

# HP3C 2022

2022 6th International Conference on  
High Performance Compilation, Computing and Communications

# WSAI 2022

2022 4th World Symposium on Artificial Intelligence

June  
23-25  
2022

Jilin, China

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## Welcome Message

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## Useful Information

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## Daily Schedule

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## Keynote Speakers

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## Online Sessions

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# WELCOME MESSAGE

We are proud to bring you to 2022 6th International Conference on High Performance Compilation, Computing and Communications (HP3C 2022) and 2022 the 4th World Symposium on Artificial Intelligence (WSAI 2022). It will be held in Jilin, China during June 23-25, 2022. It's co-sponsored by Northeast Electric Power University, National Supercomputing Center in Jinan, Qilu University of Technology, China, Research Institute of Big Data Analytics, Xi'an Jiaotong-Liverpool University, China and Guangdong University of Technology GDUT.

As coronavirus spreads worldwide, considering the safety of everyone, the organizing committee decided to convert the conference into a full-virtual conference. From a practical perspective, there are also benefits to holding a conference online. Along with preventing COVID infection, the online conference provides effective communication using modern software tools and gives a unique experience for all participants.

The conference has been planned so that experts from the industries and academia, students of universities, will share their knowledge and experiences. The field will be enriched during presentation sessions, tutorials as well as in informal conversations by the dialogue among colleagues from around the world. We hope this will be a memorable and valuable experience, and all participants will enjoy discovering the new domains of research, distributing practical knowledge, and sharing personal contacts!

Together with keynote speeches of distinguished scientists

- Prof. Witold Pedrycz, IEEE Life Fellow, University of Alberta, Edmonton, Canada
- Prof. Rajkumar Buyya, IEEE Fellow, Director, Cloud Computing and Distributed Systems (CLOUDS) Lab, The University of Melbourne, Australia
- Dr. Hossam A. Gabbar, PEng, RAMSP Fellow, Director of Smart Energy Systems Lab, Ontario Tech University, Canada

On behalf of the conference committee, we would like to express our gratitude to all the authors, the reviewers, and the attendees for their contributions and participations in this conference. Their dedication and expertise enable us to prepare this high-quality program and make the conference successful. Finally, we would like to wish all the presenters and participants having a productive and enjoyable conference.

Conference Committees

# USEFUL INFORMATION

## Online Presentation Instruction

- Please unmute audio and start video while your presentation.
- It's suggested to use headset with microphone or earphone with microphone
- Please prepare the slide file of your presentation on your laptop in advance.
- Duration of each Presentation: about 12 Minutes of Presentation and 3 Minutes of Q&A.
- E-certificate will be sent to presenters after conference by email. An excellent presentation will be selected from each session and announced on the website after conference. An excellent presentation certificate will be sent after conference by email.
- The conference secretary will capture a group photo at the end of each session, and you can download the picture after the conference on website after conference.

**Please rename yourself before entering the conference room as below (in English):**

Author: Paper ID-Name; Listener: Listener-Name; Keynote Speaker: Keynote-Name; Conference Committee: Position-Name

## Zoom Meeting Instruction

### ➤ Zoom Meeting Room Link

**Room 1:** <https://us02web.zoom.us/j/87987660147>

**Room 2:** <https://us02web.zoom.us/j/81236954198>

### ➤ Zoom Meeting Room Password: 062325

- Conference rooms will be open 30 mins before scheduled time.
- Please enter the room 10-15 minutes in advance and be prepared.



**ZOOM Download:** URL: <https://zoom.us/>

## Follow us on We-chat

Wechat Account (remark "HP3C 2022/WSAI 2022+Paper ID)



<b>Zoom Meeting Room ID: 879 8766 0147 Password: 062325</b>	
<b>Zoom Link: <a href="https://us02web.zoom.us/j/87987660147">https://us02web.zoom.us/j/87987660147</a></b>	
<b>Time</b>	<b>Contents</b>
<b>10:00-10:30</b>	<b>Test time for Keynote Speakers</b>
<b>10:30-11:00</b>	<b>Test time for Committee Members</b>
<b>11:00-11:30</b>	<b>Test time for Session Chairs</b>
<b>14:00-14:40</b>	<b>Session 1:</b> H0326, H0209, H0436, H0437, H0439, H0440, H2002, H0331 <b>Session 2:</b> H2016, H0214, H2001, H2004, H2010, H2023, H2011, H2017 <b>Session 3:</b> H0215, H0328, H0216, H0438, H0442, H2005, H2018, H3005, H0325
<b>15:00-15:40</b>	<b>Session 4:</b> H0210, H0101, H0206, H0217, H0218, H0444, H2008, H2025, H1001 <b>Session 5:</b> H0207, H0211, H0208, H0219, H0321, H3004, H1002, H0324, H3006 <b>Session 6:</b> H0329, H0103, H0332, H0435, H0445, H2019, H2024, H0330, H3007

**Zoom Meeting Room ID: 879 8766 0147 Password: 062325**

Morning Host: Prof. Steven Guan, Xi'an Jiaotong-Liverpool University, China

<b>09:00-09:05</b>	<b>Welcome Message</b> Prof. Jianpo Li, Northeast Electric Power University, China
<b>09:05-09:10</b>	<b>Opening Remarks</b> Prof. Xiaoming Xiong, Guangdong University of Technology, China
<b>09:10-09:15</b>	<b>Message from 2023</b> Prof. Xiaoming Wu, Qilu University of Technology, Shandong Computer Science Center, China
<b>09:15-10:00</b>	<b>Keynote Speaker I</b> Prof. Witold Pedrycz, University of Alberta, Edmonton, Canada (IEEE Life Fellow) <i>Speech Title: Federated Learning, Knowledge Transfer, and Knowledge Distillation: Pursuing New Avenues of Green and Granular Machine Learning</i>
<b>10:00-10:20</b>	<i>Group Photo &amp; Break Time</i>
<b>10:20-11:05</b>	<b>Keynote Speaker II</b> Prof. Rajkumar Buyya, The University of Melbourne, Australia (IEEE Fellow) <i>Speech Title: Neoteric Frontiers in Cloud, Edge, and Quantum Computing</i>
<b>11:05-11:50</b>	<b>Keynote Speaker III</b> Dr. Hossam A. Gabbar, Ontario Tech University, Canada <i>Speech Title: Transitioning to Autonomous Transportation</i>
<b>11:50-14:00</b>	<i>Break Time</i>

<b>Password: 062325</b>	<b>Room 1 Zoom ID: 879 8766 0147</b>	<b>Room 2 Zoom ID: 812 3695 4198</b>
<b>14:00-16:00</b>	<p><b>Online Session 1</b> <b>Topic: Information Network and Information Security</b></p> <p><b>Session Chair: Assoc. Prof. Wael Yafooz, Al-Madinah International University, Malaysia</b></p> <p>H0326, H0209, H0436, H0437, H0439, H0440, H2002, H0331</p>	<p><b>Online Session 2</b> <b>Topic: Artificial Intelligence and Engineering Applications</b></p> <p><b>Session Chair: Prof. Zhengyao Yi, Dalian University of Technology, China</b></p> <p><b>Co-chair: Assoc. Prof. Shahida Sulaiman, Universiti Teknologi Malaysia, Malaysia</b></p> <p>H2016, H0214, H2001, H2004, H2010, H2023, H2011, H2017</p>



<b>Password:</b> <b>062325</b>	<b>Room 1</b> <b>Zoom ID: 879 8766 0147</b>	<b>Room 2</b> <b>Zoom ID: 812 3695 4198</b>
<b>09:30-11:45</b>	<p align="center"> <b>Online Session 3</b>  <b>Topic: Data Computing and Models</b>  <b>Session Chair: Prof. Loc Nguyen, Sunflower Soft Company, Vietnam</b> </p> <p align="center">                     H0215, H0328, H0216, H0438, H0442, H2005, H2018, H3005, H0325                 </p>	<p align="center"> <b>Online Session 4</b>  <b>Topic: Electronics and Electrical Engineering</b>  <b>Session Chair: Dr. Huai-En Gao, Guangdong University of Technology, China</b> </p> <p align="center">                     H0210, H0101, H0206, H0217, H0218, H0444, H2008, H2025, H1001                 </p>
<b>11:45-14:00</b>	<p align="center"><b>Break Time</b></p>	
<b>14:00-16:15</b>	<p align="center"> <b>Online Session 5</b>  <b>Topic: Smart Image and Multimedia Applications</b>  <b>Session Chair: Prof. Yoshifumi Manabe, Kogakuin University, Japan</b> </p> <p align="center">                     H0207, H0211, H0208, H0219, H0321, H3004, H1002, H0324, H3006                 </p>	<p align="center"> <b>Online Session 6</b>  <b>Topic: Modern Electronic Technology and Intelligent System</b>  <b>Session Chair: Prof. Ljiljana Trajkovic, Simon Fraser University, Canada</b> </p> <p align="center">                     H0329, H0103, H0332, H0435, H0445, H2019, H2024, H0330, H3007                 </p>



**Prof. Witold Pedrycz IEEE Life Fellow**

**Department of Electrical & Computer Engineering**

**University of Alberta, Edmonton, Canada**

**[wpedrycz@ualberta.ca](mailto:wpedrycz@ualberta.ca)**

Witold Pedrycz (IEEE Life Fellow) is Professor and Canada Research Chair (CRC) in Computational Intelligence in the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada. He is also with the Systems Research Institute of the Polish Academy of Sciences, Warsaw, Poland. Dr. Pedrycz is a foreign member of the Polish Academy of Sciences and a Fellow of the Royal Society of Canada. He is a recipient of several awards including Norbert Wiener award from the IEEE Systems, Man, and Cybernetics Society, IEEE Canada Computer Engineering Medal, a Cajastur Prize for Soft Computing from the European Centre for Soft Computing, a Killam Prize, a Fuzzy Pioneer Award from the IEEE Computational Intelligence Society, and 2019 Meritorious Service Award from the IEEE Systems Man and Cybernetics Society. His main research directions involve Computational Intelligence, fuzzy modeling and Granular Computing, knowledge discovery, pattern recognition, data science, knowledge-based neural networks among others. Dr. Pedrycz is involved in editorial activities. He is an Editor-in-Chief of Information Sciences, Editor-in-Chief of WIREs Data Mining and Knowledge Discovery (Wiley), and Co-editor-in-Chief of Int. J. of Granular Computing (Springer) and J. of Data Information and Management (Springer).

