Program of ATAIT 2019

The 2019 International Symposium on Advanced Technologies and Applications in the Internet of Things (ATAIT 2019) will be held in Shiga, Japan on November 29-30, 2019. This conference is sponsored by the VLSI center of Ritsumeikan University, Tokyo University of Agriculture and Technology (Deng Lab.), Central South University and Tianjin University. It provides an international forum for professionals, academics, and researchers to present latest developments in IoT technologies and applications, including the network, security, processor architecture, high performance computing, image processing, FPGAs and GPUs, etc. ATAIT2019 focus on the research of "Smart and Open Support System of Healthcare Service for Elderly". It particularly welcomes those emerging methodologies and techniques which bridge theoretical studies and applications in the Internet of Things. Novel quantitative engineering and science studies may be considered as well.

November 29-30, 2019.
Ritusmeikan Universty, BKC, Intelligent High-performance Computing Lab.

Invited Talk:

Prof. Yunchuan Sun (Beijing Normal University)

Title: Event-object linked network and its application in Finance

Yunchuan Sun is currently a professor in Beijing Normal University, Beijing, China. He acts as the Secretary of the IEEE Communications Society Technical Subcommittee for the Internet of Things from Jan. 2013. He is also an associate editor of the Springer journal Personal and Ubiquitous Computing . He received his PhD in 2009 from the Institute of Computing Technology, Chinese Academy of Science, Beijing, China. After receiving his Master of Engineering from the College of Information Science and Technology of Beijing Normal University in Beijing, 2003, he worked as an assistant professor, associate professor at Beijing Normal University (2003-2016) and promoted to professor in 2017.

His research interests include Internet of Things, Semantic Link Network, Big Data, Knowledge Representation, Information Security, and Business Models for the Internet of Things. In recent years, he has successfully organized several special issues in some international journals like Springer Personal and Ubiquitous Computing, Elsevier Journal of Networks Computer Applications, and etc. He also holds or participates in several research projects from NSFC, 863 Program of China, and etc. He is now being served as the lead guest editors of two special issues of international journals Personal and Ubiquitous Computing (ISSN: 1617-4909, SCI IF=1.137) and Automatika (ISSN: 0005-1144, SCI IF: 0.108), and he has served as co-chairs for several international conferences and workshops, also program committee member and reviewer at many international conferences and journals, and has been participating in several national research projects. He is also in the Editorial board of Journal of Personal and Ubiquitous Computing (ISSN: 1617-4909, SCI IF=1.137), Next Generation Information Technology (ISSN: 2092-8637) and International Journal of Digital Content Technology and its Applications (ISSN: 1975-9339, EI-indexed). He has published more than twenty papers on several international journals and conferences.

Accepted Paper list:

Title: **Elderly Persons Protection Using Gradient Features Descriptors and Comparing Datasets with Mulitple Classifiers**

Authors: Aravinda C.V, Lin Meng, and Uday Kumar Reddy
Affiliation: Computer Science & Engineering N.M.A.M Institute of Technology

Abstract:
   The problematic of elderly humanity is now upsetting many countries. During this time, it is quite possible that they may experience a fall which could result in a serious injury or negatively affect health conditions. The situation could possibly get worse, if the concerned people are not notified about the incident immediately or within a short span of time. In this paper, a model is built which to detect human fall using HOG Feature Descriptor and Classification algorithms. In the HOG feature descriptor, the distribution (histograms) of directions of gradients (oriented gradients) are used as features. Gradients (x and y derivatives) of an image are useful because the magnitude of gradients is large around edges and corners (regions of abrupt intensity changes). However, to our knowledge, detecting a fall while in progress is an area in which reported studies have been scarce at best. While successfully detecting a fall after a person has fallen is very important so that help can be provided to the injured (elderly) person, protecting a person while he/she is falling and before hitting the ground can even be more helpful and can save the person from major injuries, In some cases even his/her life as well as important medical costs. The proposed method gives around 75% to 88% accuracy for the given dataset.

Title: Online Optimization for DAG-based Requests Through Deep Q-learning in Collaboration Edge Computing Networks

Authors: Yaqiang Zhang, Lin Meng, and Zhangbing Zhou
Affiliation: China University of Geosciences/ Ritsumeikan University
Abstract:

   With the rapid development of 5G technology and Internet of Things technology, mobile cloud computing and edge computing face great challenges in network traffic, task scheduling and energy efficiency. The impact of more complex user requests on the network is becoming apparent, and traditional load allocation schemes are often not adequate for the scheduling of complex tasks. Although in the edge computing network, the online optimization of the task has been widely discussed, however, for user requests with complex structure, how to consider the sequential dependencies inside the request and the temporal constraints between the internal subtasks to achieve effective task allocation is still a relatively complex problem. In this work, to address those issues, we use effective collaboration between edge servers to optimize the task allocation process. We address the Online Optimization for DAG-based Requests Problem (OODRP) as a Markov Decision Process (MDP), while state space and action space are multidimensional and with large scale. A Deep Q-learning based framework is developed to solve the issue.

