Introduction of Key Problems in Long-Distance Learning and Training

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1 Editorial

With rapid development of technology in the world today, especially the development of network and mobile network, creativity and communications have widely outlets. Meanwhile, classical face-to-face education is being significantly renovated with development of communication. Nowadays, long-distance learning and training becomes a main study method worldwide. Since more classrooms can be accessed from anywhere each day at any time, it is the time to aim at exploring some key problems in e-learning and e-training solutions, such as signal processing in communication, remote distributed technology as well as teaching method which can attract students through interactivity, immersion, variety of content. Moreover, papers of solution of network service, Quality of Service, organization and structure in e-learning and e-education, recommendation system of scientific research are also encouraged, such as long distance signal transmission as well as cloud and fog computing in e-learning. Meantime, emerging methods which can improve the efficiency of this domain are also welcome.

In order to provide an opportunity for researchers to publish their gifted studies of theory and technology in this research domain, this half theme issue is proposed to collect advanced method in long distance technology of e-learning and e-training, as well as excellent engineering applications within this domain. With support of eLEOT 2018, in this half theme issue, 6 in 14 submissions are accepted with ratio

42.85%. In these 6 papers, 2 papers come from China mainland, others are from United Kingdom, United States of America, Republic of Korea, and Pakistan, respectively.

The first article “A Robust Parallel Object Tracking Method for Illumination Variations” is authored by Huiyu Zhou from the Biomedical Image Processing Lab at University of Leicester, United Kingdom. This paper focuses on illumination variation in visual tracking which has a severe impact on the tracking performance. Traditional trackers based on Discriminative correlation filter (DCF) have recently obtained promising performance to hold robustness under illumination variation. However, features of target object will be not extracted and discriminated from the background when target object has significant appearance variation due to intense illumination variation [1].

Therefore, their article proposes a very effective strategy by performing multiple region detection and using alternate templates (MRAT) to improve the accuracy and robustness of DCF trackers under intense illumination variation. Moreover, it is able to perform simultaneous detection of multiple regions equivalently by enlarging the search region with parallel computation. Meanwhile the alternate template is saved by a template update mechanism in order to improve the accuracy of the tracker under strong illumination variation. Experimental results on large-scale public benchmark datasets show the effectiveness of the proposed method compared to state-of-the-art methods.

The second article “Key Technologies and Solutions of Remote Distributed Virtual Laboratory For E-learning and E-education” is authored by Lei Chen from the Department of Information Technology, College of Engineering and Computing, Georgia Southern University, USA. This paper focuses on the discussion of the key technologies and solutions for remote distributed virtual laboratory, aiming to provide reference for the design and implementation of such a system. A virtual laboratory was described as a computer networked virtual environment, which is built a networked scientific research environment with the integration of a

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variety of tools and technologies. It is referred as a “wall-less research center”, where all research activities are performed in a distributed network environment [2].

With more attentions are focused on this area, a number of key problems of this critical technology are discussed in this paper, with the goal of providing references and solutions for successful and smooth implementation in this paper. This paper discusses key technologies of remote distributed virtual laboratory in 12 aspects, such as object-oriented technology, mission-driven technology, distributed object technology, collaborative experiment technology based on remote control, group communication, experimental data sharing technology, concurrency control mechanism in distributed collaboration, measurement and control platform based on embedded technology, implementation of virtual lab server, security mechanism for user authentication mode, cloud computing and machine learning.

The third article “An IoT Service Aggregation Method based on Dynamic Planning for QoE Constraints” is authored by Muhammad Khan from the Intelligent Media Laboratory, Digital Contents Research Institute, Sejong University, Republic of Korea. This paper focuses on service gather in Internet of Things (IoT). With the rapid development of new internet technologies, amount of IoT services has grown dramatically. In order to make people easier and faster to utilize the service resources, it becomes more and more important to gather the services on the IoT. Most of the current methods can only create automatic or semi-automatic service composition schemes, and lack support and consideration of real-time data and instant-situation information, so they cannot achieve dynamic adaptive aggregation of services [3].

Thus, this paper focus on both the two constrains, and propose an IoT service aggregation method based on dynamic planning oriented QoE constraint. Firstly, knowledge model of relationship among service category concepts are constructed. Secondly, the aggregation problem of service categories is mapped to a dynamic programming problem based on the relationship between service composition, and a new semantic similarity computing method is used as the main basis for service selection by using the ontology of IoT service category. Finally, for the selection of specific service resources, a trend-aware service selection algorithm for the QoE multi-constrained measurement is proposed. Experimental results show that the proposed method has better performance in terms of recall and precision.

The forth paper “MOOCRC: A highly accurate resource recommendation model for use in MOOC environments” is authored by Zhihan Lv from the School of Data Science and Software Engineering, Qingdao University, P. R. China. This paper focuses on resource recommendation model in MOOC environment.

With rapid development of MOOC platforms, the online learning resources are increasing. Because learners differ in terms of cognitive ability and knowledge structure, they cannot rapidly identify learning resources in which they are interested. Traditional collaborative filtering recommendation technologies perform poorly given sparse data and cold starts. Furthermore, the redundant recommended content and the high-dimensional and nonlinear data on online learning users cannot be effectively handled, leading to inefficient resource recommendations [4].