**Speech Title: Federated Learning, Knowledge Transfer, and Knowledge Distillation: Pursuing New Avenues of Green and Granular Machine Learning**

**Abstract:** The visible trends of Machine Learning (ML) are inherently associated with the diversity of data and innovative ways they are used in order to carry out learning pursuits. The ongoing objectives of the research agenda are also investigated in the context of green ML (usually referred to as green AI). One can identify three ongoing challenges with far-reaching methodological implications, namely (i) completing designs in the presence of strict constraints of privacy and security, (ii) efficient model building completed with limited data of varying quality, and (iii) a reduction of computing effort knowledge transfer and distillation.

We advocate that to conveniently address these quests, it becomes beneficial to engage the fundamental framework of Granular Computing to enhance the existing approaches (such as e.g., federated learning in case of (i) and transfer knowledge in (iii)) or establish new directions to the problem formulation. Likewise, it is also essential to establish sound mechanisms of evaluation of the performance of the ML architectures. It will be demonstrated that various ways of conceptualization of information granules in terms of fuzzy sets, sets, rough sets, and others may lead to efficient solutions.

# KEYNOTE SPEAKERS

June 24, 2022, GMT+8, Beijing Time  
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To establish a suitable conceptual ML framework, we include a brief discussion of concepts of information granules and Granular Computing. We show how granular models endow numeric models with their quantification mechanisms to deliver a prerequisite for machine learning constructs with an emphasis on associated computational overhead.

To proceed with a detailed discussion, a concise information granules-oriented design of rule-based architectures is outlined. A way of forming the rules through unsupervised federated learning is investigated along with algorithmic developments. A granular characterization of the model formed by the server vis-a-vis data located at individual clients is presented. It is demonstrated that the quality of the rules at the client's end is described in terms of granular parameters and subsequently the global model becomes represented as a granular construct. The roles of granular augmentations of models in the setting of granular knowledge distillation are outlined. It is shown how the agenda of green ML is effectively realized by exploring information granules and stressing an importance of the holistic perspective at critical trade-offs among interpretability, enormous computational overhead, and transparency of predictors and classifiers.



**Prof. Rajkumar Buyya, IEEE Fellow**

**Director, Cloud Computing and Distributed Systems (CLOUDS) Lab,**

**The University of Melbourne, Australia**

**CEO, Manjrasoft Pvt Ltd, Melbourne, Australia**

Dr. Rajkumar Buyya is a Redmond Barry Distinguished Professor and Director of the Cloud Computing and Distributed Systems (CLOUDS) Laboratory at the University of Melbourne, Australia. He is also serving as the founding CEO of Manjrasoft, a spin-off company of the University, commercializing its innovations in Cloud Computing. He has authored over 850 publications and seven textbooks including "Mastering Cloud Computing" published by McGraw Hill, China Machine Press, and Morgan Kaufmann for Indian, Chinese and international markets respectively. Dr. Buyya is one of the highly cited authors in computer science and software engineering worldwide (h-index=155, g-index=340, and 125,700+ citations). Dr. Buyya is recognised as Web of Science "Highly Cited Researcher" for six consecutive years since 2016, IEEE Fellow, and Scopus Researcher of the Year 2017 with Excellence in Innovative Research Award by Elsevier. He has been recognised as the "Best of the World" twice for research fields (in Computing Systems in 2019 and Software Systems in 2021) as well as "Lifetime Achiever" and "Superstar of Research" in "Engineering and Computer Science" discipline twice (2019 and 2021) by the Australian Research Review. Recently, he received "Research Innovation Award" from IEEE Technical Committee on Services Computing and "Research Impact Award" from IEEE Technical Committee on Cloud Computing.

Software technologies for Grid, Cloud, and Fog computing developed under Dr. Buyya's leadership have gained rapid acceptance and are in use at several academic institutions and commercial enterprises in 50+ countries around the world. Manjrasoft's Aneka Cloud technology developed under his leadership has received "Frost New Product Innovation Award". He served as founding Editor-in-Chief of the IEEE Transactions on Cloud Computing. He is currently serving as Editor-in-Chief of Software: Practice and Experience, a long-standing journal in the field established 50+ years ago. For further information on Dr. Buyya, please visit his cyberhome: [www.buyya.com](http://www.buyya.com)

## **Speech Title: Neoteric Frontiers in Cloud and Edge Computing**

**Abstract:** Computing is being transformed to a model consisting of services that are delivered in a manner similar to utilities such as water, electricity, gas, and telephony. In such a model, users access services based on their requirements without regard to where the services are hosted or how they are delivered. Cloud computing paradigm has turned this vision of "computing utilities" into a reality. It offers infrastructure, platform, and software as services, which are made available to consumers as

subscription-oriented services. Cloud application platforms need to offer (1) APIs and tools for rapid creation of elastic applications and (2) a runtime system for deployment of applications on geographically distributed Data Centre infrastructures (with Quantum computing nodes) in a seamless manner.

The Internet of Things (IoT) paradigm enables seamless integration of cyber-and-physical worlds and opening opportunities for creating new class of applications for domains such as smart cities, smart robotics, and smart healthcare. The emerging Fog/Edge computing paradigms support latency sensitive/real-time IoT applications with a seamless integration of network-wide resources all the way from edge to the Cloud.

This keynote presentation will cover (a) 21st century vision of computing and identifies various IT paradigms promising to deliver the vision of computing utilities; (b) innovative architecture for creating elastic Clouds integrating edge resources and managed Clouds, (c) Aneka 5G, a Cloud Application Platform, for rapid development of Cloud/Big Data applications and their deployment on private/public Clouds with resource provisioning driven by SLAs, (d) a novel FogBus software framework with Blockchain-based data-integrity management for facilitating end-to-end IoT-Fog/Edge-Cloud integration for execution of sensitive IoT applications, (e) experimental results on deploying Cloud and Big Data/ IoT applications in engineering, and health care (e.g., COVID-19), deep learning/Artificial intelligence (AI), satellite image processing, and natural language processing (mining COVID-19 research literature for new insights) on elastic Clouds, (f) QFaaS: A Serverless Function-as-a-Service Framework for Quantum Computing, and (g) directions for delivering our 21st century vision along with pathways for future research in Cloud and Edge/Fog computing.



**Dr. Hossam A. Gabbar**

**PEng, RAMSP Fellow, Director of Smart Energy Systems Lab**

**Ontario Tech University, Canada**

Dr. Gabbar is a full Professor in the Ontario Tech University (UOIT) in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, where he has established both the Smart Energy Systems Lab (SESL), Energy Safety and Control Lab (ESCL), and Advanced Plasma Engineering Lab (APEL). He is the recipient of the Senior Research Excellence Award for 2016, UOIT. He is recognized among the top 2% of worldwide scientists with high citation in the area of smart energy and transportation infrastructures. He has been actively working in the area of transportation electrification autonomous vehicles and their integration with energy and urban infrastructures with safety considerations. He is leading national and international research in the areas of smart energy grids, test platform for connected and autonomous vehicles. Dr. Gabbar obtained his B.Sc. degree in 1988 with first class of honor from the Faculty of Engineering, Alexandria University (Egypt). In 2001, he obtained his Ph.D. degree from Okayama University (Japan). From 2001 till 2004, he joined Tokyo Institute of Technology (Japan), as a research associate. From 2004 till 2008, he joined Okayama University (Japan) as a tenured Associate Professor, in the Division of Industrial Innovation Sciences. From 2007 till 2008, he was a Visiting Professor at the University of Toronto. He has more than 220 publications, including patents, books / chapters, journal and conference papers.

### **Speech Title: Transitioning to Autonomous Transportation**

**Abstract:** This talk will discuss functional modeling of Connected and Autonomous Vehicles (CAV), and potential integrated testing and verification techniques. The talk will explain potential transitioning into CAV as part of autonomous transportation infrastructures, simulation practices, and possible deployment strategies. Different platooning and intersection management scenarios will be evaluated as part of integrated autonomous transportation infrastructures. The talk will also include possible standards, practices, and Key Performance Indicators (KPIs) for CAV deployment, such as safety, reliability, cost, human interactions, and environmental impacts. The talk will discuss evaluation criteria for driving scenarios and factors that impact decisions. Integrated modeling and simulation framework will be explained using co-simulation practices and integration of real time data to support evaluation and optimization of CAV operation and planning scenarios in normal and emergency conditions, including disaster and extreme weather conditions.



**Topic: Information Network and Information Security**

**Time: 14:00-16:00 Zoom Meeting Room ID: 879 8766 0147 | Password: 062325**

**Session Chair: Assoc. Prof. Wael Yafooz, Al-Madinah International University, Malaysia**

<p><b>H0326</b> <b>14:00-14:15</b></p>	<p>High-Performance Cryptographic SoC Virtual Prototyping Platform Based on RISC-V VP Junwei Wu, Xin Zheng, Shaofen Zeng, Xiaoming Xiong Presenter: Junwei Wu, Guangdong University of Technology, China</p> <p>Abstract: Hardware processors and optimization for secure operations in embedded devices have been a research hotspot in recent years. To full use of the limited computing and storage resources in embedded devices, it is necessary to explore the design space of software and hardware architectures in the early stage of SoC design. Therefore, SystemC-based electronic system-level (ESL) simulators are very useful for fast hardware modeling and verification. In this paper, we propose and design a SystemC-based cryptographic SoC virtual prototyping (Crypto-SoC VP) to speed up function and performance simulation of embedded security devices. We use RISC-V Crypto-Benchmark to analyze the simulation performance of the Crypto-SoC VP. SM4 crypto-accelerator with different hardware and software modes is also integrated in this VP. The experimental results show the efficiency of our design. The simulation speed on our virtual prototyping is over 50 times that of the traditional RTL simulation, while the simulation difference is only about 5%.</p>
<p><b>H0209</b> <b>14:15-14:30</b></p>	<p>A Node Selection Scheme for Data Repair Using Erasure Code in Distributed Storage System Yuejin Huang, Miao Ye, Yue Cai Presenter: Yuejin Huang, School of Information and Communications, Guilin University of Electronic Technology, China</p> <p>Abstract: The explosion of massive data poses a severe challenge to the storage cost and data storage reliability of traditional storage systems. As the number of storage nodes increases in a distributed storage system, the node failure probability increases. Erasure code technology as a redundancy strategy can greatly save the cost of storage space while providing security for data compared with multi-copy technology. In real large-scale data centers, the repair costs vary due to differences in storage node attributes and link status changes between nodes. In the repair process based on the erasure code mechanism, it is required to select a certain number of provider nodes from the surviving nodes to transmit data to the newcomer nodes, which leads to the problem of selecting nodes to participate in the repair process. In this paper, a tree-type repair scheme considering node selection (TR-NS) is designed, including an algorithm for selecting two types of nodes according to nodes performance and an algorithm for establishing the optimal repair</p>

