,努力为经济社会发展培养更多的实用型信息管理与信息系统人才。

1　国内外研究现状

目前国内外有关于人才培养模式的探讨与相关研究已有很多[2-3],总体来说,人才培养模式主要包含3个要素:教学制度、教学模式和人文环境,大部分的研究内容主张高等院校的人才培养应该在以下方面努力:面向社会实际、强调学科交叉、重视能力培养、加强实践环节、培养团队精神、训练系统思考和创新能力等。

当前针对信息管理与信息系统专业人才培养模式的研究主要问题表现在以下方面。

1.1　专业定位模糊

国家教育部《普通高等学校本科专业目录和专业介绍》[4]中对信息管理与信息系统专业的培养目标做了明确规定,但其表述具有高度概括性且较宽泛。很多学校的专业教师在对专业培养方案以及教学大纲的制定过程中,就会由于理解的模糊而造成一定偏差;从而致使该专业的学生,特别是刚刚踏入校门的新生对其所学专业的发展方向和将来的就业方向感到更加迷茫。很多高校的信息管理与信息系统专业教师是原来从事管理专业或者计算机专业教学的,就很容易从自己专业的角度出发,简单机械地把该专业分为管理发展方向和计算机发展方向。而实际上,信息管理类专业除了要开设计算机专业的信息技术类课程外,还要注重管理信息系统的设计与开发能力的培养。

从专业人才培养过程来看,很多高校的培养方案和课程体系上存在缺陷。一是专业课程的设置,没有按照知识获取行为的习惯来安排先导课程和后续课程。二是不注重实践教学环节,忽视了本专业作为交叉学科的特点,缺乏让学生应用所学知识,进行综合能力锻炼的必要手段。三是专业课程之间的必要联系体现不够深入,信息管理相关的基础理论与信息技术类课程衔接不紧密,使得学生学完相应课程后主动灵活地应用所学技术进行设计和开发较难,限制了学生能力的提高。

从现实的角度分析,信息技术已广泛应用在现代企业管理中,企业的管理理念、管理思想和管理方法发生了根本变化。信息技术同样深刻地影响着当代经济社会的各个方面。如何培养能够快速适应科学技术的发展,符合社会实际需要的学生,是信息管理类专业人才培养的又一重要课题。

1.2　培养模式混乱

目前信息管理类专业的定位体现在3类课程上:第一类是通识类课程,如高等数学、外语、思政类等;第二类是经济管理类课程,如管理学、经济学、会计学、财务管理等;第三类是信息技术类课程,如编程开发、操作系统、网络通信、数据库等。该培养模式没有形成有效的交叉学科专业课程体系,仅仅是把多个学科的课程简单拼凑,课程衔接不紧密,知识体系不健全。另外,许

[收稿日期] 2013-12-29

[基金项目] 山东省高等学校教学改革项目(2012073,2012552,2012033);山东科技大学教学研究项目(qx2013286)。

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多院校的信息管理与信息系统专业培养方案不尽相同，观点上也存在着很大的分歧。教育部 1998 年的《普通高等学校本科专业目录和专业介绍》中确定的课程包括：经济学、会计学、市场营销学、生产运作管理、组织战略与行为学、管理学原理、应用数理统计、运筹学、计算机系统与系统软件、数据结构与数据库、计算机网络、信息管理学、信息组织、信息存储与检索、管理信息系统分析与设计等[4]。以上课程若要按照模块划分，则应该有：经济学知识模块、管理学知识模块、计算机知识模块和信息管理知识模块等，针对这一方案，各高校意见不统一，表 1 是几种典型的课程模块化方案对比。

以上方案中，各校普遍达成共识的是包括基础素质知识模块、现代信息技术模块、信息管理与信息系统专业知识模块和专业学科背景知识模块。由此可见，专业培养的首要目标是要解决专业知识结构的系统性。

2.3 实验室基础条件差，实验和实训环节薄弱

信息管理与信息系统专业具有理论与实践结合紧密的特点，特别要求专业教师具有工程实践经验。但是当前很多新教师硕士或博士毕业后直接走上讲台，缺乏具体信息化工程实施的经验。由于教师无法从实践中领会信息化实施方法的本质，只能照本宣科进行理论传教，使得学生更加无法切身感受到信息技术对企业现代化建设的重要性和关键性。因此，专业教师的知识更新和工程实践经验是当前存在的严峻问题。另外大家误认为信息管理类专业属于管理科学，存在对管理类专业实验室认识的误区：相对于理工类实验室，管理类专业实验室需要大量投入，但是产出较少，甚至为零。因此，各高校宁愿大量投入资金建设理工类实验室，也不愿将资金投向管理类专业实验室。另外，部分高校对理论教学人员和实验教学人员在待遇等方面不同等对待，严重损害了实验教学人员的工作积极性。由于以上存在的问题，导致信息管理类实验室的建设明显滞后于社会对于人才培养的需求，使之无法发挥其在人才培养中的重要作用。

2 改革方案设计和解决问题的方法

2.1 改革方案设计

表 1 几种典型的课程模块化方案对比

	课程模块				
方案一	基础素质知识模块	文献信息科学知识模块	计算机与数据库知识模块	专业学科知识与相关学科知识模块	
方案二	科学文化知识基础和语言工具知识模块	经济学知识模块	现代信息技术模块	专业化课与专门化课模块	学科背景知识模块
方案三	政治课基础课	专业基础课	专业技术课	专业延伸课	背景知识课
方案四	数学物理基础模块	信息技术基础及应用模块	信息管理理论与方法模块	经济与人文社会科学知识模块	
方案五	信息管理理论及技能知识模块	现代信息技术及应用能力知识模块	应用领域知识信息开发技能层的知识模块		

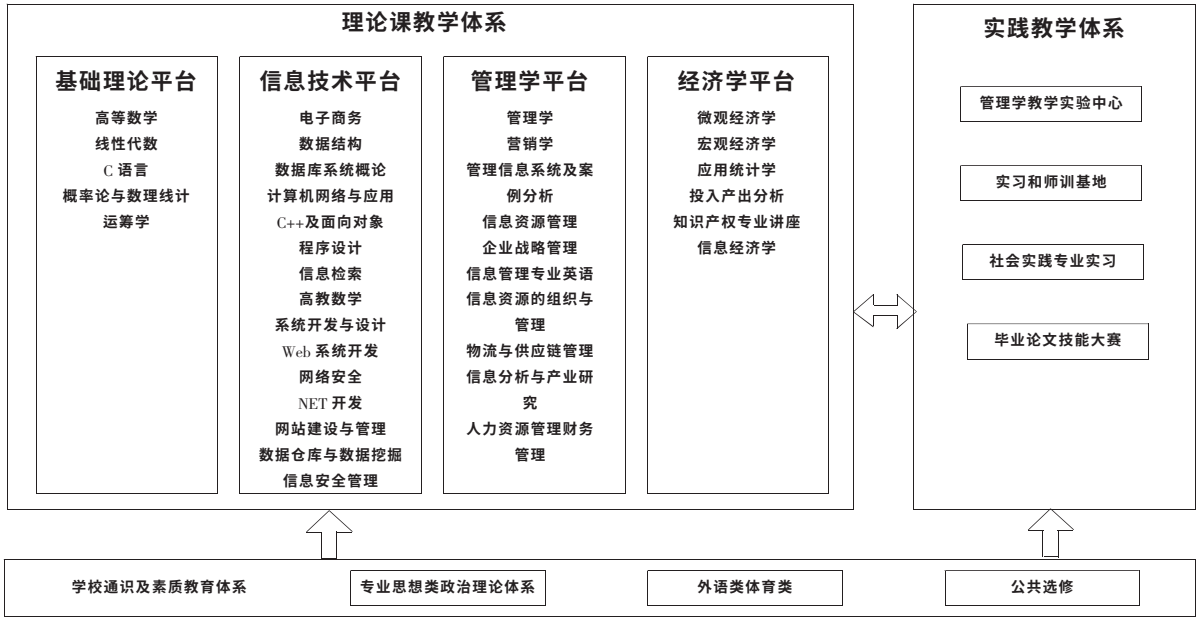

图 1 信息管理与信息系统课程体系

由图 1 可以看出信息管理与信息系统专业涉及的专业知识范围较为广泛，由于信息技术发展更新速度快，课程教学任务和工作量繁重，而专业学时有限，因此，创新专业教学改革和建设尤为重要。

(1)改革信息技术模块类课程。对信息技术模块类课程进行相应改革，使学生能够有效利用信息技术，把管理类课程中学习到的反映企业各项工作的运行状况的指标、管理与决策问题，结合在数学课程中学习到的各种定量方法，分析问题和解决问题。

(2) 改革实践教学环节。围绕行业背景和专业培养目标来构建各种实践教学环节，形成环环相扣的实践教学链，以提高学生的基本实践能力、专业胜任能力和创新能力为目标，完善和改革现行的信息管理与信息系统专业实践教学目标体系、实践教学内容体系、实践教学管理体系以及实践教学质量评价体系，构建出本专业“四位一体”的闭环实践教学体系(见图 2)。

(3)改革教学方式，创新教学手段。更新教学理念，鼓励学生勤思考、多分析，并加强学生动手能力、实践能力的训练。利用现

地方财经院校“财务分析”课程的案例教学法新探

梁毕明,于晓红

(吉林财经大学,长春 130117)

摘 要 财务分析是地方财经院校会计学和相关专业的必修课,其课程是在已有会计学相关专业知识基础上,对企业财务进行综合分析和评价,且能独立完成财务分析报告。案例教学是对传统教学方法的突破。本文主要探讨如何在财务分析教学中真正体现出案例教学应有的教学效果。

[关键词] 财务分析;课程;案例教学法;教学互动

doi:10.3969/j.issn.1673-0194.2014.11.072

[中图分类号] G647 **[文献标识码]** A **[文章编号]** 1673-0194(2014)11-0112-02

在大学教育阶段,对于学生来讲,根本的困惑在于自己专业将来的职业定位,而在学习过程中难点在于学的专业知识怎么用,有多大的用处。尤其是文科专业的同学,在一定假定的经济环境下,把所学的专业理论用于“实践活动”中,成为教学困境。案例教学法是在学生已掌握一定的基础理论知识后,通过剖析具体的案例,培养学生的实践能力和积极的思维能力的一种教学方法。

