

2021 年第八届 IEEE ICCSS 会议日程

时间：2021 年 12 月 11 日—12 日

地点：北京工大建国饭店（线上会议）

会议主题：IEEE 信息、控制论和计算社会系统国际会议

会议详细日程：

12 月 11 日（星期六），北京工大建国饭店（线上会议）		
大会报告 ID：464-844-577(腾讯会议)		
上午	08:30—08:40	与会专家、领导入场
	08:40—08:50	学校领导、会议主席、基金委领导欢迎致辞
	08:50—09:50	大会主题报告 1 吾守尔·斯拉木院士 主持：陈俊龙教授
	09:50—10:50	大会主题报告 2 柴天佑院士 主持：钟伟民教授
	10:50—11:50	大会主题报告 3 王耀南院士 主持：付俊教授
	11:50—12:00	ICCSS 2022 宣讲
中午	12:00—14:00	午餐
下午	14:00—17:20	特邀报告
	14:00—14:40	1. 虞文武教授，报告题目：Networked Collective Intelligence in Intelligent Transportation System, 主持：王大珩教授
	14:40—15:20	2. 宋永端教授，报告题目：几个利用神经网络设计控制器时被忽略的重要问题，主持：葛泉波教授
	15:20—16:00	3. 梁吉业教授，报告题目：Adaptive Graph Construction based Machine Learning, 主持：梁静教授
	16:00—16:40	4. 周彤教授，报告题目：Structure Identifiability of Networked Dynamic Systems and Beyond, 主持：吴争光教授
	16:40—17:20	5. 唐珂教授，报告题目：Evolutionary Computation

		Made Practical, 主持: 丛杨研究员
12月12日(星期日)		
大会报告 ID: 464-844-577(腾讯会议)		
上午	08:30—09:10	1. 孙富春教授, 报告题目: Behavior Intelligence: Model and Cognitive Computation, 主持: 栾小丽教授
	09:10—09:50	2. 陈恩红教授, 报告题目: 智能教育的自适应学习技术现状与展望, 主持: 何潇教授
	09:50—10:30	3. 胡清华教授, 报告题目: Trusted Multi-modality Learning with Uncertain Information, 主持: 徐天添教授
	10:30—11:10	4. 胡斌教授, 报告题目: Computational Psychophysiology Based Emotion Analysis for Mental Health, 主持: 赵延龙教授
	11:10—11:50	5. 赵珺教授, 报告题目: Data and Knowledge Driven Industrial Energy Prediction and Scheduling, 主持: 陈谋教授
中午	12:00—14:00	午餐
下午	14:00—14:40	1. 徐昕教授, 报告题目: Advances in Autonomy Intelligence and Hybrid Intelligence of Unmanned Systems, 主持: 喻俊志教授
	14:40—15:20	2. 董宏丽教授, 报告题目: Research on Recursive Filtering for Time-Varying Systems in the Sense of Energy-Saving and Secure Transmission, 主持: 程龙研究员
	15:20—16:00	3. 朱群雄教授, 报告题目: Research On Virtual Sample Generation For Label Data In Supervised Learning, 主持: 贺威教授
	16:00—16:40	4. 鲁继文教授, 报告题目: Visual Foundation Models and Applications, 主持: 孙健教授
	16:40—17:20	5. 李少远教授, 报告题目: Operation Optimization and Predictive Control for Distributed Systems, 主持: 陆振宇教授
12月11日 下午 14:00—17:20 分组报告		
分组报告 A 组	会议 ID: 123-452-758 (腾讯会议)	

	论文 ID: 005,025,027,031,033,037,051,066,057, 041, 016, 034, 002, 039, 087
分组报告 B 组	会议 ID: 145-705-070 (腾讯会议)
	论文 ID: 046, 048, 054, 056, 062, 064, 073, 067,044 ,068, 072, 075, 077, 078, 081,082, 086
12 月 12 日 上午 9:00—12:00 分组报告	
分组报告 A 组	会议 ID: 123-452-758 (腾讯会议)
	论文 ID: 088, 089, 090, 091, 092, 096, 038, 013 015, 017, 019, 026,030, 036, 052, 053
分组报告 B 组	会议 ID: 145-705-070 (腾讯会议)
	论文 ID: 055, 059, 060, 061,063, 065, 069, 070, 071, 076, 079, 083, 084, 014,093,094
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分组报告 A 组	会议 ID: 123-452-758 (腾讯会议)
	论文 ID: 001,004,007,008, 018,022,023,028, 029,032,040,042,045,047,049,058
分组报告 B 组	会议 ID: 145-705-070 (腾讯会议)
	论文 ID: 021, 080, 085, 003, 009, 010,012,020,024, 166, 043, 050, 011, 006, 110,126,160

Keynote Speech 1

Title: Discussion on Multilingual Hybrid Intelligent Processing of Silk Road

Prof. WUSHOUR SLAMU

Xinjiang University

Abstract: Introducing the new development of hybrid intelligent processing such as big data-driven knowledge learning, cross-media collaborative processing, human-machine collaboration enhanced intelligence, group integrated intelligence, autonomous intelligent system, etc. Introducing a new generation of artificial intelligence hybrid intelligent processing based on deep learning and information perception, including big data-driven knowledge learning, knowledge computing engine, cross-media analysis and reasoning, intelligent recognition, natural language intelligent understanding and automatic generation and other key common technology systems, and its perception in the intelligent system, comprehensive analysis, timely processing, and self-adjustment functions; Introducing the application of hybrid intelligent processing in promoting the intelligentization of social governance, building an intelligent monitoring with early warning and comprehensive application platform, and the construction of the Silk Road Multilingual translation platform. Emphatically introducing the belt and Road natural language intelligent mutual evaluation platform and its large-scale corpus construction based on hybrid intelligent processing such as deep neural network, advanced machine learning and big data intelligence.