	tree to complete the reconstruction of the failure data. The experimental results show that the repair time of the TR-RS scheme proposed in this paper is significantly reduced.
<b>H0436</b> <b>14:30-14:45</b>	<p>A Quantum Group Signature Based on Quantum Walk in d Dimensions Yunxiao Qian, Haoyang Yu Presenter: Yunxiao Qian, University of Science and Technology of China, China</p> <p>Abstract: In this paper, a group signature scheme based on quantum walk for quantum messages is proposed. Our scheme uses long step quantum walk-based teleportation and modified quantum one-time pad to authenticate the quantum messages respectively. In our scheme, the signer in a group signs the quantum messages by quantum walk-based teleportation and modified quantum one-time pad. The verifier can verify the signature via quantum walk-based teleportation while the group manager verifies the signature and identifies the signer via modified quantum one-time pad. The security analysis shows that the scheme can reach the properties of group signature. Compared to the teleportation via EPR pairs or Bell-like states, quantum walks are more flexible and use less measurement resources. Quantum teleportation via long-step quantum walk is more secure than that via one-step quantum walk in previous related works. The scheme can apply to arbitrary finite dimensional quantum systems and can also be possible to realize in practice.</p>
<b>H0437</b> <b>14:45-15:00</b>	<p>Performance Optimization of Sparse Deep Neural Networks Based on GPU Yucheng Shi, Long Ren Presenter: Yucheng Shi, Qinghai University, China</p> <p>Abstract: Deep neural networks are widely used in various fields. However, due to the large scale of the latest deep neural networks, the research on the sparsity of deep neural networks is constantly carried out. The implementation of the sparse deep neural network on GPU can further accelerate the computing speed of a sparse deep neural network. The performance of the GPU code of the CUDA version is far superior to the CPU codes of the Matlab version, which confirms the great superiority of the sparse deep neural network implementation on GPU. And the GPU code of the CUDA version is up x1.61 faster than the CUSPARSE version when the deep neural network has 1024 neurons and the 1920 layers.</p>
<b>H0439</b> <b>15:00-15:15</b>	<p>Large-scale parallel exact diagonalization algorithm of the Hubbard model on Tianhe-2 supercomputer Biao Li, Jie Liu Presenter: Biao Li, National University of Defense Technology, China</p> <p>Abstract: We propose a parallel exact diagonalization method for solving the large-scale Hubbard model. The core of this algorithm is the parallelization</p>



	<p>of the Lanczos algorithm, for which we propose a hierarchical communication model and a fast strategy for finding nonzero elements of large-scale matrix, starting only from the symmetry of Hamiltonian matrix. The effect of our parallel algorithm was tested on the Tianhe-2 supercomputer, where the strong scaling efficiency could reach 53% for 30,000 cores in a 140-billion dimensional matrix, and the weak scaling efficiency remained above 40% for 60,000 cores in a 730-billion dimensional matrix.</p>
<p><b>H0440</b> <b>15:15-15:30</b></p>	<p>An Energy Balance Ant Colony Routing Algorithm for WSN WEIHUA ZHU, LUYING XIE Presenter: LUYING XIE, Jilin Technology College of Electronic Information, China</p> <p>Abstract: Aiming at the problems that the ant colony routing algorithm is easy to form loops and its energy distribution is not uniform enough, an improved ant colony routing algorithm is proposed. The improved algorithm adds an ant identification combination item in the Hello packet, and stores it in the neighbor list of other nodes by broadcasting, which effectively weakens the loop effect. At the same time, the pheromone update formula is revised to improve the accuracy of pheromone update in multi-node areas and the energy difference factor is introduced, and the energy difference factor is used as the reference factor for the update of pheromone concentration, which improves the problem of uneven distribution of node energy and obtains a better balance of the energy of network nodes. The simulation results show that the improved algorithm can greatly improve the balance of node energy and the weakening of loop effects.</p>
<p><b>H2002</b> <b>15:30-15:45</b></p>	<p>Evaluation of Network Security State of Industrial Control System Based on BP Neural Network Daojuan Zhang, Peng Zhang, Wenhui Wang, Minghui Jin, Fei Xiao Presenter: Daojuan Zhang, State Grid Key Laboratory of Information &amp; Network Security, State Grid Smart Grid Research Institute co., Ltd, Beijing, China</p> <p>Abstract: With the development of computer and network technology, industrial control systems are connecting with the Internet and other public networks in various ways, viruses, trojans and other threats are spreading to industrial control systems, industrial control system information security issues are becoming increasingly prominent. Under this background, it is necessary to construct the network security evaluation model of industrial control system based on the safety evaluation criteria and methods, and complete the safety evaluation of the industrial control system network according to the design scheme. Based on back propagation (BP) neural network's evaluation of the network security status of industrial control system, this paper determines the number of neurons in BP neural network input layer, hidden layer and output layer by analyzing the actual demand, empirical equation calculation and experimental comparison, and designs the network security evaluation index system of industrial control system according to factors affecting industrial control safety, and constructs a safety rating table. Finally, by comparing the performance of BP neural network and</p>

	<p>multilinear regression to the evaluation of the network security status of industrial control system through experimental simulation, it can be found that BP neural network has higher accuracy for the evaluation of network security status of industrial control system.</p>
<b>H0331</b> <b>15:45-16:00</b>	<p><b>Reinforcement Learning Enabled Throughput Optimization for Interconnection Networks of Interposer-based system</b> SHUHAO LING, HUAIEN GAO, JIASONG CHEN, DAWEI LIU Presenter: Shuhao Ling, GaungDong University of Technology, China</p> <p>Abstract: Silicon interposer enables 2.5D stacking of memory chips and processor chips to pursue advanced memory access performance. In interposer-based system, different traffic transfers through network-on-interposer (NoI) lays on the silicon interposer which makes NoI throughput important to transmit the mass of data. However, the performance of the existing topology varies under different traffic patterns. In this paper, reinforcement learning (RL) is adapted to further optimize the throughput of NoI in various traffic. We design a dedicated RL framework for NoI enviroment to enable performance improvement. Three algorithms are used to maximize the throughput as well as reward in the RL Model. Simulation results demonstrate that the proposed RL approach provide higher throughput both in memory traffic and coherence traffic.</p>



**Topic: Artificial Intelligence and Engineering Applications**

**Time: 14:00-16:00 Zoom Meeting Room ID: 812 3695 4198 | Password: 062325**

**Session Chair: Prof. Zhengyao Yi, Dalian University of Technology, China**

**Co-chair: Assoc. Prof. Shahida Sulaiman, Universiti Teknologi Malaysia, Malaysia**

<b>H2016</b> <b>14:00-14:15</b>	<p>Dynamic Anti-windup Compensation Control of Yaw Movement for a Coaxial Eight-Rotor Unmanned Flying Robot Cheng Peng, Lihua Cai, Guanyu Qiao, Xun Gong Presenter: Cheng Peng, Chinese Academy of Sciences, China</p> <p>Abstract: The actuator saturation tends to occur in the yaw movement of the coaxial eight-rotor unmanned flying robot under external disturbances, for the reason that the yaw movement is much weaker than the pitch and roll movement. For this problem, a dynamic anti-windup compensator based on linear active disturbance rejection controller(LADRC) is proposed from the perspective of practical engineering application. LADRC is easy to adjust in engineering, and can estimate and compensate external disturbances in real time. On this basis, a dynamic anti-windup compensator is devised to prevent actuator saturation in the yaw movement. Then, the stability of the yaw control system with dynamic anti-windup compensator based on LADRC is proved. Finally, the validity and robustness of the proposed algorithm are verified via numerical simulations and coaxial eight-rotor unmanned flying robot experiment.</p>
<b>H0214</b> <b>14:15-14:30</b>	<p>An Efficient Parallel Architecture for Convolutional Neural Networks Accelerator on FPGAs Huang Hongmin, Li Xueming, Qin Yadong, Hu Xianghong, Xiong Xiaoming Presenter: Huang Hongmin, Guangdong University of Technology, China</p> <p>Abstract: Convolutional Neural Networks (CNNs) have been widely used in the field of computer vision. Due to the computational complexity of CNNs, their computational efficiency has become a major concern. Field Programmable Gate Array (FPGA) is an ideal embedded device for accelerating CNNs due to its parallelism and programmability. However, the key challenge is how to efficiently deploy CNNs on embedded platform FPGA. Based on the inherent parallelism of CNNs, this paper proposes an efficient parallel accelerator architecture with two processing element (PE) arrays to accelerate CNNs through layer-wise calculation. Using three tile strategies, the accelerator can be reconfigured to accelerate different CNNs, including VGG, and tiny-YOLO v2. Consuming 448 dsps, the experimental results show that the accelerator can reach a peak performance of 164.25 Giga Operations Per Second (GOPS) on VGG-16 and 138.77 GOPS on tiny-YOLO v2. Compared with previous research, this accelerator achieves enhanced power efficiency and performance density.</p>