[收稿日期] 2014-03-04

1 财务分析课程介绍

地方财经院校会计学专业、财务管理专业等都开设财务分析

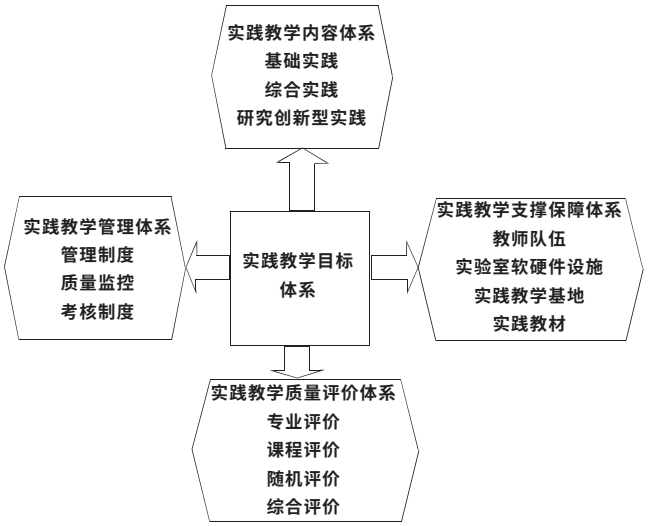

图2 “四位一体”的闭环实践教学体系

代化教学方法和教学手段,充分调动学生的学习主动性。在课程教学中,注重学生自学能力、创新能力以及独立分析问题、解决问题能力的培养。课堂教学中,坚持理论与工程案例相结合,提高学生综合运用所学知识解决实际问题的能力。

2.2 解决问题方法

基于上述的改革方案,我们提出了以下解决问题的方法:

(1)优选教材和教学参考书。选配一套适合我校自身特点的教材体系,而且要注意教材与教材之间的相互衔接。每一门课程应有一本好的教学参考书。教材的选择是重要的,一门课程使用一本优秀的教材将使学生受益良多,弄通了一本教材,可触类旁通。

(2)重视基础理论课程的教学,合理安排课程进度。重视基础课、专业核心课程和实验课程的教学,加强辅导、答疑和批改作业,选派全系较好的教师上基础课和专业基础课。根据多年的教学经验,学生能否逐步成长为有培养前途的科学技术人才或适应社会需求的人才,第一年的学习尤其重要。除公共课程外,学科的特点决定了一年级学生应该把大部分精力放在数学等基础课程的学习上,而不是首先学会计算机操作、程序设计等课程。认真听课、反复读书、勤于思考、深入体会等一系列需要重复进行的枯燥的学习方式恰恰突出地反映了本专业低年级的特点。许多学生由于没有在低年级进行系统的、艰苦的基础课程的学习与训练,结果导致在高年级学习较有深度的课程时,常常感到力不从心。而一旦某个学生较好地完成了基础课程的学习,即使大学入学成绩低于其他学生,也会在今后的学习中赶上甚至超过别的学生,且学习后续课程较为轻松。其中的根本原因在于,这类学生按照信息管理与信息系统专业对基础课程的要求,真正地经历了基础知识的严格训练。

(3)改革考核方式。信息管理与信息系统专业具有理论性和应用性很强的双重特性,核心课程的考核方式对学生的成长具有重要的作用。应倡导优良学风,依靠科学的学分管理机制,使理论学习与知识应用得到充分体现,保证考核公正、客观、可信。

(4)加强实验教学,规范实验教学过程。在重视基础课程课堂授课的基础上,有针对性地、有计划地加强信息管理与信息系统实验课程中基本实验技术的教学,培养学生理论联系实际能力和良好的动手能力。

3 总 结

信息管理与信息系统专业是信息化社会中一个必不可少的专业,各行各业都需要进行信息管理,本文从理论和实践教学等方面对当前信息管理与信息系统专业人才培养模式改革进行探讨,希望能进一步提高该专业毕业生的社会适应能力。

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目 次

会计研究 KUAIJI YANJIU

关于非货币性资产交换准则适用范围的思考 /田春晓/ 3
对我国公共债务会计的反思与重构 /邓小军/ 4
权责发生制的困惑与二重会计确认核算模式的构建 /钞天虎/ 6
电算化条件下特定业务的会计核算 /程 萍/ 9
医院财会电算化网络系统的建立与实施 /袁 晶/ 11
会计信息化应用中的问题及几点建议 /张力红 李 威/ 12
施工单位会计管理的主要问题及对策 /韩创社/ 14
关于会计电算化内部控制的思考 /马 雯/ 15
公共财政改革对科研项目经费的信息化监督 /冯 虹/ 17
浅议施工企业内部会计控制 /李赓禹/ 18

财务管理 CAIWU GUANLI

事业单位拨入项目款的管理与使用浅析 /屈艳清/ 20
浅谈不同预期下应收票据贴现的账务处理 /王先鹿 鞠志强/ 21
论财务报表分析在商业银行信贷工作中的运用 /吴青川 鄢志娟/ 22
商业信用风险控制决策中的敏感性分析 /王洪海 王 静/ 24
浅谈本币现金池管理中的税收和费用问题 /祝映兰 杨 坤/ 28
刍议中小企业财务风险预警 /赵增弘/ 30
基于 VBA 的住房贷款规划模型设计与实现 /陈艳艳/ 32
房地产业上市公司现金股利分配的影响因素分析 /吕文勇/ 34
浅议企业集团纳税筹划 /于桂英/ 37
浅谈加强企业存货管理的措施 /王 英/ 39
浅论设计阶段的工程项目投资控制 /王 丽/ 41
基于现金流量法的企业价值评估 /李郑巧 张 彤/ 42
依托信息网络技术提升高校医院财务管理水平 /蔡郁群/ 43
浅析上市公司股利分配政策 /李学君/ 45
浅谈海外企业的金融管理 /于金刚 赵 虹/ 46
加强医院财务管理 强化医院内部控制制度 /杨建国/ 47
石油企业竞争日益激烈背景下的人工成本控制研究 /李 蕾/ 49
集团企业风险管理与财务管控探讨 /石小明/ 50

[期刊基本参数]CN 22-1359/ TP*1998*s*A4*160*zh*P*¥ 7.00*4600*93*2011-09-01

论中小企业经营性现金流量管理 /刘 宁/ 51
国防科研项目软件定价探讨 /徐 苹/ 52
医院经营管理中的成本控制 /王 宇/ 53
小议行政事业单位固定资产的内部控制 /乔 娟/ 56

审计研究 SHENJI YANJIU

基于数据挖掘的审计数据分析 /荆 霞 张金城 黄作明/ 57
审计人员谈判绩效及影响因素研究 /任秀梅 石雪静/ 60
浅谈工程造价审计的程序 /万丽杰/ 62
政府非税收入管理规范化探讨 /苏文荟/ 63
集团企业内部控制体系的构建 /何克飞/ 64
当前我国企业内部控制存在的问题与对策 /曹乐颜/ 65

金融与投资 JINRONG YU TOUZI

基于KMV模型的市政债券信用风险管理问题研究 /刘 澄 王大鹏/ 67
民营银行市场准入法律制度 /张媛媛/ 70
企业负债的违约风险测度 /李 岭 张 群 邵艳军 杨 健/ 72

经济管理 JINGJI GUANLI

基于灰色理论的甘肃省非师范类人才有效供给预测 /马慧莉 胡春平/ 74
航空物流配送路径优化 /王秀珊 许坤榕/ 76
目前商品交易的新特征 /梁阿莉/ 77
内蒙古能源产出与地区GDP关系的实证分析 /李国晖/ 79
临沂市林农参与林业专业合作社的行为研究
——基于149户林农的问卷分析 /孙 翠 翟印礼 田少静/ 81
基于工作搜寻理论的石油院校毕业生就业问题研究
——基于东北石油大学2010届毕业生的调查 /尹志红 付 瑶 高翠娟/ 83
不动产产权估价理论方法研究 /李 跃/ 85
浅谈煤矿开采沉陷区的综合治理措施 /康志红/ 88
统计学在经济与管理领域的应用探讨 /尹彩芳/ 89

公共管理 GONGGONG GUANLI

知识管理视角下促进高校科技成果转化的对策研究 /王桂月 徐世星/ 90
信息负熵在图书馆系统管理中的作用 /赵孝芬/ 92
普适计算环境下的图书馆参考咨询服务与管理 /朱彩萍/ 94
导入CIS战略加强高校期刊阅览室的管理 /杨红梅/ 96
新形势下的图书信息化管理 /徐菊香 黎 明/ 97
提高高校科技档案利用水平推动档案工作迈上新台阶 /李怡林/ 98
新生代农民工城市融入策略
——社区工作完善初探 /潘绅姝/ 99
“人肉搜索”网络传播规范的路径研究 /王印红 吴晶晶/ 101
浅议人民陪审制度的缺陷及管理完善 /钱 怡/ 103

企业管理信息化 QIYE GUANLI XINXIHUA

ERP系统运行状态测评研究 /江 炼/ 104

主　　编　吴文凯
执行编辑　周振新　刘　军
版式编辑　王　征
主　　管　吉林出版集团有限责任公司
主　　办　吉林科学技术出版社
编　　辑　《中国管理信息化》编辑部
电　　话　(0431)85635173
　　(0431)86037903
传　　真　(0431)85635173
投稿信箱　xxh2005@VIP.sina.com
　　xxh2005@mail.jl.cn
在线 Q Q　770259850
出　　版　中国管理信息化杂志社
地　　址　长春市人民大街4646号出版大厦9层
邮　　编　130021
第二编辑室
电　　话　(0431)86552407
印　　刷　吉林省东文印务有限公司
国内发行　吉林省报刊发行局
邮发代号　12-175
订　　阅　全国各地邮政局(所)
国外发行　中国国际图书贸易总公司
国外代号　M5125
刊　　号　ISSN 1673-0194 / CN 22-1359/TP
广告登记证号 2200004000050
出版时间　每月1日、15日
定　　价　7.00元

制造型企业信息化成熟度测评体系设计　/吕虹云 / 108
Web混合模式下面向订单装配的生产管理系统　/汝　刚 / 110
武警部队生活费管理信息化初探　/屈　晨　徐俊杰 / 112
TCP/IP路由穿透方案设计　/许西文 / 114
基于云计算的中小物流企业信息化分析　/马鹏煊 / 115
基于SOA的监狱信息集成研究　/邓　可 / 117
基于ERP的科研项目管理探索　/贾君君　李为卫　杨　扬 / 120
基于Excel的商品销售统计分析系统的构建　/杨　桦 / 121
从企业的角度看ERP实施　/陆　赞 / 123
信息化建设在人事工资管理工作中的作用分析　/史丽波　于连美　刁慧杰 / 127
医院管理信息化建设初探　/杨爱荣　魏赟鹏　张慧英 / 128