Title: Predictive Modelling Data Analysis for Prevention of Heart Attack using Deep Learning Techniques

Authors: Aravinda C.V, Lin Meng, and Akshaya & Amar Prabhu G
Affiliation: Computer Science and Engineering N.M.A.M Institute of Technology
Abstract:

    Health care organisation is suffering from unsustainable costs and lack of data utilization. Therefore, there is a need to find solution that can reduce unnecessary costs and improve quality of health care. Due to this reason, preventable death in INDIA, according to International Congestive Heart Failure study is about 23% per year. If we separate the death cause between preventable death and other death in INDIA preventable death stands in 3rd position due to Heart-attack. So, there is huge problem present in modern house care, including high cost, high waste and low quality of health. This global cause of death can increase the number to grow more than 23.6 million by 2030. The population in low and Middle-income countries (LIMC) are the most affected by heart diseases. 80% of death by heart disease especially to younger people occur usually at LIMC when compared to higher income countries. Many researches have been done with the techniques of knowledge discovery in various fields for Heart Disease prediction and have shown the acceptable levels of accuracy. By investigating the survey of those accuracy levels, this research paper is proposed to help doctors not only to diagnose and predict the heart disease by achieving accuracy levels but helps to prescribe the medicine successfully according to the predicted disease.

Title: Configurable IoT-Aware Allocation in Business Processes

Authors: Mengyu Sun, and Zhangbing Zhou
Affiliation: China University of Geosciences
Abstract:

The Internet of Things (IoT) paradigm has established an efficient platform to enable the collaboration and cooperation of self-configurable and energy-aware IoT nodes for supporting complex applications. Heterogeneous IoT nodes provide various kinds of functionalities, which can be encapsulated and represented as IoT services. These services can be composed to provide value-added services, while spatial–temporal constraints of IoT services should be satisfied, and energy consumption of IoT nodes should be balanced to prolong the network lifetime. Given a set of concurrent service requests, a challenge is to recommend efficient service compositions. To address this challenge, this paper proposes to identify and share common functional components, and thus, to integrate and optimize concurrent requests, where a component corresponds to a snippet of IoT service compositions. Shared components in different requests should not violate their temporal dependencies and thus improving resource utilization. Consequently, composing IoT services with respect to concurrent requests can be reduced to a constrained multi-objective optimization problem, which can be solved by heuristic algorithms. Experimental evaluation has been performed with respect to the state-of-art's algorithms, and the results demonstrate the efficiency and performance of this technique, especially when IoT nodes are relatively large in number and their functionalities are highly overlapped with each other.

Title: Research on Remote Monitoring System for Elderly based on the Internet of Things

Authors: Xuebin Yue, Hengyi Li, and Lin Meng,
Affiliation: Zhongyuan University of Technology / Ritsumeikan University
Abstract:

With the development of the aging society, the health of elderly has become an important social problem. At the same time, with the popularization of intelligent medicine, the medical industry is realizing the transformation from doctor-centered to patient-centered. Research on supplementing and strengthening existing medical services based on the Internet of Things technology has attracted much attention. Our work mainly introduces the Wireless Sensor Network (WSN) technology which is applied to monitor the elderly in different places in the context of the Internet. And deep learning is applied to the Internet of Things to analyze and predict the health conditions of the elderly. When abnormal signs are detected, an early warning signal is immediately sent to the nearest medical center to provide safe, reliable and intelligent medical services for the elderly. As a result, the transformation from "treatment" to "prevention" is realized. The elderly remote monitoring system is based on the Internet of Things and provides a reference direction for the research of intelligent medical care for the elderly. Finally, this paper describes the challenges and future development prospects of the system in detail.

Title: FPGA Based AI Edge Computing

Authors: Hengyi Li, Xuebin Yue, and Lin Meng
Affiliation: Zhongyuan University Of Technology
Abstract:

With the approach of the internet of things, Edge Computing combining with AI is going to flourish. And massive IoT device terminals and 5G networks will promote this development trend as well. The processing of massive data based on AI intelligent edge computing poses a huge challenge to existing devices. It is urgent to find new terminal solutions. Although the solutions based on ASIC chips have huge advantages in the aspect of energy efficiency in the specific application areas than that of general-purpose chips such as CPU and GPU. However, the current AI algorithm is still in a continuous and fast updating process of renewing, and its application scenarios are rapidly evolving. The current and future architectures of edge computing will remain active and develop continually for many years, and their algorithms and workloads will continue to evolve and change. The future of AI edge computing must extend to the continuously updated architectures and the rapidly growing data scales. Based on the issues above, re-configurable FPGA has absolute advantages in the field of AI edge computing.