<p><b>H2001</b> <b>14:30-14:45</b></p>	<p>Motion simulation and analysis of four wheeled climbing transformer robot Guanqun Li, He Zhu, Peng Yuan, Yu Zheng, Hongdan Zhao, Feng Gao, Haoran Zhu, Junxu He Presenter: Junxu He, Northeast Electric Power University, China</p> <p>Abstract: In order to realize the reliable climbing of the climbing transformer robot on the transformer wall and solve the problems of unstable center of gravity and easy sliding of the current wall climbing robot, this paper studies the kinematics of the four-wheel climbing transformer robot according to the actual working situation, and establishes the two-wheel differential driving motion equation of the four-wheel robot and the steering radius equation of the four-wheel robot, The model of the climbing transformer robot is established by SolidWorks. After importing the model into ADAMS, the kinematics simulation analysis is carried out in ADAMS / view, and finally the motion characteristics of the four-wheel climbing transformer robot are obtained to ensure the wall climbing reliability of the wall robot.</p>
<p><b>H2004</b> <b>14:45-15:00</b></p>	<p>Application of Artificial Intelligence in Mechanized Construction of Power Grid Engineering Chunan Luo, Yong Wu, Shaofan Li, Chunyu Liang Presenter: Chunan Luo, Guangdong Power Transmission and Distribution Engineering Co., Ltd., China</p> <p>Abstract: Artificial intelligence is one of the most disruptive science and technologies at present, with strong processing capabilities in computational intelligence, perceptual intelligence and cognitive intelligence. This paper expounds two applications of artificial intelligence in the mechanized construction of power grid engineering, namely the application of BIM building model and BP neural network in emergency rescue of mechanized construction, and the application of artificial intelligence in the positioning and sway prevention of tower cranes. The application of artificial intelligence in the mechanized construction of power grid projects improves the rescue work of rescuers, ensures the personal safety of construction workers, and enables tower cranes to quickly locate and eliminate swings. The corresponding links of its application are described in detail in this paper.</p>
<p><b>H2010</b> <b>15:00-15:15</b></p>	<p>Efficiency and Safety Improvement of Power Equipment Smart Inspection and Operation via Augmented Reality glasses based on AI technology Xiaoxiong Lu, Jie Zhang, Kaihua Chen, Di Ma, Yingmei Zhang, Yiru Wan Presenter: Xiaoxiong Lu, Market Technology Center State Grid Zhejiang Electric Power Co., Ltd. Hangzhou Power Supply Company, China</p> <p>Abstract: In order to solve the common problems such as low efficiency, heavy labor consumption, incomplete inspection existing in the operation and maintenance of traditional power equipment and improve the overall operation and application efficiency, this work presents a kind of wearable metering device based inspection method of the augmented reality system consists of wearable smart augmented reality glasses, used for taking pictures, recording, scanning the bar code for data information acquisition, and selectively through gestures or voice operation real-time display the required</p>

	<p>information. The collected data is sent to the intelligent mobile terminal through wireless transmission. Eventually, the system can realize the display of login interface and function menu interface, voice recognition and gesture recognition function, and work order acquisition and feedback. We provide experiments to show the superiority of the system designed in this work in meter reading and accounting tasks and real-time response.</p>
<p><b>H2023</b> <b>15:15-15:30</b></p>	<p>Self-adaptive Knowledge Embedding for Large-scale Electronic Component Knowledge Graph Junyu Lu, Yuxin Liu, Pingjian Zhang Presenter: Junyu Lu, South China University, China</p> <p>Abstract: Substitution of electronic components is an important research topic in the supply chain management of design and manufacture of electronic products. Previous studies mainly use simulation technology and case study, the system is complex and unable to comprehensively evaluate the different properties of components in each application environment. In this paper, we propose the Electronic Component Knowledge Graph (ECKG), which helps to discover knowledge from a large amount of data and assist in the substitution of electronic components. The ECKG integrates the electronic component data from different manufacturers and contains substitution relations labeled by domain expert experience. The ECKG contains two types of nodes: the central node is the representation of electronic components, and the peripheral node contains the attribute values that provides semantic support for the central node, which helps learning the structural knowledge. Moreover, we present the Self-adaptive Knowledge Embedding (SAKE) approach that integrates the semantic information of peripheral nodes into their corresponding central node. The SAKE is pre-trained on our large-scale ECKG with a knowledgebased attention mechanism to obtain the contextual representation of the central nodes. Experiment results show that SAKE outperforms other counterparts on the entity typing and link prediction tasks.</p>
<p><b>H2011</b> <b>15:30-15:45</b></p>	<p>Improvement of Self-Driving Algorithm with Traffic Command Recognition and Vehicle Information Interaction Wang Yuxiang, Maogen Fu Presenter: Maogen Fu, Edinburgh University, UK</p> <p>Abstract: Self-driving technology has been studied and developed for a long time and gradually tends to mature. However, we want to complete the fully self-driving under the smart city, whether in self-driving cars or uncrewed express vehicles and other vehicles. However, there are still many problems with traffic command and vehicle interworking during the car's driving. In this article, based on the two problems mentioned above, the authors improve the existing self-driving algorithm from these two aspects. On the one hand, the authors use the OpenPose to deal with 3-D motion and gestures and experiment on static images and static video of traffic gestures, the model can accurately segment various traffic information including traffic indication gestures in the target, and give feedback based on the set priority. On the other hand, by simulating vehicle information experiments, the algorithm can process nearby information and makes corresponding pre-processing according to the processing results. These two improvements not only make the</p>

	existing self-driving algorithm more perfect but also make the surrounding road condition information predictable, which means that the self-driving technology becomes more flexible and safer.
<b>H2017</b> <b>15:45-16:00</b>	<p>Finite-Time Super-Twisting Trajectory Tracking Control for a Coaxial Twelve-Rotor Unmanned Flying Robot Cheng Peng, Guangjian He, Lihua Cai Presenter: Cheng Peng, Chinese Academy of Sciences, China</p> <p>Abstract: Finite-time super-twisting trajectory tracking control for a coaxial twelve-rotor unmanned flying robot(UFR) is investigated under un-modeled dynamics and external disturbance. The coaxial twelve-rotor UFR as the nested closed-loop control system is divided into outer loop and inner loop. The integral sliding mode controller is adopted for the outer loop, and finite-time super-twisting sliding mode controller is proposed for the inner loop. A finite-time extended state observer(ESO) is designed to effectively estimate un-modeled dynamics and external disturbance. Then, the stability of the closed- loop system is proved by Lyapunov stability theorem. Finally, numerical simulation experiments demonstrate the effectiveness and superiority of the proposed control strategy.</p>

**Topic: Data Computing and Models****Time: 09:30 -11:45 Zoom Meeting Room ID: 879 8766 0147 | Password: 062325****Session Chair: Professor Loc Nguyen, Sunflower Soft Company, Vietnam**

<b>H0215</b> <b>09:30-09:45</b>	<p>Research on used car valuation problem based on model fusion Guozheng Liu, Haoxiang Chu, Ye Zhang, and HuiLing Shi Presenter: Guozheng Liu, Qilu University of Technology (Shandong Academy of Sciences), China</p> <p>Abstract: In recent years, with the rapid development of the automobile industry, the trading volume of second-hand cars in our country has grown rapidly. However, with the continuous expansion of the second-hand car market, a scientific and reasonable evaluation system or unified standard has not yet been formed in the second-hand car market, which makes the second-hand car trading market lack credibility and restricts its development of the second-hand car trading market. Therefore, it is particularly important to establish a reasonable and perfect second-hand car valuation method. In this paper, GBDT, LightGBM, and XGBoost models are introduced into the field of the used car valuation, and by analyzing the influence of body infrastructure and vehicle conditions, a used car valuation model based on the fusion of GBDT, LightGBM, and XGBoost is constructed. Then it conducts in-depth analysis and research on the problem of used car valuation. At the same time, to verify the advantages and rationality of the model proposed in this paper, the used car valuation model based on the fusion of GBDT, LightGBM and XGBoost is compared and analyzed with random forest, KNN, linear regression, and other models. Finally, after verification, the proposed model based on GBDT, LightGBM, and XGBoost fusion can significantly improve the prediction accuracy, and under the self-defined model evaluation standard in this paper, the model recognition accuracy is up to 89%, which has good practical value.</p>
<b>H0328</b> <b>09:45-10:00</b>	<p>Modern Distributed Data-Parallel Large-Scale Pre-training Strategies For NLP models Hao Bai Presenter: Hao Bai, Junior student, Computer Engineering, UIUC, USA</p> <p>Abstract: Distributed deep learning is becoming increasingly popular due to the expanding demand for computing resources for deep learning models with a larger amount of parameters. Dierent from traditional training approaches, data-parallel training allows multiple compute nodes to train large deep learning models simultaneously in order to boost the training eciency. In this paper, we present and compare six strategies for data-parallel training using PyTorch on the language model GPT-2 with 100M parameters using a qualitative approach. These strategies are Single GPU, Single Parameter Server, Distributed Parameter Server, Horovod, Distributed Parameter Server with Apex mixed-precision strategy, and Horovod with Apex mixed-precision strategy. We also analyze the quantitative experiment results from each strategy. In the end, we draw the conclusion that the Distributed</p>

	<p>Parameter Server with Apex mixedprecision strategy has the best performance on single node training, while Horovod with Apex is the most robust approach to use when we have single or multiple nodes. The appendix is located at <a href="https://www.jackgethome.com/publication/data_parallel/hp3cappendix.pdf">https://www.jackgethome.com/publication/data_parallel/hp3cappendix.pdf</a>.</p>
<p><b>H0216</b> <b>10:00-10:15</b></p>	<p>Genome-Wide Association and Interaction Study on Quantitative Traits of CSF Phosphorylated Tau in ADNI cohort Dandan Chen, Jin Li, Hongwei Liu, Lang Ao, Qiushi Zhang Presenter: Dandan Chen, Harbin Engineering University, China</p> <p>Abstract: Alzheimer’s disease (AD) is a most common and particularly complex neurodegenerative disease commonly characterized by a progressive decline in cognition and memory impairments. CSF A<math>\beta</math>42 and tau levels have emerged as useful biomarkers for disease and Quantitative Traits (QTs) for genetic studies of AD. In this study, CSF Phosphorylated Tau (P-tau) were used both in genome-wide association studies (GWAS) and genome-wide interaction study (GWIS) as QTs. The GWAS results shows that genes identified by Total Tau (T-tau), also have been replicated on QTs of P-tau, and a new GWAS loci of rs157582 have been identified by GWAS of CSF P-tau. The three genes of APOE, APOC1, and TOMM40 identified by p-Tau in this GWAS are previously confirmed AD susceptibility genes, while our GWAS have replicated them. Therefore, we may argue that QTs of P-tau is more sensitive and more significant than tau. This also indirectly proves the view of P-tau may be a more specific marker than T-tau for AD. Furthermore, the results demonstrate that the data, phenotypes, quality control methods and GWAS method we used to be rationality and validity, which making the subsequent GWIS based on this data more meaningful. In GWIS, 8 pairs of SNPs showed significant interaction effects on the CSF P-tau (corrected p-value &lt;0.05). These 8 pairs of SNPs revealed by GWIS codes from 8 novel genes. Among them, NAT1, ST18, CTNNA2 and IMMP2L have been reported as AD risk genes. NCKAP5, LHFPL3, PRLHR are related to schizophrenia (SCZ). And the gene of AOA1 go unreported be related to AD or SCZ. All the work illustrates the plausibility of T-tau as QTs on our dataset, while we also found more significant SNPs by GWIS, which can be used as an effective supplement when AD risk loci cannot be identified by GWAS. The 8 pairs of SNP interactions findings warrant replication and can be used for the analysis of other complex diseases.</p>
<p><b>H0438</b> <b>10:15-10:30</b></p>	<p>Attention Modulates the Neural Oscillation of Theta Frequency in Audiovisual Integration Wang Wenjing , Liu Guoao , Xi Yang Presenter: WangWenjing, Northeast Electric Power University, China</p> <p>Abstract: The ability to integrate information reaching us is a fundamental requirement for forming a coherent mental representation of our environment. One mechanism that has been proposed to underlie multisensory information across distributed cortical networks is transient synchronization of neural oscillations. Multisensory integration is a complex information processing, which is modulated by attention. In this study, we intended to explore the modulation of attention on neural oscillation of theta frequency band in audiovisual integration, by manipulating active attention</p>