企业管理 QIYE GUANLI

基于改进BP神经网络的钢铁企业能耗分析　/胡　睿　张　群 / 129
论我国对公司交叉持股的法律规制　/庄小茜　林　真 / 132
三维数字化技术(UG NX)在翻斗矿车设计中的应用　/方海林　白莉婷 / 133
心理咨询模式下的人力资源管理模式研究　/华姝姝 / 134
对建筑施工现场安全控制的探讨　/陈永欣 / 135
浅谈企业的污水处理　/赵培荣 / 136
细节管理引导石油企业矿区管理与服务品质提升　/崇大鹏 / 137
经济增加值与企业价值管理研究　/曹卫军 / 138
浅议《管子》经济思想与企业生产经营管理　/黄丽娜　王璐颖 / 139
浅谈家族企业可持续发展问题　/张　赫 / 141
基于平衡计分卡的高校综合治理绩效评价指标体系构建研究　/高一明 / 142
论企业实现长效管理的有效手段　/张长春 / 145

电子商务 DIANZI SHANGWU

网页设计中平面视觉元素的应用　/张　晶 / 146
整合资源建立泰山旅游文化电子商务综合平台研究　/温希波 / 147

教学研究 JIAOXUE YANJIU

管理类课程案例教学误区分析与思考　/李彦普 / 149
信息管理与信息系统专业实践教学体系研究——基于CISC 2010研究成果　/张　戈　刘位龙　张　新 / 151
自我管理策略在进行英语学习中的作用研究　/张淑静 / 153
改进计算机网络基础课程教学方法的研究　/崔　艳　游　汇 / 155
论大学生学科信息素养教育的理论与实践　/杨德平 / 156
浅谈高职会计专业人才培养目标的定位　/王明轩 / 158
项目教学法在电子线路教学管理中应用初探　/聂兆伟 / 159
浅探高等戏剧艺术院校排课软件的设计思路　/贾自强 / 160

信息管理与信息系统专业实践教学体系研究
——基于CISC 2010研究成果

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[摘　要] 本文基于CISC 2010确定的信息管理与信息系统专业课程体系,结合用人单位对毕业生实践能力的要求,提出了一个以实践教学内容和实践教学环境为主轴的信息管理与信息系统专业实践教学规范与指导,以供各高校参考,从而可以根据自己人才培养的定位制定出有特色的实践教学具体要求。

[关键词] 信息管理与信息系统专业;实践教学体系;CISC 2010
doi:10.3969/j.issn.1673-0194.2011.17.087
[中图分类号] G642　[文献标识码] A　[文章编号] 1673-0194(2011)17-0151-03

2010年,由清华大学经管学院联合国内十余所高校组成的中国高等学校信息系统学科课程体系(China Information Systems Curricula 2010,CISC 2010)课题组,参考由国际计算机学会(ACM)和信息系统协会(AIS)共同提出的信息系统学科的教学参考计划和课程设计(IS 2010)的研究框架,结合信息社会对人才的新需求,建立了我国信息管理与信息系统专业的课程体系结构,并给出了核心课程的教学框架和课程大纲。

在制定CISC 2010的过程中,课题组提出要制定一个信息管理与信息系统专业实践教学的指导性规范。因此,组成工作组研究了国内外多所高校信息管理与信息系统专业实践教学的现状,并依据工作组成员多年在教学和教学管理第一线所获得的经验,形成了一个以实践教学内容和实践教学环境为主轴的实践教学规范与指导。本文即为这项工作的成果之一。

1　实践教学的重要性

教育部原部长周济曾在第二次全国普通高等学校本科教学工作会议上的讲话中指出:"知识来源于实践,能力来自于实践,素质更需要在实践中养成;各种实践教学环节对于培养学生的实践能力和创新能力尤其重要;实践对于大学生成长至为关键。"因此,实践环节是培养学生创新思维和创新能力的重要教学环节,在实践教学的各个环节突出创新能力的培养,成为创新人才培养过程中的重要课题。

根据CISC 2010课题组对社会人才需求的调研分析,现在用人单位都非常注重信息管理与信息系统专业毕业生处理实际问题的能力,要求毕业生能够经过尽量少的培训就能直接承担具体的工作,而实践环节就是培养这种能力不可或缺的过程。因此,各高校应根据新形势下信息管理与信息系统专业的人才培养目标,构建与理论教学相辅相成的具有本专业特色的实践教学体系,采用相应的实践教学方法,使实践教学的各个环节都能培养、锻炼学生的实践能力,激发学生的创新意识。

2　实践教学内容

总体上,信息管理与信息系统专业的实践教学内容可包括课程实验、课程设计、专业实习、毕业实习与毕业设计、课外实践5个环节。

2.1　课程实验

课程实验主要是针对课程内容相关知识点设计的实验,按照循序渐进的原则安排,通常和理论课的内容紧密结合来进行设计。通过课程实验使学生加深对课堂理论知识的理解,并对其进行验证,能够启发学生对所学知识的深入思考,达到理解和掌握课程知识、培养动手能力的效果。

通常在课程的总教学学时中划出一部分实验学时或者是另行配备一部分学时,例如,在CISC 2010中,系统分析与设计课程的建议理论学时为48学时,根据需要,课外可以另行配备24~32学时的上机实习时间。

2.2　课程设计

课程设计是指和课程相关的某项实践环节,可以是以一门课程为主的,也可以是多门课程综合的,统称为综合课程设计,简称课程设计或者综合设计。相对于课程实验,课程设计更强调综合性、设计性。从规模上讲,课程设计的复杂度也高于课程实验,且以3~5人为小组完成不同的设计题目。通过课程设计培养学生综合一门或多门课程所学知识解决实际问题的能力,同时也初步培养学生的团队协作能力。参照CISC 2010的课程体系和信息管理与信息系统专业的人才培养目标,可以设置下面的课程设计:

(1)程序设计基础与数据结构课程设计:综合考虑程序设计基础、数据结构等相关课程,对一个以数据结构与算法设计为核心的课题进行设计与实现,通过这一过程的训练,培养学生系统掌握问题建模、数据结构设计、算法设计与分析、程序设计与实现等各环节的方法和能力。

(2)网络技术与应用课程设计:综合考虑计算机网络、计算机概论、计算机硬件与系统软件、Web技术等相关课程,通过掌握网络工程中的网络设备的安装、网络协议的配置、网络应用系统的使用以及网络应用程序的开发,培养学生理论联系实际、动手操作以及编写网络应用程序的能力。

(3)信息资源管理课程设计:综合考虑信息资源管理、信息组织、信息检索、数据库系统等相关课程,通过掌握信息采集、信息组织与存储、信息检索与应用等方面的知识和方法,培养学生的信息素养和信息管理能力。

(4)数据库与商务智能课程设计:综合考虑数据库系统原理、商务智能方法与应用等相关课程,通过商业数据库系统的设计、商务智能过程的构建、商务智能的应用,培养学生设计大型商业数据库的能力和基于商务智能技术的数据分析能力。

[收稿日期] 2011-04-23

(5)系统开发与管理课程设计:综合考虑管理信息系统、系统分析与设计、信息系统项目管理等相关课程,通过一个信息系统项目的需求分析、软件设计、编程实现、系统测试和项目管理,培养学生的信息系统开发能力和信息系统项目管理能力。

(6)企业信息系统综合应用课程设计:综合考虑管理信息系统、电子商务以及企业信息系统与应用等相关课程,通过模拟操作一个以 ERP 为核心的企业信息系统的应用,进行企业经营、管理的实战演练,培养学生的企业信息系统应用、管理能力和应用信息系统解决管理问题的能力。

一般来讲,课程设计可以集中安排在 1~2 周内完成,也可以根据实际情况将这 1~2 周的时间分布到一个学期内完成,较大规模的课程设计可以安排更长的时间。由于各学校对学生的培养方向有所侧重,再加上实践学时和条件的限制,各学校可以根据本校实情合理选择和安排课程设计的内容。

2.3 专业实习

专业实习是信息管理与信息系统专业教学活动的一个重要环节,既是对课堂教学内容的验证、应用,也是对课堂教学的补充。通过让学生直接参与信息系统专业相关的实习活动,还可以进一步了解、感受未来将要从事的实际工作,从而明确自己的学习目标,有针对性地进行自主学习。专业实习一般应该安排在实习基地、IT 企业、信息系统应用企业、信息资源服务机构等相关单位进行,部分内容也可以与课外实践活动相结合。

专业实习的内容可以根据学生的课程进度和实习基地的情况适当安排,最好能够直接结合企事业单位的信息化工程等实践工作进行,具体内容及组织形式建议如下:

(1)系统认知实习:安排学生到软件产业园区、IT 企业、信息中心或信息化应用程度较好的企事业单位进行参观考察,了解信息技术、信息系统的发展现状及应用情况,激发学生从事信息系统专业的积极性和热情。认知实习可以作为专业教育的一个环节安排在第一学期或者第二学期初进行,时间一般为 1~3 天。

(2)信息系统开发与项目管理实践:可以配合“系统开发与管理课程设计”展开,以小组为单位,进行某个信息系统的部分或全部开发工作,使学生熟悉相关信息系统开发平台以及项目管理软件的使用,掌握信息系统开发过程中的各个阶段及技术、方法与工具,培养团队精神。实践地点可以在校内实习基地,可让学生参与老师承担的信息系统开发项目,有条件的学校可以安排到软件企业等校外实习基地进行联合培养、实训,时间一般安排在三年级的寒假或暑假进行,为期 3~6 周。

(3)信息系统运行管理实践:主要目的是帮助学生了解如何进行信息系统的运行管理与维护,实习地点最好安排在信息化应用水平比较好的企业进行;也可以利用校内专业实验室,利用模拟数据,由具有实践经验的教师或请企业相关人员担任指导老师。时间一般安排在三、四年级的假期进行,为期 2~3 周。

(4)信息资源管理实践:主要目的是配合信息资源管理、信息组织、信息检索等课程的教学工作,目的是让学生了解信息资源的采集、组织、存储、检索和应用的过程及关键技术,实践地点可以在校内实习基地或实验室,有条件的学校可以安排学生到情报检索机构、企业或公益性机构(如图书馆、档案馆等),为期 1~2 周。