Title: Research and application of an uncertain GMCFSFDP clustering algorithm in landslide hazard prediction

Authors: Yimin Mao, Tao tao, Qin hui, and Maosheng Zhang
Affiliation: Jiangxi University of Science and Technology
Abstract:

Due to difficulties in obtaining and effectively processing rainfall in landslide hazard prediction, as well as the existing limitation in dealing with large-scale data sets in clustering by Fast Search and Find of Density Peaks (CFSFDP) algorithm, a novel CFSFDP algorithm based on grid and merging clusters (GM-CFSFDP) has been proposed to assess landslide susceptibility model. Firstly, this method adopted a new two-phase clustering algorithm, which is suitable for large-scale data sets. Secondly, the uncertain data model is presented to effectively quantify triggering factors (precipitation). At the same time, a novel Euclidean distance formula based on midpoint and length of uncertain data (E-ML distance formula) is designed, which makes the new method to manage the uncertain data. Finally, the prediction model of landslide hazards was constructed and verified in Baota district of Yan'an city. The experimental results show that the uncertain GMCFSFDP clustering algorithm can effectively improve the accuracy of landslide hazard prediction.

Title: Research and application of uncertain NNSBOPTICS clustering algorithm in landslide hazard prediction

Authors: Weiming Liu, Zhang Chi, Huabin Chen, and Yimin Mao
Affiliation: Jiangxi University of Science and Technology

Abstract:

Due to the difficulties in effectively obtaining and processing rainfall and other uncertain factors in landslide hazard prediction, as well as the existence of setting density threshold and high time complexity in the OPTICS-PLUS algorithms, NNSB-OPTICS (nearest neighbor search based on OPTICS), a novel uncertain clustering algorithm, was proposed and applied to landslide prediction. In this method, firstly, the "expansion strategy" of OPTICS-PLUS clustering algorithm is optimized, which avoids setting density threshold by hand and improves the efficiency of the algorithm. Subsequently, according to the distribution characteristic of rainfall data, the EC (Expectation and Cloud) distance formula, which can process the uncertain rainfall data effectively, was proposed by combining with the EW (Expectation and Width) distance and the cloud theory. Finally, the experiment conducted in the Baota district of Yan'an city showed that the overall accuracy of the method is 89.7%, and invalid the feasibility of an uncertain NNSB-OPTICS clustering algorithm in landslide hazard prediction.

Title: Application of uncertain ant colony clustering algorithm based on approximate backbone in landslide hazard prediction

Authors: Yimin Mao, Lei Chen, Zhongli Li, and Maosheng Zhang
Affiliation: Jiangxi University of Science and Technology

Abstract:

Since the uncertain factor rainfall is hard to accurately handle, ant colony clustering algorithm is prone to get caught into sub-optimal solution and the searching speed is low in searching space. Affected by these above two points, for improving the accuracy of predicting landslide hazard, I propose an uncertain ant colony clustering algorithm based on approximate backbone. Firstly, it utilizes the point probability model to describe the uncertain data for measuring the similarity. Secondly, it introduces the pheromone redistribution and adaptive dynamic variables to update the local pheromone and global pheromone for improving the searching speed, and loads the genetic algorithm to prevent it from falling into local optimality early. Finally, it combines the approximate backbone theory to construct uncertain ant colony clustering algorithm model based on approximate backbone which reduces the iteration times and obtains the clustering solution rapidly. Experiment results show that this method achieves a higher clustering quality and the prediction accuracy reaches 93.3% in UCI true datasets and landslide experiment datasets of the Baota district of Yan'an, which verified the feasibility of this algorithm in landslide hazard prediction.

Short Research Presentation

Presenter	Title
Zelin Meng *(Ritsumeikan Univ.)*	Application of Stereo Vision-Based Motion Estimation Approach
Zhichen Wang *(Ritsumeikan Univ.)*	Gender Classification of Elderly People using Doppler Radar Images based on Machine Learning
Zhiyu Zhang *(Ritsumeikan Univ.)*	Rubbing Character Recognition Combined with Deep Learning and Lexical Analysis
Bing Lyu *(Ritsumeikan Univ.)*	Frame Detection and Text Line Segmentation for Early Japanese Books Understanding
Lehan Chen *(Ritsumeikan Univ.)*	Deep learning for Early Japanese Books Understanding