	<p>to both visual and auditory stimuli or not attended at all. We analyzed the power of theta band, degree and long-range connectivity strength of functional brain networks in theta band. Our results showed that there was a significant difference in the power of theta frequency band between attended and unattended audiovisual integration, and the output degree of prefrontal area in attended theta network is significant higher than that in unattended network. Moreover, the strength of long-range connectivity from frontal area to parieto-occipital area is also significant higher in attended theta network of audiovisual integration, comparing to that in unattended theta network. We speculated that the top-down attention modulates the audiovisual integration, by increasing the neural oscillation of theta band, and that the top-down attention transmits theta signals to other regions through the frontal region, guiding other regions to integrate the visual and auditory inputs consciously.</p>
<p><b>H0442</b> <b>10:30-10:45</b></p>	<p>Hypernetwork Representation Learning with the Transformation Strategy Yu Zhu, Haixing Zhao, Jianqiang Huang, Xiaoying Wang Presenter: Yu Zhu, Qinghai University, China</p> <p>Abstract: In real life, there are many cases that cannot be described by the network abstracted as the graph, but can be described perfectly by the hypernetwork abstracted as the hypergraph. Different from the network, the hypernetwork structure is more complex and poses a great challenge to the existing network representation learning methods. Therefore, in order to overcome the challenge of the hypernetwork structure, a hypernetwork representation learning method with the transformation strategy is proposed. Firstly, as three types of transformation strategies from the hypergraph to the graph, line graph, incidence graph and 2-section graph are combined into three types of integral graphs with the hyperedge information, namely incidence graph + 2-section graph, line graph + incidence graph and line graph + incidence graph + 2-section graph. Secondly, a shallow neural network algorithm is trained respectively on five types of networks abstracted as incidence graph, 2-section graph, incidence graph + 2-section graph, line graph + incidence graph and line graph + incidence graph + 2-section graph to obtain node representation vectors. Finally, the evaluation experiment is conducted on four different types of hypernetwork datasets. The experimental results demonstrate that the node classification performance of 2-section graph is better than that of other graphs, and the link prediction performance of incidence graph + 2-section graph is better than that of other graphs.</p>
<p><b>H2005</b> <b>10:45-11:00</b></p>	<p>Prediction model of power grid project duration based on BP neural network Baogang Chen, Jing Mo, Zhanghai He, Qinghe Zeng, Zhilong Weng, Xiangbiao Leng, Haixiang Yu Presenter: Baogang Chen, China Southern Power Grid Co.,Ltd, China</p> <p>Abstract: With the continuous progress of science and technology, artificial intelligence has emerged and received widespread attention. At present, it has been applied in many fields. In order to realize the prediction of power grid construction project duration, this paper proposes a prediction model of power grid construction project duration based on BP neural network. Firstly, the characteristics of the power grid project are analyzed and the influencing factors that have a great influence on the project duration are summarized. Secondly, according to the construction characteristics of the</p>

	<p>power grid project, the whole project is divided into several stages, and each stage is subdivided into several processes. Thirdly, according to the construction stage of the power grid project and the division of the process, the number of nodes in each layer of the BP neural network is designed, and the effectiveness of the method is demonstrated by engineering examples. Finally, it is concluded that the model has certain value in the prediction of the duration of the power grid project.</p>
<p><b>H2018</b> <b>11:00-11:15</b></p>	<p>An improved random forest intrusion detection model based on Tent mapping Jimin Liu, Jianye Zhuo, Huiqi Zhao, Xueyu Dong, Xin Ge Presenter: Jianye Zhuo, Shandong University of Science and Technology, China</p> <p>Abstract: At present, there are a lot of algorithms about Intrusion Detection System (IDS) of the Wireless Sensor Network (WSN). However, based on the complexity of the environment and its own characteristics, the traditional intrusion detection technology has some problems, such as low detection rate and slow detection rate for different kinds of intruders. In order to enhance the accuracy of the model, this paper introduces Random Forest (RF) and Arithmetic Optimization Algorithm (AOA) to solve the intrusion detection problem when WSN receives DDoS attack, with higher accuracy and lower error rate. The improved tent chaotic map is used to increase the diversity of individuals; The parallel strategy enhances the communication between populations and adjusts the optimization. Firstly, the PT-AOA algorithm proposed has excellent performance in the evaluation of test function, and effectively ensures the improvement of RF classifier. On this basis, the optimized RF intrusion detection model has better performance than the traditional machine learning method in the simulation experiments on WSN-DS and CICDDoS2019 data sets.</p>
<p><b>H3005</b> <b>11:15-11:30</b></p>	<p>A Neural Network Optimization Model-based Approach to Evaluate the Teaching Effectiveness of English Courses Ying Cao Presenter: Ying Cao, Chengdu Neusoft University, China</p> <p>Abstract: The improvement of teaching quality is an essential part of modernization of Chinese education, and the scientific, rational and timely improvement of teaching effectiveness assessment plays a key role. The improvement of scientific and timely teaching effectiveness evaluation plays a key role. This paper takes artificial intelligence technology as the leading to address the problem of low accuracy of university English teaching effectiveness evaluation, a evaluation method based on IGA-WNN is proposed. Firstly, an English course teaching evaluation system was established according to the actual teaching situation, and the entropy method (EM) was used to assign weights to the original teaching evaluation effect data, then an English course teaching evaluation model was designed based on wavelet neural network, and an improved genetic algorithm was studied to optimize the wavelet neural network parameters. The experimental results show that the method can evaluate the quality of English teaching more accurately and has a good educational support function.</p>

**H0325**  
**11:30-11:45**

Parallel Performance and Optimization of the Lattice Boltzmann Method Software Palabos Using CUDA

Bin Huang, Anjun Liu, Min Tian, Jingshan Pan, Yu Zhang

Presenter: Bin Huang, Qilu University of Technology (Shandong Academy of Sciences), China

Abstract: The open-source fluid dynamics software Palabos based on the Lattice Boltzmann Method (LBM) has been widely used in porous media, biological fluids, free interfaces and other physical problems. Palabos has excellent MPI parallel performance and can complete large scale computation of computational fluid dynamics. To realize the heterogeneous parallelism of Palabos, we test the performance of Palabos on a large-scale simulation on a general-purpose cluster at first. The experimental results show that Palabos has a good performance in 16000 MPI processes. Then, we designed a CUDA parallel optimization algorithm for the case of cavity flow according to address mapping and shared memory optimization. Numerical experiments results show that the speedup ratio can achieve about a 1.5x acceleration ratio when the number of the grid is  $512 \times 512 \times 512$ .

**Topic: Electronics and Electrical Engineering**

**Time: 09:30-11:45 Zoom Meeting Room ID: 812 3695 4198 | Password: 062325**

**Session Chair: Dr. Huai-En Gao, Guangdong University of Technology, China**

<p><b>H0210</b> <b>09:30-09:45</b></p>	<p>Research on charging control of battery pack in low temperature environment Chao Liu, Hong Rui Zang, Ying Xin, Yu Wang Presenter: Hong Rui Zang, State Grid Jilin Electric Power Co., Ltd. information and communication company, China</p> <p>Abstract: Due to the wide use of lithium batteries, the charging safety of lithium batteries in low temperature environment has become a matter of concern. This time, through the battery bench test verification of the battery pack charging control method in the low-temperature environment, it shows that this method can ensure the normal operation of the battery pack in the low-temperature environment, and the charged power is 93.2% of the rated capacity of the battery pack, which effectively ensures the charging safety of lithium battery in the low-temperature environment.</p>
<p><b>H0101</b> <b>09:45-10:00</b></p>	<p>Analysis of thermal-mechanical characteristics and metallographic detection of broken connection of transmission line Cheng Sijin, Zhu He, Zhou Yibing, Sun Hao, Tian Junyu, Liao Hanliang, Zhu Jinfu Presenter: Liao Hanliang, Northeast Electric Power University, China</p> <p>Abstract: In order to study the thermal mechanical characteristics of the broken line of the connecting pipe and pipeline joint of the transmission line, the tensile test of the steel cored aluminum strand steel wire, the thermodynamic analysis of the broken line joint of the connecting pipe and the metallographic test of the steel core of the broken line joint were carried out successively. The tensile strength of the steel core of the steel cored aluminum strand, the temperature load curve at different times and the metallographic test results of the steel core of the broken line joint were obtained, Finally, the exposed section of steel core is tested by metallography. The results show that the tensile strength of steel cored aluminum strand meets the standard, the heating of connecting pipe caused by conductor current will affect the calculated breaking force of steel core, and the exposed section of steel core has been running at high temperature for a period of time before being pulled off.</p>
<p><b>H0206</b> <b>10:00-10:15</b></p>	<p>Fault Early Warning of Wind Turbine Generator based on Residual Autoencoder Network Zhaoyang Wang Presenter: Zhaoyang Wang, Nanjing Huadun power information security evaluation Co., Ltd, Jiangsu, Nanjing, 211106 China</p>