这些环节都是希望通过专业实习,让学生认识专业、了解专业,由于各个学校各有特点,因此在实施过程中可以各具特色。

2.4 毕业实习与毕业设计

毕业实习是安排在毕业设计之前的一个实践环节,可以对学生在大学四年学习中所获得的知识掌握情况,学习和接受新知识、新技术的能力以及解决实际问题的能力进行检验。学生在毕业前通过综合运用所学理论知识、方法和技能参与实际工作,从而可以了解在实际工作中如何进行有关信息管理与信息系统方面的业务活动,并培养和强化其社会沟通能力;配合毕业设计,开展调查研究,还可以培养学生面对现实问题的正确态度和独立分析解决问题的基本能力。毕业实习可以视为学生从学校环境到社会大环境的一个过渡和缓冲,为今后较顺利地走上工作岗位打下一定的基础。

毕业设计作为教学中的一个重要的、无法替代的环节,在整个实践教学体系中,它的综合性最强。作为教学计划中的最后一项任务,它承担着培养学生综合运用所学知识和掌握的技能去分析和解决实际问题、独立工作、团队协作、问题表达等能力的任务。

总体上,毕业实习可以和毕业设计合并在一起安排,毕业实习的地点一般应安排在校外实习基地、用人单位或以校内、校外相结合的方式安排,时间一般安排在四年级课程结束之后。

2.5 课外实践

学生在校期间通过参加社团公益活动、IT 俱乐部、兴趣小组、社会调查、社会服务、“三下乡”、勤工助学等第二课堂活动参与课外实践,可以进一步激发其学习本专业的兴趣与热情。鼓励学生参加“挑战杯”、“全国数学建模竞赛”等活动,培养学生的团队协作意识和创新精神。对于信息管理与信息系统专业的学生而言,这也是非常重要的一个实践环节。

3 实践教学环境

3.1 实验室环境

根据教学规模,各高等学校应建设相应的实验教学环境。一般来说,为了适应 CISC 2010 课程体系的实践教学内容的要求,各学校可以配备如下相关的实验室环境:

(1)企业信息系统实验环境:用于演示、学习信息系统(如 ERP、CRM、SCM 等)在企业运营、管理中的应用,可以进行管理信息系统、企业信息系统及应用等相关课程的实验教学、课程设计以及信息系统运行管理实践;可以选用国内外的商业化软件为基础来建立实验环境,如 SAP、Oracle、用友、金蝶、浪潮、神州数码等公司的产品。

(2)电子商务实验环境:用于演示、操作电子商务的一般性过程,通过对不同电子商务模式(B2B、B2C、C2C 等)的模拟,让学生了解电子商务的概念、操作方法和商务流程。

(3)计算机软硬件与程序设计实验环境:用于帮助学生掌握计算机基础、程序设计基础以及数据结构等课程的基本知识,包括对硬件的认知与性能学习、系统软件的原理学习以及编程基础等支持工作。

(4)计算机网络实验环境:用于进行计算机网络的相关实验和课程设计,使学生能了解网络管理与应用的一般知识。

(5)信息资源管理实验环境:用于进行信息资源管理、信息检索、信息组织等课程的相关实验、课程设计和专业实习。

(6)信息系统开发与管理实验环境:用于信息系统分析与设计以及信息系统项目管理等相关课程的实验、课程设计和专业实习,可以配置相关建模工具、CASE 工具、项目管理软件以及开发环境(J2EE 或 VS.NET)。

(7)数据库与商务智能实验环境:用于数据库系统原理、商务智能与数据挖掘等相关课程的实验、课程设计和专业实习,可

自我管理策略在进行英语学习中的作用研究

张淑静

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[摘 要] 自我管理作为一种语言学的学习理念由来已久,并构成了传统教育与现代教育沟通的基本精神内核,也是传统教学理念与现代教学理念的共同之处。而在现代英语教学当中,自我管理策略的应用价值随着人的主体性崛起而进一步凸现出来。本文重点探讨自我管理策略在英语教学中的作用。

[关键词] 自我管理策略;英语学习;自主性;英语教学
doi:10.3969/j.issn.1673-0194.2011.17.088
[中图分类号] G64 [文献标识码] A [文章编号] 1673-0194(2011)17-0153-02

一、自我管理策略内涵体系概述

自我管理,通俗地讲就是个体对自身的思想、理想、价值观、心理和行为等表现进行的管理,通过自己对自己的组织、计划、约束、激励、控制和思考,实现自己对自己的管理。作为一种语言学的学习理念,很多语言学家都认同一点,语言学习者的元认知策略实质上是指学习者对自己学习的自我管理。主要包括计划、监控和评估3个方面。同时,元认知策略属于高一级的策略,不直接作用于学习,而是通过一系列的计划、监控和评估对语言学习起宏观调控作用。这里的元认知,指的就是最初的认知,即对语言本质的一种认知。可以说,语言学界将对语言学习的本质准确地定位于自我管理范畴,是对自我管理策略的一种深层次的肯定。自我管理策略在企业管理领域大量应用,其内涵表现为员工对各个企业的基本决策的直接参与形式。在社会化大生产的过程中,其重心在于生产资料实现了社会化,从而归全体员工或整个社会所有,从所有制基础上推论,员工在较小的团体中往往采取直接的方式,而在较大的团体中则通过他们在工会或者员工委员会的代表,决定生产和收入分配这种最基本的问题,而技术和业务方面的事务也由他们主持、管理和监督。而从更为广义的层次来说,自我管理策略是民主组织形式在整个宏观、微观经济活动中的集中表现。各个企业的承担机构诸如工会、员工委员会,都会向整个部门和整个经济组织的上级管理部门派遣代表来为其团体利益代言。在每一级的设置上,自我管理的机构载体都要负责其相对应的方针的制定、实施和相对独立的企业之间实行协调的最高权威。

[收稿日期] 2011-07-18

二、英语学习中自我管理策略的内涵表现

涉及到“管理”字样,就必然涉及管辖治理的行为模式,也就是实行计划、组织、指挥、协调和控制的一系列过程。而在英语学习中,自我管理往往表现为两大模式:认知模式和情感模式。认识模式是较易理解的,即强调个体对自身能力的自省自觉。著名教育心理学家加涅认为:“认知策略是学习者用以支配自己的心智加工过程内部组织起来的程序性知识。它体现学习者处理内部实

以配置Oracle、SQL Server或Kingbase等数据库系统以及SAP Business Objects、Hyperion、MicroStrategy等商业智能软件。

以上实验室环境建设,可以进行不同的集成和组合,提高软硬件等资源的应用效率。

3.2 实习基地

在专业建设过程中,应该根据信息管理与信息系统专业的人才培养目标建设相对稳定的实习基地,确保各种实践教学活动按计划进行,有步骤地组织学生到已经建成的实习基地进行专业实习、毕业实习或毕业设计。实习基地分为校内实习基地和校外实习基地两类,它们应该各有侧重,相互补充,共同承担学生的实习、实训任务。

4 结束语

各高校可参照本实践教学规范和CISC 2010,并根据自己的培养特色和侧重,合理设计适合本校信息管理与信息系统专业人才培养目标的实践教学体系。例如,对于以应用型人才培养为主的学校可以侧重于系统的分析、编程能力和信息系统开发等能力的培养;对于以研究型人才培养为主的学校可以侧重于信息资源管理能力、应用能力和数据分析能力的培养。总之,通过构建与理论教学相辅相成、具有各高校特色的信息管理与信息系统专业实践教学体系,是培养具有专业能力和创新能力、符合社会需求的人才的重要保障。

注:本文为CISC 2010课题组、国家级特色专业“信息管理与信息系统专业”、2009年山东省高等学校教学改革研究项目“信息管理与信息系统专业实践教学体系的研究与实践”(编号:2009349)和2008年山东省教育科学规划课题“面向信息技术与管理融合的信管专业课程整合的研究”(编号:2008GG055)的阶段性研究成果。

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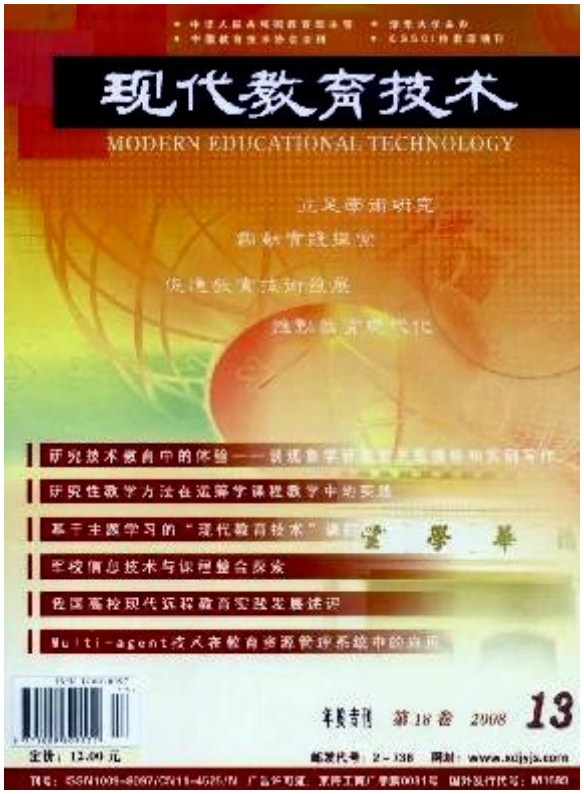
现代教育技术
MODERN EDUCATIONAL TECHNOLOGY
学 学 学
年度专刊 第18卷 2008 13
定价：12.00元