In order to enhance learner efficiency and enthusiasm, this paper presents a highly accurate resource recommendation model (MOOCRC) based on deep belief networks (DBNs) in MOOC environments. This method deeply mines learner features and course content attribute features and incorporates learner behavior features to build user-course feature vectors as inputs to the deep model. Learner ratings of courses are processed as supervised labels with supervised learning. The MOOCRC model is trained by unsupervised pre-training and supervised feedback fine tuning and obtained by adjusting the model parameters repeatedly. Experimental analysis shows that the MOOCRC has greater recommendation accuracy and converges more quickly than traditional recommendation methods.

The fifth paper “Innovative Citizen’s Services through Public Cloud in Pakistan: User’s Privacy Concerns and Impacts on Adoption” is authored by Amjad Mehmood from the Institute of Information Technology, Kohat University of Science & Technology, Pakistan. This paper focuses on privacy factors on public service cloud. Today, government services is used to provide scalable and cost effective public services to their citizens due to limited resources and budget. Government needs to assess the user’s behavior intention and use behavior before choosing public cloud as platform for their innovative citizen’s services also known as government to citizen’s services (G2C). As citizen’s information is stored on public cloud, which is provided by a third party, user’s concerns about privacy of information may affect the adoption of these services [5].

This study finds out the privacy factors that influence the adoption of e-government services by choosing and recommend suitable technology adoption model. As a methodology, the Unified Theory of Acceptance and Use of Technology Model was amended to add two additional privacy variables Perceived Internal Privacy Risk and Cloud Information Privacy Concern from e-commerce domain. Structure Equation Modeling was used to investigate the effect of all variables. The result shows that Performance Expectancy, Effort Expectancy and Social Influence had positive effects on user’s Behavior Intention while Cloud Information Privacy Concerns and Perceived Internet Privacy Risks had negative effects on Behavior Intention. The Facilitating Conditions and Behavior Intention had a strong positive effect on User Behavior.

The sixth paper “Newly Published Scientific Papers Recommendation in Heterogeneous Information Networks” is authored by Xiao Ma from the School of Information and Safety Engineering, Zhongnan University of Economics and Law. This paper focuses on cold start problem of new scientific paper recommendation. Millions of new research papers are published each year, making it extremely difficult for researchers to find out what they really want. Existing paper recommendation algorithms cannot effectively address the recommendation of newly published papers due to lack of historical information (e.g., citation information; view log). Furthermore, in most of these studies, papers are considered in homogeneous or bipartite networks. However, in a real bibliographic network, there are multiple types of objects (e.g., researchers, papers, venues, topics) and multiple types of links among these objects [6].

In this way, this paper studies the problem of new paper recommendation in the heterogeneous bibliographic network, and a new method of meta-graph based recommendation model called HipRec is proposed. First, the top-K most interesting meta-paths are selected based on the training data. Secondly, a greedy method is proposed to select the most significant meta-graphs generated by merging the meta-paths. Meantime, meta-path and meta-graph based topological features are systematically extracted from the network. Lastly, a supervised model is used to learn the best weights associated with different topological features in deciding the researcher-new paper recommendations. Experiments on a real bibliographic network (DBLP network) shows the effectiveness of this approach by compared to state-of-the-art new paper recommendation methods.

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References

1. Liu S, Liu G, Zhou H (2018) A Robust Parallel Object Tracking Method for Illumination Variations. *Mobile Networks and Applications*. <https://doi.org/10.1007/s11036-018-1134-8>
2. Lin Y, Wang S, Wu Q, Chen L (2018) Key Technologies and Solutions of Remote Distributed Virtual Laboratory for E-Learning and E-Education. *Mobile Networks and Applications*. <https://doi.org/10.1007/s11036-018-1130-z>

3. Jia B, Hao L, Zhang C et al (2018) An IoT Service Aggregation Method Based on Dynamic Planning for QoE Constraints. *Mobile Networks and Applications*. <https://doi.org/10.1007/s11036-018-1135-7>
4. Zhang H, Huang T, Lv Z et al (2018) MOOCRC: A Highly Accurate Resource Recommendation Model for Use in MOOC Environments. *Mobile Networks and Applications*. <https://doi.org/10.1007/s11036-018-1131-y>
5. Ali U, Mehmood A, Majeed MF et al (2018) Innovative Citizen's Services through Public Cloud in Pakistan: User's Privacy Concerns and Impacts on Adoption. *Mobile Networks and Applications*. <https://doi.org/10.1007/s11036-018-1132-x>
6. Ma Z, Zhang Y, Zeng J (2018) Newly Published Scientific Papers Recommendation in Heterogeneous Information Networks. *Mobile Networks and Applications*. <https://doi.org/10.1007/s11036-018-1133-9>

Mobile Networks and Application and so on. He also acts as a reviewer of IEEE Transactions on Fuzzy Systems, IEEE Transactions on Image Processing, Information Sciences, Applied Mathematics and Computation, IEEE Access, and so.

Shuai Liu received his bachelor's (2002), master's (2004) and doctoral (2011) degrees from the College of Computer Science and Technology, Jilin University. He now works as an Professor in the College of Computer Science, Inner Mongolia University. He has published more than 20 papers in Elsevier, Springer, Oxford and other publishers. He is now interested in image processing, computer vision and fractals. He now acts as an (associate/guest) editor in IEEE Access,

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agreement number PIRSES-GA-2010-269,124 and Visual analytics for sense-making and analytic reasoning in criminal intelligence analysis (VALCRI) (2015–2018) funded through EU FP7 Programme with contract Number FP7-IP-608142.