	<p>Abstract: The condition monitoring and fault Early Warning of wind turbine can find its faults early and reduce its failure rate and maintenance cost. This paper presents a fault diagnosis method of wind turbine generator based on residual autoencoder network (RAE). The proposed RAE has an autoencoder network structure. The encoding network is responsible for extracting the feature vector reflecting the distribution law of supervisory control and data acquisition (SCADA) data, the decoding network is responsible for reconstructing SCADA data according to the feature vector, and training the RAE network according to the reconstruction error of input data and reconstructed data. There are several shortcut connections between the corresponding layers of the encoder and decoder of the RAE. Shortcut connections introduce the shallow features in the encoder into the decoder and combines them with the deep semantic features in the decoder. Moreover, the shortcut connections allow the network to get additional supervision during back propagation process, avoiding the problem of gradient disappearance. Through the simulation analysis of the recorded data before and after generator fault, the effectiveness of the proposed RAE network for wind turbine generator fault diagnosis is verified.</p>
<p><b>H0217</b> <b>10:15-10:30</b></p>	<p>Power Probabilistic Energy Flow Calculation for Integrated Energy System Considering Uncertainties of Renewable Energy Output and Load Di Jin, Chenhang Sun, Zhiyi Yang, Ruifa Cao, Zhigang Zhang Presenter: Di Jin, State Grid Ningbo Electric Power Supply Company, China</p> <p>Abstract: The intermittent output of renewable energy and the load fluctuation bring many uncertainties to the integrated energy system. Therefore, this paper proposes a power probabilistic energy flow calculation method for integrated energy systems considering renewable energy output and load uncertainty. Firstly, the electricity-heat-gas integrated energy system's steady-state energy flow calculation model is constructed based on the energy hub model. On this basis, considering the uncertainty of renewable energy output and load, a probabilistic energy flow calculation method for integrated energy systems based on the Quasi-Monte Carlo simulation method is proposed for the probabilistic energy flow of electricity. Finally, the accuracy of the calculation method is verified by an example analysis.</p>
<p><b>H0218</b> <b>10:30-10:45</b></p>	<p>Control strategy of multi-energy collaborative low carbon energy management system LiangLiang Zhong, Xi Hu, Jun Lei, Gaopeng Guo, Haojun Yan Presenter: LiangLiang Zhong, State Grid Zhejiang Electric Power Co., Ltd. Ningbo Power Supply Company, China</p> <p>Abstract: The proposal and development of a multi-energy collaborative low-carbon energy management system put forward new solutions for gradually increasing the proportion of new energy power generation, optimizing energy utilization efficiency, and reducing greenhouse gas emissions. Because this paper fully considers the differences in dynamic characteristics among various energy sources, and the optimal scheduling is also different according to the load under different time scales and the prediction accuracy results of new energy. In the multi-energy coordinated comprehensive energy park system of cold, heat, electricity, and gas, the multi time scale scheduling strategy reasonably coordinates a variety of equipment to optimize its operation,</p>

	<p>which is of great significance to the economic and reliable operation of the system, Based on the detailed modelling of the equipment, combined with the time-sharing price and time-sharing natural gas price, and considering the multi-energy complementary operation, this paper dynamically adjusts the equipment operation state to deal with the small-scale uncertain fluctuation of load and new energy output, so as to meet the economic and reliable operation of the system.</p>
<p><b>H0444</b> <b>10:45-11:00</b></p>	<p>A Local Ratio Power Control Approach for Capacitated Access Points in Mobile Edge Computing Qinghui Zhang, Weidong Li, Qian Su, Xuejie Zhang Presenter: Qinghui Zhang, Yunnan University</p> <p>Abstract: Terminal devices (TDs) connect to networks through access points (APs) integrated into the edge server. This provides a prerequisite for TDs to upload tasks to cloud data centers or offload them to edge servers for execution. In this process, signal coverage, data transmission, and task execution consume energy, and the energy consumption of signal coverage increases sharply as the radius increases. Lower power leads to less energy consumption in a given time segment. Thus, power control for APs is essential for reducing energy consumption. Our objective is to determine the power assignment for each AP with same capacity constraints such that all TDs are covered, and the total power is minimized. We define this problem as a minimum power capacitated cover (MPCC) problem and present a minimum local ratio (MLR) power control approach for this problem to obtain accurate results in polynomial time. Power assignments are chosen in a sequence of rounds. In each round, we choose the power assignment that minimizes the ratio of its power to the number of currently uncovered TDs it contains. In the event of a tie, we pick an arbitrary power assignment that achieves the minimum ratio. We continue choosing power assignments until all TDs are covered. Finally, various experiments verify that this method can outperform another greedy-based way.</p>
<p><b>H2008</b> <b>11:00-11:15</b></p>	<p>Operation characteristics and thermal stability of conductor splice tube under overheat operation Fatigue damage simulation analysis Guanqun Li, He Zhu, Peng Yuan, Yu Zheng, Hongdan Zhao, Feng Gao, Haoran Zhu, Jinfu Zhu, Hanliang Liao Presenter: Jinfu Zhu, Northeast Electric Power University, China</p> <p>Abstract: In order to study the thermal mechanical characteristics of the broken line of the connecting pipe and pipeline joint of the transmission line, the tensile test of the steel cored aluminum strand steel wire, the thermodynamic analysis of the broken line joint of the connecting pipe and the metallographic test of the steel core of the broken line joint were carried out successively. The tensile strength of the steel core of the steel cored aluminum strand, the temperature load curve at different times and the metallographic test results of the steel core of the broken line joint were obtained, Finally, the exposed section of steel core is tested by metallography. The results show that the tensile strength of steel cored aluminum strand meets the standard, the heating of connecting pipe caused by conductor current will affect the calculated breaking force of steel core, and the exposed section of steel core has been running at high temperature for a period of time before being pulled off.</p>

<p><b>H2025</b> <b>11:15-11:30</b></p>	<p>Vehicle oil sensor vibration isolation technology research Hua Yang, Mingkuan Wang, Jing Tian, Hanqing Huang, Yunti Liu, Jibin Zhao, Lunming Huang Presenter: Mingkuan Wang, China University of Petroleum (Beijing), China</p> <p>Abstract: During the acceleration of the vehicle, the oil sensor will generate violent vibration, which will affect its measurement accuracy. For the vibration problem of the oil sensor, a vibration isolation device is proposed to achieve the purpose of vibration isolation. To this end, this paper takes the oil-liquid sensor vibration isolation device as the research object, establishes a two-dimensional CFD simulation model with the help of Fluent software, and studies the influence of different damping media and spring stiffness on the oil-liquid sensor integration device. The results show that the use of a spring with a stiffness coefficient of 1500N/m in the horizontal direction, a spring with a stiffness coefficient of 3000N/m in the vertical direction and diesel oil or kerosene as the damping medium can effectively improve the vibration isolation effect of the vibration isolation system for the oil-hydraulic sensor, reduce the data acquisition error caused by severe vibration, and provide a theoretical basis for the optimal design of the vibration isolation system for the oil-hydraulic sensor.</p>
<p><b>H1001</b> <b>11:30-11:45</b></p>	<p>Research on new energy vehicle charging safety monitoring platform based on DTW time clustering algorithm CHAO LIU, Rui Hong Zang, Ying Xin, Yu Wang, Presenter: Rui Hong Zang, State Grid Jilin Electric Power Co., Ltd. information and communication company, China</p> <p>Abstract: With the widely use of new energy vehicles, charging safety has increasingly become a topic of public concern. Based on the analysis of the factors which affect charging safety, this paper proposes to build a charging safety monitoring platform to realize real-time charging monitoring and improve the charging safety of new energy vehicles. Based on DTW time clustering monitoring model and temperature management model, the platform monitors the abnormal conditions of temperature, electric quantity and voltage, and realizes the monitoring and early warning of abnormal conditions such as no power charging, temperature mutation, current abnormality, instantaneous overvoltage / overcurrent.</p>

**Topic: Smart Image and Multimedia Applications**

**Time: 14:00 -16:15 Zoom Meeting Room ID: 879 8766 0147 | Password: 062325**

**Session Chair: Prof. Yoshifumi Manabe, Kogakuin University, Japan**

<p><b>H0207</b> <b>14:00-14:15</b></p>	<p>Road extraction method of vehicle trajectory data based on geo-referenced videos Zhongxin Du, Ye Qiu, Qingbin Yu, Yingjie Chen, Mengru Ma, Wei Ding Presenter: Zhongxin Du, Qilu University of Technology (Shandong Academy of Sciences), China</p> <p>Abstract: With the increasing use of driving recorder equipment, people need new methods for the analysis of vehicle trajectories. The extraction of road information from vehicle trajectory data is one of the focuses in the field of geographic information. In this paper, we proposed two-vehicle trajectory extraction methods, a fast vehicle trajectory extraction method based on GPS points and a vehicle trajectory extraction method based on the field of view. First, we gave a problem definition for the video trajectory display method. Then we expounded on the field of view of the Geo-referenced video and its related information. The first method connects the location points, and each segment of the trajectory line indicates the current driving direction of the vehicle. The other method introduces the concept of perspective on this basis. It not only shows the direction of the trajectory line but also extracts the perspective of keyframes to accurately describe the trajectory of the vehicle. Next, we used a time and distance-based spatiotemporal clustering algorithm to extract points and demonstrate them through experimental results. We visualized the extracted vehicle trajectories and displayed them on a map. Finally, we compared the efficiency and accuracy of the traditional vehicle trajectory extraction method and the two methods proposed in this paper. The results showed that the vehicle trajectory extraction methods proposed in this paper are superior to the traditional vehicle trajectory display method in accuracy.</p>
<p><b>H0211</b> <b>14:15-14:30</b></p>	<p>Research on Recognition Method of Textual Implication Chenglong Wang, Chunyang Wang, Huimin Li, Tong Liu, Shuang Guo Presenter: Chenglong Wang, Chang Chun of Science and Technology, China</p> <p>Abstract: Text implication recognition aims to judge the semantic and logical relationship between two paragraphs of text. The reasoning process involves syntactic analysis, vocabulary understanding, logical reasoning, social experience, and common sense. It is a way to judge whether the computer is to a certain extent. The challenging research task of “understanding” text semantics is also one of the more important benchmark tasks in the field of natural language processing. It is found that in the past ten years, the total number of publications in this field has been increasing year by year, and the popularity is also increasing. At present, there are mainly text implication relationship recognition methods based on similarity, text implication</p>