中文社会科学引文索引（CSSCI）检索源期刊

现代教育技术

（年度专刊）

（2008）京新出报刊增准字第（689）号

第 18 卷 第 13 期

（总第 90 期）

1991 年创刊

清华大学胡东成教授题写刊名

主　　管：中华人民共和国教育部

主　　办：清华大学

社　　长：吴庚生

总编/副社长：王学优

编辑部主任：宋述强

本 期 责 编：何佳媛

编 辑 出 版：《现代教育技术》杂志社

印　　刷：北京东方之彩印刷有限公司

刊　　号：ISSN1009-8097 / CN11-4525/N

邮 发 代 号：2－736

国外总发行：中国国际图书贸易总公司（北京 399 信箱）

国外发行代号：M1689

广告许可证：京海工商广字第 0081 号

本 社 地 址：北京市 100084 -77 信箱（清华大学内）

邮　编：100084

总编室：010－62792534

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本刊广告代理

北京东方联讯广告有限公司

地址：北京市海淀区苏州街 49-3 号盈智大厦 803 室（100080）

目　录

理论研究

5 研究技术教育中的体验——谈现象学研究的主题提炼和实例写作　朱光明

10 社会计算视野下的教与学　刘润英　胡　航　任友群

15 内隐学习理论视角下的教学设计　王瑞峰　李新成

18 人工智能应用于教育的新进展　王海芳　李　锋

21 认知建构主义与社会建构主义在学习观的分析比较　沈映珊

24 人体脑神经先天发育水平与后天补偿对策的系统集成研究框架　苗治平　林　波　刘　欢　吕振中

29 传播理论在现代远程教育过程中的应用　赵　强

32 基于分类的类比过程分析　马喜丽

教学探索

35 研究性教学方法在运筹学课程教学中的实践　管清波　冯书兴

38 社会经济状况差异下的教师与学生课堂行为研究　芦俊佳　和学仁

42 略论实验教学法在网络新闻实务课中的应用　杨　嫚

45 从与专业课程融合的角度议大学生信息素养教育　喻　芸

48 基于仿真技术的聋教学设计与实现　韩玉敏

50 基于产品电子代码的供应链管理实训方案的设计　易　久　谷　可　张　幸

52 过程流体机械网络虚拟实验室的建设　张　颖　丛　蕊　李　伟　戴　光

55 拉萨市中小学教师现代教育技术能力培训现状与对策　徐全学

精品课程建设

59 基于主题学习的“现代教育技术”课程设计　张伟平　毛慧娟

62 “制冷原理及设备”教学改革探索与实践　匡江红　夏　鹏

65 《离散数学》中“笛卡尔积”课堂情境式教学实践　王维花　宫成强　王志巍

68 基于项目驱动的“管理信息系统”课程教学研究　张　戈　王洪海　王华杰

70 上海市“航空机务”职业技术人才培养现状、需求与对策分析　李永平　匡江红

73 哈工大电机学课程的发展历史和专业课设置　李　勇　刘承军

75 测量学精品课程建设的探讨与实践 赵相伟 姜 岩 季 民 孙翠羽 刘尚国
77 基于测控专业特色，《传感器》多媒体辅助教材的编写 王月娥 何远虑

信息技术与课程整合

78 军校信息技术与课程整合探索 符 容 张 鹏
80 基于积件思想的多媒体课件设计 李 梁
83 几何画板与高中函数教学整合研究 吴仕勇 王天志 方 奎
86 论计算机技术在“概率统计”课程教学中的作用 刘琼荪 钟 波
89 信息技术与《电子技术基础》课整合的教学心得 左守金
90 在e时代开拓练习口语的新天地 曾 理
92 浅谈多媒体课件教学的优势和弊端 李 花
94 新课程改革中优化信息技术教学的几点思考与建议 郭兴华
96 中学信息技术教学方法初探 郭立明

网络与远程教育

98 我国高校现代远程教育实践发展述评 杨 艳 马红亮
101 新加坡南洋理工大学的elearning系统——edveNTUre 寇继虹
106 美国公立中小学互联网最新应用调查分析评述 王艳艳 王承博
109 远程教学网络的信息安全策略研究 林 盾 张伟平
112 构建网络学习共同体促进学习者自主学习 姜 强 刘虹验 赵 蔚
115 基于网络平台的英语教学电子学档的构建 高元梓
117 魔灯(Moodle)网络教学平台研究 陈 明
120 高校信息技术网络教学模式探讨 朱建兴 尹 力
123 浅析成人教育中移动教育的应用 高艳云

技术开发与应用

125 Multi-agent 技术在教育资源管理系统中的应用 赵希武 杨 贵
128 基于WEB的网络教学评价系统设计与实现 余童兰 刘 杰
132 视频编码模式以及在 Windows Media 编解码器的应用 王仁云
138 Dreamweaver 8.0 使用技巧 祖 邦

信息窗

1 54 122 137 141

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中国核心期刊（遴选）数据库全文上网期刊
国际龙源期刊网全文收录期刊
中国教育技术协会会刊

2008年12月20日出版

Modern Educational Technology

(Monthly)

Volume 18, No.13（Serial No. 90）December 20, 2002

Sponsored by Tsinghua University

Edited and Published by Editorial Board of Modern Educational Technology

Editor in Chief: WANG Xue-you

ISSN 1009-8097 **CN** 11-4525/N

Overseas Code Number and Distributor. M1689, China International Book Trading Corporation, P. O. Box 399, Beijing, China

Printed by Oriental Color Print Limited Company, Beijing

Address: Educational Technology Center, Tsinghua University, Beijing, 100084, China

Telephone: 86 10 62782405

Fax: 86 10 62782388

Email: xdjyjs@mail.tsinghua.edu.cn

Main Contents

5 Experience of Research on Technology Education

ZHU Guang-ming

10 Teaching and Learning in the Vision of Social Computing

LIU Run-ying HU Hang REN You-qun

15 Instructional Design in the Perspective of Implicit Learning Theory

WANG Rui-feng LI Xin-cheng

18 The New Progression of Artificial Intelligence Applying to Educations

WANG Hai-fang LI Feng

21 Analysis and Comparison Learning Point Between Cognitive Constructivism and Social Constructivism

SHEN Ying-shan

24 The Research Frame of Human Body Cranial Nerve Congenital Growth Level and the Postnatal Compensate Countermeasure System Integration

MIAO Zhi-ping LIN Bo LIU Huan LU Zhen-zhong

29 Application of the Communication Theory in Modern long-distance Education ZHAO Qiang

基于项目驱动的“管理信息系统”课程教学研究

张 戈 王洪海 王华杰

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【摘要】文章通过对当前管理信息系统教学的现状分析，提出了基于项目驱动的教学方法，并介绍了项目驱动教学法的基本原理，然后论述了项目驱动法在管理信息系统教学中的应用，并提出了应该注意的事项。实践证明目驱动教学法激发了学生的自信心和积极性，在 MIS 的教学中效果显著。

【关键字】项目驱动；管理信息系统；教学研究

【中图分类号】G40-057 **【文献标识码】**A **【论文编号】**1009—8097（2008）13—0068—02

一 引言

目前，全国各高校的信息管理与信息系统专业都开设管理信息系统（Management Information System，MIS）课程，并将其作为本专业的核心课程。信管专业学生应该具备更高的综合素质和较强的社会适应能力，包括独立分析和解决问题的能力、开拓创新能力、团队协作、交流能力和终生学习能力。为此，各高校纷纷进行管理信息系统课程的教学体制改革：把更新教育理念、优化课程体系、压缩课堂理论教学课时、增加实践教学课时作为重点，使教学内容能够更好地反映学科专业的最新研究方向与发展趋势，以切实增强学生的学习兴趣，完善学生的知识结构。基于以上目标，需要我们努力探索管理信息系统课程的教学模式和教学方法。

二 管理信息系统课程教学现状

1 教学方法欠缺

在 MIS 的教学中，虽然采用了多媒体教学方式，但是学生仍是被动接受知识，以课堂理论讲授为主，与学生的互动性差。

2 课程定位有偏差

学生对于 MIS 这门课程的理解也有偏差，错误的认为该课程属于软件工程学科，学习这门课就是要学习如何编程，而且由于对计算机知识也掌握不足，因此很多学生对这门课程会产生困难感。

3 考核方式欠佳

MIS 课程考核方式多以书面试卷为主，这使得很多学生只在考试前突击背概念，因此对课程知识内容缺少深刻的理解。

4 实践内容薄弱

MIS 是一门实践性很强的课程，必须坚持理论与实践并重的原则。纯粹的理论讲授，学生会觉得抽象枯燥，提不起学习的兴趣，也影响到学习的积极性和效果。

三 项目驱动教学法

从学生的角度说，“项目驱动”是一种学习方法，它适用于学习各类实践性和操作性较强的知识和技能；学生按项目被分成若干小组，各小组的活动在导师的指导下进行，学生也不再把学习当任务，而是根据项目需求来学习，由被动地接受知识转变为主动地寻求知识。从教师的角度说，“项目驱动”适用于培养学生自主学习、分析问题、解决问题的能力；教师不再是知识和理论的简单灌输者，而是发挥着导师的作用，循序渐进地引导学生在实践中学习理论，在实践中消化理论，应用理论，在实践中掌握知识。

基于“项目驱动”的教学把知识转化为理论和技能相结合的教学方式。学生接受项目后，教师除随时给学生补充必要的理论和技能知识信息外，更重要的是在整个项目开发过程中，充分调动学生的学习兴趣，鼓励学生以合作完成课程项目为宗旨。通过案例导向、项目驱动的教学方式，使学生的实践能力、自学创新能力、团队合作能力和交流表达能力都得到了较大的锻炼与提高。

四 项目驱动法在管理信息系统教学中的实施

收稿日期：2008 年 9 月 16 日

1 项目设计

教师根据教学进度和教学计划，选择难度适中的 MIS 项目，将该项目分成若干相对独立的子项目分配给学生，并围绕项目准备好相关的理论知识、领域知识和技术知识等。项目一般来源于教师的纵、横向课题以及学校承接的对外服务等；也可由学生自由寻找和拟定自己感兴趣的选题，但需经过论证和教师同意。

2 项目实施与控制

确定项目后，学生以自由组合的方式成立项目小组，确定项目经理，由项目经理带领各组成员制定项目进度表。教师讲解完 MIS 的项目管理概念后，要求项目小组进行项目论证并写出可行性方案，并制定项目任务书。

学生根据项目任务书的需求参与设计，并以小组方式进行讨论，以培养其合作与协调能力。在课程的进行当中，系统建设的各个环节都要开展主题讨论，总结经验，交流认识。教师再从企业的角度介绍情况，评议学生的设计，让学生感到所学知识的实用性。并可邀请软件公司相关技术人员作专题报告，不定时组织学生参观软件公司的相关活动。

3 项目评价

学期末以项目组为单位提交相应的系统文档和系统模型，最后的课程考核采用以项目答辩为主、试卷测试为辅的方法，以各小组提供的系统文档和系统模型以及小组成员在项目中的表现为标准进行评判，而试卷测试主要针对基本理论知识，所占比例较小。因为管理信息系统的教学不是能通过考试就可以验证教学效果的，而项目驱动法教学的显著特点，也在于实行能促进学生专业技能能力提高的项目答辩的课程考核方式。

五 项目驱动法在管理信息系统教学中的注意事项

在项目驱动法教学过程中，由于知识的具体意义和学生自身的不足逐渐被发现和明确，必然会引起学生对教学内容和相关理论知识的学习热情，而且，完全真实的 MIS 项目也会引起他们的好奇心和挑战欲。所以，较传统教学法而言，学生的学习动机比较强而持久，对知识、能力、素质的培养更能起到良好的积极作用。

但是，在教学过程当中我们还应该注意以下几个问题：

（1） 项目来源要实时、实际。由于信息技术发展迅速，以往的项目往往代表落后的设计思想，只有实时的项目才能保障所学技术的先进性；同样为了提高学生的积极性和热情，教师尽可能选择具有实际应用价值的项目，项目要贴近实际，体现实际的工作过程，源于企业实践，又要高于企业实践。

（2） 抓住驱动环节，由以教师主变为以学生为主。项目驱动教学过程中要做到：一是适当引导，学生大都是第一次接触项目，因此肯定会有很多挫折感，所以教师需要引导学生尝试使用各种方法去克服困难，完成项目任务，从而有利于培养学生的自学创新能力和对相关知识的掌握。二是要鼓励思考，项目进展的步骤应该有利于促进学生的主动思考，由此需要教师去激发和鼓励学生。三是倡导创新，在项目结束时，要善于使用精炼的归纳性语言，指出项目的开放性和扩展性，以拓宽学生的视野，激发学生的求知欲和好奇心，使其善于对项目进行深入的探究与开发。

（3） 通畅的沟通和答疑渠道。为解决学生平时答疑辅导等问题，指导教师除了把教学资料下发给学生，还应充分利用网络资源，例如我校的 Blackboard 学习平台，师生之间可以基于该平台进行在线交流和互动；另外，教师应公开自己的电子邮箱、联系电话等等，使学生尽可能通过多种渠道能和指导教师取得联系，获得帮助。

六 结束语

项目驱动教学法的应用，使管理信息系统课程在宏观教学设计上实现了以项目覆盖知识面、以项目体系构成教学布局的教学新思路。在教学过程中始终贯彻项目驱动、学生为主的原则，使学生在学习课程知识时，有一个完整的、真实的、具体的、有形的项目作为知识的应用载体，避免停留在抽象枯燥的理论层面。经实践检验，项目驱动教学法激发了学生的自信心和积极性，锻炼了学生的综合能力，为今后较快地参与实际项目的开发奠定了坚实的基础，在 MIS 的教学中效果显著。

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大学生自我认知的作用机理、差异测评模型及提升路径探析

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摘　要:大学生自我认知对提升大学生学习效率、有效预防大学生心理健康问题、促进大学生职业发展和推进高等教育事业健康有序发展均具有十分重要的意义。文章以大学生自我认知为研究对象,明晰大学生自我认知的作用机理,构建深层次的认知差异测评模型,探析大学生自我认知提升的有效路径。实证结果遵循马斯洛需求理论与自我效能感理论,现状满意度及自我满意度较大程度影响当代大学生自我认知水平的提升。相比个体属性差异与年级差异,成长环境与专业性质成为影响大学生自我认知的主要客观因素。有效的学业规划与职业规划教育、积极的社会认知与社会实践能力培养是高校积极提升大学生自我认知水平的关键路径。自卑型认知大学生较适合浅层次循循善诱的提升路径,而自傲型认知大学生更适合浅层认知与思想深度认知融合的提升路径。

关键词:自我认知;差异测评模型;提升路径;作用机理
中图分类号:G647;G444　　**文献标识码**:A　　**文章编号**:1009-8534(2022)04-0014-08
基金项目:山东财经大学校级教学改革研究项目心理健康教育教学专项“提高大学生自我认知的课程优化及活动设计”(jy201913xl);山东财经大学课程思政示范课程培育项目“Java 高级程序设计”(kcsz202115)。
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DOI:10.13985/j.cnki.34-1227/c.2022.04.002

知人者智,自知者明。只有明确自己的优势与劣势,才能积极发挥自身优势,按照成功的标准提升自身能力。根据埃里克森的心理社会发展理论,大学生面临的人格任务是形成自我同一性,即形成整体的和一致的自我概念,其实质是个体自我意识的深度整合和跨越发展。因此,大学生自我认知既是职业生涯规划的起点,更是个人确立目标、规划人生的前提条件。当代大学生接触面广、生活条件较优,他们个性张扬但心理更加敏感,同时全球信息化的发展也为他们提供了不同于以往的生活与学习资源。环境的多样性与复杂性,使得大学生更容易走进一种自我假象,造成现实我、投射我、理想我的冲突。而自我认知能力的提升有助于大学生实现“现实我”与“理想我”的统一,提升自我学习意识与自主学习能力,引导其树立正确的世界观、人生观与价值观,增强其社会责任感与使命感。

一、新时代大学生自我认知存在的问题

目前,国内大学生的自我认知水平总体较高,但两极分化明显,其心理特征具有复杂性。这首先要归因于当代大学生多为独生子女,父母期盼较以往更高,家庭对孩子的要求予取予求,而父母对其成长中的健康教育与引导程度不一;其次,初高中时期繁重的课业压力,学校对学生的过度保护,使得大学生在此期间较少对自身进行积极的认知。由此导致部分初入高校的大学生在自我认知中多种极端现象时有发生,尤其是迷之自信与过度自卑。

另外,当代大学生在校期间自我认知存在片面性。大一学生容易以高考分数和学习成绩作为自我认知的核心衡量标准,较易产生过高或者片面的自我认知。进入较高年级,学生面临升学、求职等方面抉择的迷茫与压力,容易产生焦虑、急躁心理,在自我认知上表现出较强的矛盾性。

尤其全球信息化的发展,为当代大学生提供了更广阔的学习平台和资源,也使得大学生自我认知环境愈加复杂。面对不断增强的社会压力、多元化的环境,大学生需要用更多的精力去适应和自我调节,导致有的大学生自我规划不当、心理健康问题出现。而传统引导路径在大学生认知水平提升中收

效不大,因此适度自我认知和科学合理的自我调节方式方法的选择,成为大学生保持良好健康状态的关键之一。

学者们对大学生自我认知层面的研究主要集中在大学生自我认知现状、影响因素、对自身发展的影响及提升路径[1-3]。部分学者通过问卷分析不同特征大学生的认知现状[4],如留守经历大学生[5]、卓越地理师范生[6]、少数民族大学生[7];有学者对大学生自我认知的调节过程进行研究[8];部分学者分析并提出各类型大学生自我认知水平提升的路径[9][10];多数学者热衷于研究自我认知影响因素[11][12]及对各类发展的影响,如有学者研究指出大学生自我认知提升可以促进就业倾向明确[13],对职业生涯规划[14]、就业能力[15]、社会适应性[16]、自我效能[17]等均有不同程度影响。

新形势下,当代大学生自我认知能力培养存在哪些关键影响因素?又存在何种深层次作用机理?对大学生自我认知能力间差异又该如何做出科学、有效的评价?尤其针对过度认知与认知不足类大学生,如何通过各因素的配置组合有效优化其自我认知路径?这些问题成为大学生自我认知水平提升的关键,也是学术界有待解决的问题。另外,以往学者们的研究方法多基于问卷的简单统计,深层次的数理分析理论有待完善,研究结果也有待深挖。

有效解决上述问题,对提升当代大学生自我认知水平、解决各类学生的认知困境,帮助其树立正确的人生观、世界观与价值观具有积极的指导意义与借鉴价值。因此,本研究以提升大学生自我认知水平为目标,对大学生自我认知现状进行跟踪调查,基于大学生自我认知作用机理分析,提出大学生自我认知差异测评模型,对主客观影响因素的作用效果与稳健性进行量化分析,旨在探寻典型认知类型大学生自我认知优化路径。研究结论对大学生职业选择和人生规划具有重要意义,也为各组织对当代大学生进行自我认知指导提供可行方案。

二、大学生自我认知作用机理与差异测评模型构建

(一)大学生自我认知作用机理分析

自我认知是主观自我对客观自我的认识与评价,是对自己身心特征的认识。自我认知过程遵循自我感觉、自我概念、自我观察、自我分析和自我评价的认知逻辑,受到主、客观因素的共同作用。大学生自我认知过程是伴随大学生发展的一个逐步形成过程,尤其是发展过程中的客观因素将对主观因素产生潜移默化的影响,并联合影响大学生自我认知发展。大学生自我认知过程也是一个不断循环、交互影响的复杂过程,尤其自我认知水平与各主观因素间相互作用明显,如图1所示。

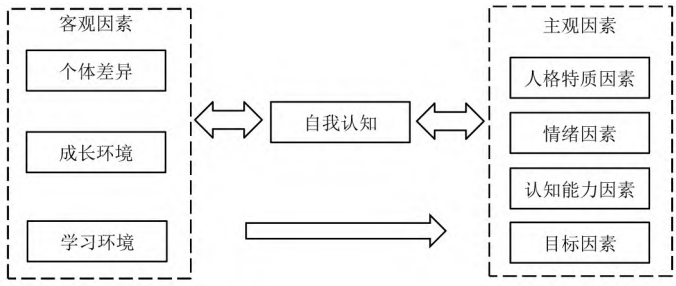

图1 大学生自我认知作用机理

影响大学生自我认知的客观因素主要包括个体差异、成长环境(包括成长中尤其是未成年时期的社会环境与家庭环境)、学习环境。上述因素在个体人生观、价值观、世界观的形成过程中起到不可替代的重要作用,在大学生自我认知发展中也发挥重要作用。但随着社会生产生活方式的转变及国家全面素质教育水平的提升,各因素对大学生自我认知的作用力度将会发生变化,尤其性别因素的作用转变明显。

主观因素主要包括人格特质因素、情绪因素、认知能力因素、目标因素,并受到客观因素较大影响。其中人格特质因素受到个体差异与成长环境的影响较大,具有长期稳定性;情绪因素、认知能力因素与目标因素受到成长环境与学习环境的影响较大,但情绪因素的短期波动性较强,相比而言,认知能力因素与目标因素的稳定性较强。

客观因素与主观因素共同影响大学生自我认知,而大学生自我认知水平又会进一步对主观因素

产生影响。尤其对情绪因素、目标因素的影响较大。当今大学生自我认知复杂性提升，陷入过度自信与过度自卑两种极端认知情形的大学生比例不断上升，陷入迷茫、焦虑、矛盾、妄想及更复杂情形的大学生数量也在不断上升。总体上，各认知类型均受到上述主客观因素的影响，各因素影响力度的复杂性组合也是导致各种认知类型差异的重要原因。