	relationship recognition methods based on alignment, and deep neural networks. The textual implication relationship recognition method. This article summarizes the different methods.
<b>H0208</b> <b>14:30-14:45</b>	<p>MVideoIndex: Querying and Indexing of Geo-referenced Videos Mengru Ma, Yingjie Chen, Qingbin Yu, Zhongxin Du, Wei Ding Presenter: Mengru Ma, Qilu University of Technology (Shandong Academy of Sciences), China</p> <p>Abstract: The geo-referenced video consists of space-temporal information such as time, spatial location, camera shooting direction, camera viewing angle, viewable distance, etc. This type of video is widely applicable with sensors loaded on video capture devices. The application of geo-referenced video queries is increasingly popular recently (e.g., travel recommendation, intelligent transportation, road anomaly detection). And each of them needs to realize the query process of geo-referenced video at a specific time or spatial location. However, existing mobile video indexing methods still have room for improvement. There still exist problems with efficiency and accuracy. In this paper, we proposed a novel indexing method named MVideoIndex. MVideoIndex can process point or range queries quickly by utilizing Minimum Bounding Tilted Rectangle (MBTR) in leaf nodes based on the linear change of movement direction in geo-referenced videos. For representing the viewable regions of geo-referenced videos along the trajectory better, we constructed the index with a memory buffer limit to avoid the situation, where the query target falls into a large index and is inconvenient to query. We experimentally analyzed the performance of MVideoIndex and the state-of-art video index method GeoVideoIndex to verify our theory. The performance shows that MVideoIndex is capable of reducing the index construction time and query time, presenting a better performance than other methods. We further compared the impact of the memory buffer threshold size on query efficiency and found that the optimal memory buffer threshold size is about 8-kilometer Byte. We also conducted experiments to explore the effect of MVideoIndex and GeoVideoIndex on different datasets and found a more suitable application scenario for MVideoIndex.</p>
<b>H0219</b> <b>14:45-15:00</b>	<p>Explore Deep Feature Learning to Power Equipment Monitoring and Defect Detection Xiaoxiong Lu, Jie Zhang, Kaihua Chen, Mini Wu, Qingxue Li, Xiaomeng Yu Presenter: Xiaoxiong Lu, Hangzhou Power Supply Company marketing technology Center, China</p> <p>Abstract: The research of power equipment defect detection based on image feature has become a hot issue nowadays. In order to solve the problems of low efficiency and accuracy in traditional power equipment defect detection methods, a defect detection method of power metering equipment based on image deep learning is proposed in this work. We train the deep feature learning network model and obtain the optimal solution of network weights in right of training. The association rules are designed and the defect detection mechanism is designed in combination with the collected meter reading dataset. Based on the designed deep network model, defects are identified with the preprocessed images. In the meantime, in order to reduce the power consumption and time delay of data transmission in the process of defect recognition, we introduce the idea of edge computing, so that part of the defect</p>

	<p>recognition tasks can realize end-to-end intelligence while taking images. Experimental results show that the proposed method can improve defect detection capability and guarantee the normal operation of power metering equipment largely.</p>
<p><b>H0321</b> <b>15:00-15:15</b></p>	<p>Road Bump Outlier Detection of Moving Videos Based on Domestic Kylin Operating System Yingjie Chen, Mengru Ma, Qingbin Yu, Zhongxin Du, Wei Ding Presenter: Yingjie Chen, Qilu University of Technology (Shandong Academy of Sciences), China</p> <p>Abstract: With the increasing number of moving videos, anomaly detection of moving videos has become a popular data mining task in the field of intelligent transportation. Traditional road anomaly detection algorithms are hard to detect road bump outliers while the domestic platform has not yet applied road bump detection methods using the accelerometer and gyroscope data. For this, we proposed a road bump outlier detection algorithm (RBOD) and illustrated migration and the improvement of our algorithm for the domestic platforms. Our RBOD algorithm used a Kalman Filter-based method to solve the noise data problem of the accelerometer or gyroscope and selected the accelerometer or gyroscope data for outlier detection according to the sampling frequency. The experimental results show that our RBOD algorithm can detect moving things anomalies efficiently and accurately.</p>
<p><b>H3004</b> <b>15:15-15:30</b></p>	<p>Similarity-Based Graph Enhanced Text Representation Learning for Electronic Component Knowledge Graph Completion Yuxin Liu, Junyu Lu, Pingjian Zhang Presenter: Junyu Lu, South China University, China</p> <p>Abstract: In the electronic component supply chain system, manually built knowledge graph usually lacks some attributes of the electronic components and the alternative relations among the electronic components, which requires the support of knowledge graph completion. Prevalent graph embedding approaches exhibit strong capability in representing graph elements, e.g., Graph Convolutional Network-based node embeddings explore the topological structure by aggregating local information. However, it's difficult to generalize to never-seen elements due to the graph incompleteness, and the Laplacian-based convolution of GCN limits the information propagation to immediate neighbors. In contrast, the pre-trained encoder have stronger ability to extract semantic information, being more generalizable and robust to the graph completion. In this paper, we propose a hybrid encoding approach SiGeTR: Similarity-based Graph Enhanced Text Representation. Based on the approach of structural encoding, it incorporates the textual encoding which employs the text of triples in the graph and contextualized representations. Meanwhile, we propose to use node similarity based convolution matrices in the GCN to compute node embeddings to enhance the perception of important elements. In experiments, our methods obtain state-of-the-art performance on the electronic components knowledge graph benchmark dataset that we constructed for alternatives link prediction and achieve significant results with low resources.</p>

<b>H1002</b> <b>15:30-15:45</b>	<p>Searching Top-K Similar Moving Videos Qingbin Yu, Zhongxin Du, Mengru Ma, Yingjie Chen, Wei Ding Presenter: Qingbin Yu, Qilu University of Technology (Shandong Academy of Sciences), China</p> <p>Abstract: The application of sensors enables mobile devices to generate amounts of content-aware data, such as trajectory, gyro, and video data. Moving video is an emerging new type of moving object that can provide a potential source for geo-referenced applications. Measuring the similarity of moving videos is widely used in traffic management, tourist recommendations, and location-based advertising. Our prior work proposed two similarity measures, the Largest Common View Subsequences can accurately calculate similar moving videos, and the View Vector Subsequences can fast calculate similar moving videos. In this paper, we proposed the searching top-k similar moving videos (K-SSMV). First, we give the problem definition of searching top-k similar moving videos. Then, we illustrated the strategy of searching for moving videos. Specifically, we sorted the video pairs by the most similar videos. Since the similar videos would be less than k, we first calculated the similarity of moving videos by the Largest Common View Subsequences algorithm, if the number of similar videos is less than k, we will adopt the View Vector Subsequences algorithm to compute the similarity of moving videos. Next, we mixed the candidate videos calculated by the Largest Common View Subsequences and the View Vector Subsequences algorithms, the searching top-k similar moving videos algorithm picked the top-k similar videos from candidate videos. Finally, we evaluated the performance of our proposed algorithms on the accuracy and computational cost. The experiments verified that our algorithms can efficiently search top-k similar moving videos.</p>
<b>H0324</b> <b>15:45-16:00</b>	<p>Research on Medical Image Classification Based on Image Segmentation and Feature Fusion Lingzhi Kong, Zhiyuan Ren, Yan Zhou, Wei Ding, Jinyong Cheng Presenter: Lingzhi Kong, Qilu University of Technology, China</p> <p>Abstract: Pneumonia has always been the leading infectious disease leading to the death of children under five years old. X-ray images of the lungs have become the key to the diagnosis of this disease. If computer-aided medical diagnosis is used to automatically detect lung abnormalities, the accuracy of the diagnosis will be improved. This article aims to introduce a deep learning technology based on the combination of image segmentation and feature fusion, which can realize automatic diagnosis of patients with pneumonia in X-ray images. First, use residuals to achieve image segmentation to more accurately divide the lung area. Secondly, the Xception network is used to extract the in-depth features of the data, and the extracted features are passed to the LSTM model to detect the extracted features, and classify the two cases of pneumonia and no pneumonia. This research combines Pearson's feature selection ideas and fuses the correlation between the two loss functions. Experimental results show that the accuracy of this paper is 98%, and the accuracy of AUC is 99%. Compared with the existing technical methods, the accuracy of the model designed in this paper is greatly improved. The model we designed has achieved excellent experimental results on the currently available data sets. I hope our research can help doctors in the detection of pneumonia in children.</p>

**H3006**  
**16:00-16:15**

A Network Anomaly Intrusion Detection Method based on Ensemble Learning for Library e-Learning Platform

SUN Tingting, YAN Kai, LI Tingwei, LU Xiaoqian, DONG Qian

Presenter: SUN Tingting, University of Electronic Science and Technology of China, China

Abstract: E-learning is an important part of the library service and a direction of transformation for libraries. How to ensure the security of e-learning platforms is a key point that cannot be ignored in the construction. Although machine learning has been widely used in network anomaly detection, traditional machine learning methods have problems such as over-reliance on manual feature extraction, dimension disaster, etc., and it is difficult to achieve effective prediction of potential threats in practical applications. To solve these problems, this paper proposes a network anomaly intrusion detection method based on ensemble learning to effectively ensure the network security of the e-learning platform. Combined with the concept of ensemble learning, simple decision tree is used as the base class learner, and by combining multiple models into a stronger model, the random forest method is used to improve the ability to identify anomaly network attacks. After experimental verification, various performance evaluation indicators and ROC curves of the experimental results show that the algorithm can effectively identify both normal network access and abnormal network access. Therefore, this method can be applied to the library e-learning platform, which can provide learners with rich and convenient online learning services, and at the same time effectively ensure the network security of the platform.