（二）大学生自我认知能力差异测评模型构建

大学生进行自我认知评价过程中受主观因素的影响较大，传统量表设计与测度结果呈现一定局限性，简单数理统计也难以有效反映大学生自我认知的真实现状。为有效剖析影响大学生自我认知出现差异的重要因素，将大学生自我认知的评价内涵扩展为认知深度、认知广度和认知水平三个协同维度，并基于三维度差异协同构建大学生自我认知差异测评模型。

设客观理想解 P^* 为对个体自我认知的客观满意评价向量，个体自我认知客观评价向量为 P_i，以客观评价指标范畴表征大学生自我认知差异广度，个体 i 自我认知差异广度 SCW_i 为：

$$SCW_i = \sum_{k\in I} w_k \sum_{j\in I} w_{kj} \cdot |P_i(\pi_k(j)) - P_i^*(\pi_k(j))|$$

其中，I 为指标集合，$\pi_k(j)$ 为第 k 个二级指标的第 j 个指标值，W_k、W_{kj} 为对应权重。

以与理想解间的距离表征大学生自我认知差异深度，个体 i 自我认知差异深度 SCD_i 为：

$$SCD_i = \sum_{k\in I} w_k \cdot d\left(P_i^*(\pi_k) - P_i(\pi_k)\right)$$

其中，d 以距离相似性进行测算，采用层次分析法进行权重设置。

基于客观理想解，以过度认知或认知不足程度来表征自我认知差异的水平维度，以理想解和客观值的差距进行测度。

$$SCL_i = \sum_{k,j\in I} P_i^*(\pi_k(j)) - P_i(\pi_k(j))$$

其中，正数表示认知不足，负数表示过度认知，绝对值越大表示自我认知差异越大。

综上，个体自我认差异测评模型为：

$$DSC_i =\cdot\ SCW_i^{\alpha} \cdot SCD_i^{\beta} \cdot SCL_i^{\theta}$$

其中，α、β、θ 为根据大学生群体特征设置的认知差异深度、认知差异广度和认知差异水平的灵敏度。

另一方面，为有效剖析大学生自我认知影响因素的作用效果，探寻大学生自我认知水平提升的有效路径，分别以大学生自我认知水平、自我认知差异为因变量，构建回归模型：

$$\ln SC = \ln GT + \ln CZ + \ln ST + \ln RG + \ln QX + \ln NL + \ln MB$$

进一步，考虑大学生自我认知水平与主观因素间的相互影响，在大学生自我认知差异影响因素分析中纳入认知水平的考虑，构建模型如下：

$$\ln DSC = \ln SC + \ln GT + \ln CZ + \ln ST + \ln RG + \ln QX + \ln NL + \ln MB$$

根据主、客观因素分类，采用逐步回归思想，深入剖析各因素对大学生自我认知的影响。

三、量表设计与检验

（一）研究对象

本研究选取大一、大二、大三、大四本科生作为调研对象，编制《大学生自我认知现状及因素调查问卷》，在山东省多个兄弟院校开展实证调研，共发放 500 份问卷，回收 435 份有效问卷，问卷有效回收率为 87%。有效样本涵盖不同性别、家庭环境及专业，并选取普适性样本（20 例）及差异性样本（10 例）进行个案分析，旨在从个体、家庭、专业、学校与社会环境、自我层面等多维度探寻大学生自我认知影响因素及提升路径。为提升数据的可靠性与有效性，选取授课学生进行访谈，并通过授课老师讲解后发放此问卷。

（二）量表设计

通过教学信息反馈与学生个别座谈，编制《大学生自我认知现状及因素调查问卷》，并根据分析结果进行题项设计。具体包括个体差异、成长环境、学习环境、自我认知评价、自我规划、社会认知、专业满意、现状满意及自我满意等类别，兼具单选题项和多选题项。

为保证问卷的有效性，采用 SPSS21.0 对调研问卷进行信度与效度检验。以 Cronbach Alpha 系数为表征，系数为 0.825，显示问卷内部一致性良好，问卷具有一定信度，见表 1。

借鉴学者们的研究，采用 KMO 和 Bartlett 检验分析问卷效度。取样足够度的 KMO 值为0.868>0.7，

表 1　信度检验

Cronbach's Alpha	基于标准化项的 Cronbachs Alpha	项数
0.764	0.825	33

Bartlett 球形度检验显著性为 0.000<0.05，即通过5%水平的显著性检验，问卷具有良好的结构效度，见表 2。

表 2　效度检验

KMO 和 Bartlett 的检验		
KMO		0.868
Bartlett 球形度检验	近似卡方	3812.726
	df	435
	Sig.	0.000

进一步，采用主成分分析法抽取特征值大于 1 的公因子，取消因子负荷小于 0.4 的题项，结合影响因素分类，得到 9 个因子的累计方差贡献率达 61.973%，且陡阶检验图显示在第 9 个因子后逐渐趋于平缓，结果比较理想，见图 2。

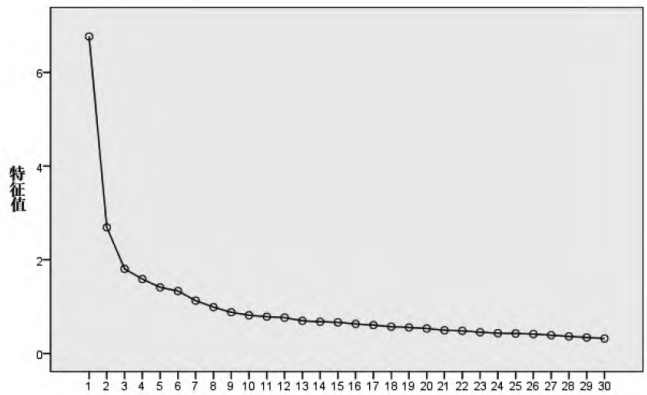

图 2　陡阶检验图

四、大学生自我认知路径提升的实证分析

（一）大学生自我认知水平的总体表现及水平内差异分析

初步调查发现，客观因素对大学生自我认知状态分布的影响如表 3 所示。

大学生自我认知水平较以往有所提升，近 65% 的大学生有较清晰的自我认知，这与社会整体文化水平的提升紧密相关。进一步设计量表，从大学生

表 3　大学生自我认知总体表现及水平内差异分析

控制变量		自我认知水平（1-4 水平逐渐升高）				Pearson 相关性
		1	2	3	4	
个体差异	男	1.63%	27.17%	53.26%	17.93%	-0.155**
	女	2.80%	37.60%	50.80%	8.80%	
成长环境	城市	1.53%	22.99%	59.39%	16.09%	-0.267**
	农村	3.47%	48.55%	40.46%	7.51%	
	独生子女	1.43%	22.38%	58.10%	18.10%	-0.234**
	1 个兄弟姐妹	2.86%	40.57%	50.29%	6.29%	
	2 个兄弟姐妹	5.26%	50.00%	31.58%	13.16%	
	3 个以上兄弟姐妹	0.00%	63.64%	27.27%	9.09%	
年级	大一	2.29%	27.06%	54.59%	16.06%	-0.117*
	大二	1.14%	40.91%	48.86%	9.09%	
	大三	3.77%	35.85%	52.83%	7.55%	
	大四	2.67%	40.00%	46.67%	10.67%	
专业	非技术类专业	5.71%	42.86%	48.57%	2.86%	-0.322***
	技术类专业	0.00%	22.22%	61.11%	16.67%	
总体分布		2.30%	33.18%	51.84%	12.67%	

注：*P<0.1，** P<0.05，*** P<0.01。

个体差异、成长环境(包括生活环境、家庭环境)及大学学习环境(包括年级、专业性质)角度剖析影响大学生自我认知的客观因素。数据分析显示,整体上各因素与大学生自我认知水平间具有显著相关性,均通过5%水平的显著性检验,且各因素设计具有较好结构信度,样本也具有一定现实解释力度。

结果显示,当代大学生自我认知的时代特征愈加鲜明,个体及年级差异对大学生自我认知水平分布没有显著差异,而不同成长环境(包括社会环境与家庭环境)、专业性质对大学生自我认知水平分布差异显著,主要归因于当代大学生及各类社会教育群体平等意识与全面素质教育意识的普遍提升。

尤其成长环境差异(包括社会环境与家庭环境)仍然是影响当今大学生自我认知的重要因素。第一,农村生源大学生的自我认知水平较以往有很大提升,近半数大学生有较清晰的自我认知,但整体上仍明显低于城市地区(具有清晰自我认知的大学生比例达75%),特别是中、西部经济欠发达省市农村地区的大学生自我认知水平整体有待提升。第二,家庭环境尤其是家庭中兄弟姐妹数量对大学生自我认知具有显著影响。随着家庭兄弟姐妹数量增多,大学生自我认知处于较清晰水平的人员占比逐渐降低(各情形下占比依次为76%、57%、45%、36%),剩余大部分处于不太清晰认知水平。

实证结果进一步显示,大学生自我认知水平与个体未成年时期生活环境中的人文环境及家庭教育紧密相关。这说明基础教育阶段教育环境与教育资源对个体大学阶段乃至整个人生自我培养的重要性,也显示出国家城镇化与新农村建设工作对人才培养的重大意义,成年教育中家庭教育的重要性也得到了社会及家长的一致认同。

另外,不同专业性质(技术类专业与非技术类专业)下大学生自我认知水平分布呈现显著差异。技术专业大学生自我认知水平优于非技术类专业大学生,具有较清晰自我认知水平的大学生比重分别为78%和51%,与大学生专业课学习强度及就业认知程度紧密相关。

(二)大学生自我认知影响因素实证分析

采用逐步回归思想,通过深度量化分析与实证,深度挖掘影响当代大学生自我认知的关键主、客观要素,主要包括社会环境、家庭环境、自我规划、实践水平及各类别满意等,见表4。

表4 大学生自我认知水平影响因素实证分析结果

变量	模型1		模型2		模型3		模型4		模型5	
	系数	标化系数	系数	标化系数	系数	标化系数	系数	标化系数	系数	标化系数
截距	2.641***		2.278***		1.890***		1.751***		1.569***	
性别	-0.098	-0.069	-0.050	-0.035	-0.017	-0.012	0.013	0.009	0.014	0.010
生长环境	-0.266***	-0.186***	-0.250***	-0.175***	-0.219***	-0.154***	-0.200***	-0.140***	-0.202***	-0.142***
兄妹数量	-0.122***	-0.130***	-0.124***	-0.132***	0-.132***	-0.141***	-0.126***	-0.134***	-0.123***	-0.131***
年级	-0.006	-0.010	-0.016	-0.026	-0.035	-0.058	-0.036	-0.059	-0.025	-0.041
专业满意	0.075	0.075	0.032	0.032	-0.013	-0.014	-0.010	-0.010	-0.019	-0.019
现状满意	0.296***	0.264***	0.144***	0.128***	0.132***	0.118***	0.100*	0.089*	0.089*	0.079*
自我满意			0.380***	0.332***	0.316***	0.276***	0.271***	0.237***	0.254***	0.222***
职业规划					0.208***	0.237***	0.169***	0.192***	0.133***	0.151***
社会认知							0.178***	0.186***	0.172***	0.180***
学业规划									0.117**	0.110**
F	16.521***		22.811***		24.920***		24.839***		23.126***	
ΔF	16.521***		49.335***		29.137***		16.781***		5.396**	
D-W	1.944									

注:*P<0.1,** P<0.05,*** P<0.01。

第一,当代大学生自我认知水平受环境因素影响显著,尤其受到社会环境与家庭环境的稳健影响。实证结论显示,整体上农村生源大学生自我认知水平较城市生源大学生自我认知水平低0.142单位,且每单位家庭兄妹数量增加将引起大学生自我认知水平0.131单位的降低。另一方面,逐步回归结果显示,社会环境与家庭环境对大学生自我认知水平的影响具有稳健性,在各类逐步回归中均通过5%水平的显著性检验。这与控制变量分析中的结论高度一致,进一步体现了社会教育与家庭教育对大学生自我认知水平提升的持久性与重要性。

第二,明确的学业规划与职业规划均显著提升大学生自我认知水平。大学生学业规划由无到明确设计的4个渐进过程中,每单位提升将有效促进大

学生自我认知水平 0.11 单位的提升。相应地,职业规划的促进力度更大,其由无到明确设计的 4 个渐进过程中,每单位促进力度达到 0.151。上述两项规划的作用力度均具有稳健性,且在各逐步回归模型中均通过 5%水平的显著性检验。高校应加强大学生学业规划与职业规划的引导与能力培养,既是大学生全面素质教育与发展的要求,也是国际化优势人才培养的要求。教育部针对当代大学生规划能力也出台了众多政策,有助于提升大学生自我认知水平,对大学生正确人生观、价值观与世界观的形成具有积极推动作用。

第三,积极的社会实践与社会认知能力培养对当代大学生自我认知水平提升的重要作用不容忽视。社会实践能力对大学生自我认知水平的提升具有显著且稳健的促进作用,其促进力度同比较高(0.180)且通过 5%水平的显著性检验,成为推动大学生自我认知水平提升的重要因素。近年教育部密切关注并出台多项措施积极推动大学生实践能力的培养,如加大实践类课程在大学生整体培养环节占比,推动创新创业及暑期实践活动开展。在实践中发现短板、反思并不断追求新发展,对于大学生进行深度自我认知剖析具有积极推动作用。

第四,遵循马斯洛需求理论与自我效能感理论,现状满意度及自我满意度较大程度影响当代大学生自我认知水平的提升。尤其自我满意度提升对大学生自我认知起到积极促进作用,作用力度高达 0.222,其作用效果极具稳健性且通过 5%水平的显著性检验。遵循马斯洛需求层次理论与自我效能感理论,自我满意的需要成为推动大学生自我认知水平提升的内在重要驱动力,也是自我认知能力不断内化的过程。近年来教育部通过新课改等多项措施,一直积极推动教学中学生主体地位提升,多次强调在教学中启发学生积极性、挖掘学生潜能,对当代大学生自我认知水平的提升及人生观、世界观、价值观的培养均具有长远意义。

(三)不同类型大学生自我认知能力提升的路径分析

分别针对自卑型、自傲型大学生自我认知群体,从浅层次认知提升与思想深度认知提升两条路径去探究降低大学生自我认知差异的有效方法,以提升大学生自我认知整体水平,见表 5。

表 5 不同类型大学生自我认知能力提升的路径分析

自我认知类型	自卑型>0				自傲型<0			
变量	模型 1		模型 2		模型 1		模型 2	
	系数	标化系数	系数	标化系数	系数	标化系数	系数	标化系数
截距	1.516***		1.043***		-0.190***		-0.249***	
表层认知	-0.501***	-0.765***	-0.486***	-0.743***	0.044***	0.461***	0.053***	0.551***
思想深度认知			0.170***	0.211***			0.018***	0.216***
F	136.719***		81.357***		44.407***		27.384***	
ΔF	136.719***		11.374***		44.407***		8.376***	
D-W	2.103				2.015			

注:★P<0.1,★★ P<0.05,★★★ P<0.01。

第一,对于自卑型认知的大学生来说,更适合采用由表及里、循序渐进的自我认知提升路径。在自我认知差异测评模型中,定义大学生自我认知差异正向趋大时趋于自卑型认知。实证结果显示,单位浅层自我认知提升将引起大学生自我认知差异 0.743 单位降低,单位思想深度自我认知提升将引起大学生自我认知差异 0.211 单位提升。意味着,对于自卑型认知大学生,通过提升其表层认知差异能更好达到降低其整体自我认知差异的目标,即遵循其性格特征,通过提升其对外貌、身材、性格、特长、人际关系等浅层次自我认识差异的了解,引导其进行深层次自我认知差异剖析;通过进一步加强其各项心理建设,有效提升大学生整体自我认知水平。而直接采用思想深度自我认知提升路径反而会加剧自卑型认知大学生的逃避与反抗心理,扩大其自我认知差异缺口,不利于大学生自我认知水平的提升。

第二,对于自傲型认知的大学生来说,浅层认知与思想深度认知两条路径结合使用的效果更好。特别地,加大浅层次认知差异路径的实施力度,适度的思想深度认知差异教育也必不可少。自傲型认知的大学生极易出现整体自我认知过度的情形,在测评模型中以负向认知水平进行表征。实证结果显示,单位浅层自我认知提升将引起大学生自我认知差异0.551单位提升,单位思想深度自我认知提升将引起大学生自我认知差异0.216单位提升。说明对自傲型认知大学生来说,浅层认知教育的作用力度有所下降(自卑型标化系数为0.743),深入人心的思想教育成为其缩小认知差距的关键配套路径。此路径的实施遵循自傲型认知大学生心理发展规律,同比自卑型认知大学生,应适当配套选用打击式教育模式。

结　语

综上,对当代大学生自我认知水平提升提出以下建议。

第一,降低教育的地理与思想约束,筑牢学校、家庭、社会三位一体教育格局,推进线上线下衔接模式的软、硬件教育资源统筹建设与共享,培育良好的社会教育与家庭教育环境。统筹推进县域内城乡义务教育一体化改革发展,积极推动县域义务教育均衡发展和城乡基本公共教育服务均等化。同时,推进课堂教学与"互联网+教育"模式的有效衔接,规范并强化教育移动互联网建设,搭建健康有序发展的教育资源共享平台,推动网络教育高质量发展与有序监管,充分实现区域教育资源共建共享。在上述基础上,通过开展多种形式的亲子活动、校园活动及社会实践活动,积极推动学校、家庭、社会的教育协同格局与机制,做到在工作安排上相互衔接、在教育内容上相互贯通、在教育渠道上相互补充。

第二,增强全面素质教育贯彻力度与质量,构建灵活有效的人才培养与教育监管机制,注重培养德智体美劳全面发展的社会主义建设者和接班人。德育为先,尤其注重完善各级各类学校思政教育体系,加强新时代爱国主义教育和中华传统美德教育;将德育工作融入课堂教学与社会实践中,加强专任教师对学生关爱与指导。另一方面,从劳动育人的教育理念出发,推动各级各类学校认真规划并组织形式多样的劳动教育,以增强学生的社会认知与实践能力。同时,在素质教育过程中,加快构建与完善多元合理的教学质量监管与评价体系。

第三,强化大学生心理健康教育与生涯规划教育。针对不同认知类型大学生,构建与完善心理健康教育体系与运行机制,摒除大学生对心理健康活动的认知障碍,实现高校心理健康教育常态化发展。针对不同类型学生,因地制宜开展形式多样的心理健康活动,尝试从心理学角度进行疏导,培养其正确的世界观、人生观与价值观。同时,在大学生教育过程中,以引导鼓励为主,进行适度的生涯规划教育,搭建行政系统与专职教师系统配套的生涯指导体系,强化专任教师在学生生涯规划中的作用,帮助大学生开展积极的学业与职业生涯规划。

第四,深化产教融合,促进教育链、人才链与产业链、创新链有机衔接,增强大学生创新创业思维与认知,提升大学生社会认知与实践能力。围绕区域经济发展及企业人才需求现状,打造政产学研院协同育人机制;主动对接区域产业集群,强化双师育人机制,培育国家级或省级特色专业群,积极推动校级实践基地建设。另一方面,强化大学生创新创业思维的教育与实践引导,推动大学生创新创业类产业园的建设与运行,搭建适于大学生创新创业的孵化环境与支撑机制;通过多种形式的创新创业课堂教学及实践,引导大学生积极参与"互联网+"、"创青春"等比赛,提升在校大学生创新创业的自我认知水平,增强学生的自我效能感。

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Research on Mechanism, Differences Assessment Model and Promotion Path of College Students´ Self- Cognition

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Abstract: The study of college students´ self-cognition is of great significance to the improvement of their efficiency at study and professional development,prevention their psychological problems, cultivate the positive corrective outlook on life and world, as well as the healthy and sustainable development of higher education. Taking college students´ self-cognition as the research object, the mechanism and differences assessment model is constructed, which aims to explore the effective way to improve college students´ self-cognition. All the results follow Maslow´s hierarchy of needs and self-efficacy theory. Especially, current situation and self satisfaction affect the college students´ self-cognition improvement most greatly. And the research results show that college students´ self-cognition is significantly affected by their speciality and growth environment, while the impact of grade and individual difference are gradually weakened. Further, the deeper mathematical analysis and empirical analysis also prove that there are two critical paths to advance the self cognition ability of college student. One is effective academic and career planning education, and the other is positive social cognition and practice ability development. Self-abasement student is more suitable for the promotion path of shallow and systematic guidance, while self-conceited student are more suitable for the promotion path of shallow and profound cognition integration.

Key words: self-cognition; differences assessment model; promotion path; mechanism 责任编辑:张宏志