**Topic: Modern Electronic Technology and Intelligent System****Time: 14:00 -16:15 Zoom Meeting Room ID: 812 3695 4198 | Password: 062325****Session Chair: Prof. Ljiljana Trajkovic, Simon Fraser University, Canada**

<b>H0329</b> <b>14:00-14:15</b>	<p>A DIGITAL SIGNATURE VIRTUAL PLATFORM BASED ON HARDWARE-SOFTWARE CO-DESIGN FENGJIE LIN, SHUTING CAI, HEMING LIU Presenter: FENGJIE LIN, Guangdong University of Technology, China</p> <p>Abstract: Data is encrypted using digital signature technology, which is a crucial step to ensure information security. An SoC with encryption ensures the security of data transmission. The previous SoC design method is to develop hardware first and then develop software, and it is difficult to achieve software and hardware co-design. Therefore, we propose a virtual prototype platform to solve this problem. With the help of SystemC and gem5, we successfully built a virtual prototype platform and conducted simulation experiments through this virtual prototype platform. The experiment results show that the proposed method realizes the software and hardware co-design. In addition, the SystemC cycle-accurate model used in the virtual prototype platform is converted into an RTL model by means of translator conversion, and the experimental results of the virtual prototype platform are compared and verified. The proposed virtual platform to develop and verify SoC models will reduce simulation time.</p>
<b>H0103</b> <b>14:15-14:30</b>	<p>Track planning and obstacle avoidance of wave glider based on improved artificial Xiaobin Zong, Yufeng Mao, Zhaocheng Sun, Lei Kou , Yi Zheng, Tiejun Li Presenter: Xiaobin Zong, Institute of Oceanographic Instrumentation, Qilu University of Technology (Shandong Academy of Sciences), China</p> <p>Abstract: The research on track planning and obstacle avoidance methods of wave glider is an indispensable ability for its smooth work in the ocean. As a real-time track planning and obstacle avoidance algorithm, artificial potential field algorithm has attracted extensive attention. Aiming at the problem that the target point can not be reached in the traditional artificial potential field algorithm, the distance factor between the wave glider and the target point is introduced into the repulsive potential field; The relative velocity potential field function is introduced and the influence of velocity potential field is enhanced to solve the threat of dynamic obstacles to wave gliders. Then, based on the motion characteristics of wave gliders, the influence of stable waves in a certain range on track planning and obstacle avoidance is analyzed. Finally, the simulation analysis is carried out. The simulation results show that this method has good track planning and obstacle avoidance effect, and the generated path is smooth. Fixed the problem of not being able to reach the target.</p>

<p><b>H0332</b> <b>14:30-14:45</b></p>	<p>Secure Mechanism of Intelligent Urban Railway Cloud Platform Based on Zero-trust Security Architecture Ye Qiu Presenter: Jinan Rail Transit Group Co. LTD., Jinan, China</p> <p>Abstract: Aiming to strengthen the stability of operation and maintenance of the urban rail transit network cloud platform at this stage, it is emerging to solve the security mechanism of the intelligent urban railway cloud platform. In this paper, we proposed a zero-trust network security solution for the rail transit system network construction. First, we built a zero-trust network construction for smart city rail transit at the architecture level, it can break the phenomenon of information security silo of rail transit line platform and minimize the system security risk based on a zero-trust network. Next, we focus on building a cloud security brain for urban rail transit networks and proposed the self-learning trust algorithm for a zero-trust network. Specifically, we illustrated the modified network model and constructed a dynamic updating user trust profile as the trustworthy access list. The parameters of the self-learning trust algorithm consist of the state, available chain road bandwidth, waiting for queue state of network traffic, linkage actions, and so on. We adopted a dynamic self-learning strategy for adjusting mitigation policy, the learning step predicted the state of the predetermined congestion and selected the rich links for execution. Finally, experiments show the efficiency of our secure mechanism of railway cloud platform based on zero-trust security architecture.</p>
<p><b>H0435</b> <b>14:45-15:00</b></p>	<p>Research on highway CPS-T of wide area communication and data cloud REN LOU, JIACHENG ZHANG, LEI ZHANG, QIANG HONG, YUEQI ZHOU, XINGHUA LI Presenter: Jiacheng Zhang, Department of Traffic Information and Control Engineering Tongji University Shanghai China, China</p> <p>Abstract: Cyber physical transportation system (CPS-T) is a traffic perception, control and service system based on algorithm, model, data and computing power. With the help of radar point cloud, video image, GNSS, sensor and other types of monitoring equipment, the highway data can be collected with high quality and transmitted with high reliability under the condition of relatively complete communication conditions. This paper studies the technical application of CPS-T for highways. Through the deployment of communication technology and data cloud platform, it can intelligently perceive and analyze dynamic and static operation data, accurately identify or predict key ramps, bottleneck sections and mainstream traffic channels, and dynamically implement active control strategies such as ramp control, shoulder control, lane control and rate adjustment, so as to realize the advance guidance and control of highway traffic flow. The relevant research has been measured in the highway sections of Shanghai and Zhejiang Province, and the research results have strong engineering reference value.</p>
<p><b>H0445</b> <b>15:00-15:15</b></p>	<p>Optimize DGL Operations on x86-64 Multi-Core Processors Chaorun Liu, Huayou Su, Yong Dou, Qinglin Wang Presenter: Chaorun Liu, National University of Defense Technology, China</p>

	<p>Abstract: Modern x86-64 processors have strong performance due to long vector units. Therefore long vector units are widely used in CNN-like neural network model inference on modern x86-64 processors. However the performance of GNN inference on modern x86-64 processors is poor. Unfortunately, with the development of GNNs and the increase of graph datasets, GNN inference performance meets the serious challenge on x86-64 processors. In this paper, we study the problem of poorly optimized DGL-based GAT models on the x86-64 platform, and analyze the main performance bottlenecks in this case. In order to optimize the performance of DGL on the two main x86-64 platform CPUs of Intel and AMD, we implement a simple and effective task allocator to balance the task load among multiple cores and use vector instructions to optimize the core operators in DGL. In addition, we also propose corresponding optimization ideas for the NUMA architecture. The experimental results show that our optimization method improves the performance of the basic DGL version by up to 3.12x and 2.6x on Intel and AMD platforms.</p>
<p><b>H2019</b> <b>15:15-15:30</b></p>	<p>Failure Prediction Using Gated Recurrent Unit and Autoencoder in Complex Manufacturing Process Dongting Xu, Zhisheng Zhang, Jinfei Shi Presenter: Dongting Xu, Southeast University, China</p> <p>Abstract: Big loss is caused by the failures in complex manufacturing process or in a production line. The design of the efficient and effective failure detection and prediction algorithms is the key for reducing the loss, and more and more algorithms rely on advanced machine learning technologies. The design of failure detection and prediction algorithms is however particularly challenging due to the high dimensionality, extremely imbalanced classes and the non-stationary distribution of the multivariate time series. For multivariate time series in real complex manufacturing process, it's really hard to decide whether the variable is dependent or independent because there is always variation along the production line. In this study, a novel failure prediction approach which combines gated recurrent unit and autoencoder is designed to improve the performance of imbalanced learning. The failure prediction algorithm is applied in a real pulp and paper mill to detect and predict the sheet break during the production. The results show that the proposed method can perform better than other related work.</p>
<p><b>H2024</b> <b>15:30-15:45</b></p>	<p>Turning radius prediction method for tracked vehicles based on PSO-BP algorithm Hua Yang; Haoyue Wu; Ruisheng Wan; Wenkai Wu; Jin Wang; Rui Tian Presenter: Haoyue Wu, China University of Petroleum (Beijing), China</p> <p>Abstract: Crawler vehicles always slipped during the steering process. To address this problem, this paper uses particle swarm algorithm (PSO) to optimize the initial weights and thresholds of the BP neural network and establishes a turning radius prediction model based on the PSO-BP neural network. The model takes the turning angle as the input and the turning radius as the output. Kalman filter is used for data processing to eliminate random errors during the test process. The law between the physical parameters and algorithm parameters in the model is discussed by changing the</p>

	<p>range of turning angle and the number of hidden layers and initialization populations, and the reliability of the model is verified by a real vehicle test. The results show that it is feasible to predict the turning radius in the presence of slip by using the PSO-BP neural network algorithm, and the accuracy of the prediction model can reach 99% after Kalman filtering. The prediction model of the turning radius proposed in this paper provides a certain reference for the prediction of the turning radius of tracked vehicles under actual conditions.</p>
<p><b>H0330</b> <b>15:45-16:00</b></p>	<p><b>A HIGH-PERFORMANCE BIDIRECTIONAL COMPILER FOR CONVERSION BETWEEN SYSTEMC AND VERILOG</b> Chenyu Huang, Huaien Gao, Yongfeng Zhong, Shuting Cai Presenter: Chenyu Huang, Guangdong University of Technology, China</p> <p>Abstract: With the continuous development of chip design technology, many chip description languages continuously emerge. Both Verilog and SystemC play an important role in chip description. Verilog is a widely used hardware description language that can be used in multiple stages of the hardware design process, including modeling, synthesis, and simulation. At the same time, to shorten the design cycle of chips, it has become a trend to use SystemC for hardware design and modeling. Therefore, we need to this end to convert between the two, namely Verilog And SystemC(VASC), is proposed. Experiments show that, compared to existing open-source tools, the VASC has excellent accuracy and faster compilation speed.</p>
<p><b>H3007</b> <b>16:00-16:15</b></p>	<p><b>Focus Layer — Drawing Attention to Necessary Obstacles</b> Tianyu Wang, Yuhang Ye, Zihan Zhang, Haoran Zhang, Zonghan Yang Presenter: Tianyu Wang, The University of Leeds, the United Kingdom</p> <p>Abstract: With the development of automatic driving, fast and safe motion planning algorithms are in need. However, data transferred to the motion planning part may be noisy, and some obstacles are unnecessary for later processing. This paper proposes a focus layer and a DQN agent to select necessary barriers and submit them to the motion planning algorithms. The Focus layer ignores some obstacles that are not likely to impact the ego vehicle and focuses attention on those critical obstacles.</p> <p>Note to Practitioners: This paper is motivated by the heavy computation time in automatic driving when planning a trajectory. Constraints such as obstacles along the road affect the efficiency of the planning methodology. Existing research conducts experiments on capturing drivers' facial expressions or eye contact when driving on the road. However, such research cannot fit into the automatic driving algorithms. Thus, we propose a method to reduce unnecessary obstacles in a simulation environment, which is similar to focusing on the essential elements for drivers. Our process generates a layer to focus ego vehicles' attention on critical obstacles before the trajectory planning algorithm and can easily fit in all trajectory planning algorithms.</p>