WUSHOUR SLAMU is currently a Professor and a Ph.D. Supervisor with Xinjiang University. He is also an Academician of the Chinese Academy of Engineering. He is also an Executive Director of the Chinese Association for Artificial Intelligence. He has published more than 200 articles and presided over 65 key projects, including seven national 863 projects and one national 973 project. He has presided over the formulation of five international standards and more than 14 national standards. His research interest includes multilingual natural language processing. He received three National Science and Technology Progress Award.

Keynote Speech 2

Title: Development Directions of Industrial Intelligence

Prof. Tianyou Chai

Northeastern University

Abstract: In this talk, the role of industrial automation and information technology in the industrial revolutions is analyzed, as well as the current status and main problems in automation and information for manufacturing enterprise. The connotation of industrial intelligence and the challenges in realizing industrial intelligence are put forward. Based on the analysis and application cases of industrial internet and industrial artificial intelligence, the technical basis of industrial intelligence is presented. Then, the research directions, ideas and methods of industrial intelligence are proposed.



Tianyou Chai received the Ph.D. degree in control theory and engineering in 1985 from Northeastern University, Shenyang, China, where he became a Professor in 1988. He is the founder and Director of the Center of Automation, which became a National Engineering and Technology Research Center and a State Key Laboratory. He is a member of Chinese Academy of Engineering, IFAC Fellow and IEEE Fellow. He has served as director of Department of Information Science of National Natural Science Foundation of China from 2010 to 2018.

His current research interests include modeling, control, optimization and integrated automation of complex industrial processes.

He has published 260 peer reviewed international journal papers. His paper titled *Hybrid intelligent control for optimal operation of shaft furnace roasting process* was selected as one of three best papers for the Control Engineering Practice Paper Prize for 2011-2013. He has developed control technologies with applications to various industrial processes. For his contributions, he has won 5 prestigious awards of National Natural Science, National Science and Technology Progress and National Technological Innovation, the 2007 Industry Award for Excellence in Transitional Control Research from IEEE Multiple-conference on Systems and Control, and the 2017 Wook Hyun Kwon Education Award from Asian Control Association.

Keynote Speech 3

Title: Application and development trend of key technologies in intelligent manufacturing and industrial Internet

Prof. Yaonan Wang

Hunan University

Abstract: Industrial Internet is an industrial and application ecology formed by the all-round deep integration of new generation information technology and manufacturing industry, and is a key integrated infrastructure to promote the high-quality development of manufacturing industry, which involves many disciplines such as computer, control, communication, robotics, artificial intelligence and cognitive science. In the past decade, industrial Internet technology has developed rapidly, and the new generation of intelligent manufacturing systems resulting from the integration with artificial intelligence technology have been more and more widely used in many advanced manufacturing fields such as aerospace, marine engineering, rail transportation, and new energy vehicles, which play a crucial role in promoting China's scientific and technological innovation, economic development, major needs, and people's health.

This report first reviews the history, background and current development status of smart manufacturing at home and abroad, and points out the new connotation of contemporary smart manufacturing. Then, it clarifies the important position of industrial Internet in smart manufacturing, outlines the latest development status of industrial Internet at home and abroad, and points out the core content of industrial Internet and current challenges. Then, the system structure of industrial Internet, the technology of Cloud-Edge collaborative computing, the technology of Cloud-Edge convergent robot and its typical application cases in the smart manufacturing industry such as medicine, electronics, automobile and ship are introduced in detail. Finally, the future development trend of industrial Internet in smart manufacturing is prospected.



Yaonan Wang is an Academician of the Chinese Academy of Engineering, expert in robotics and intelligent control, professor and doctoral supervisor of Hunan University, is the director of National Engineering Laboratory of Robot Vision Perception and Control Technology. He is currently a member of the Chinese Society of Automation, the Chinese Society of Computer Science, the Chinese Society of Artificial Intelligence, the Chinese Society of Graphics, the Vice President of the National Intelligent Robotics Innovation Alliance, the Executive Director of the Chinese Society of Automation, the Supervisor of the Chinese Society of Artificial Intelligence, a member of the Technical Committee of Artificial Intelligence and Blockchain of the Science and Technology Commission of the Ministry of Education, and the President of the Hunan Provincial Society of Automation. He was the subject matter expert in the field of intelligent robotics of the National 863 Program, and the

chief scientist of the EU Fifth Framework International Cooperation Major Project.

He has long been engaged in research and teaching scientific research on robot sensing and control technology and engineering applications, and has won one National Technical Invention Second Prize, three National Science and Technology Progress Second Prizes, and 11 Provincial and Ministerial First Prizes as the first completer. He has published more than 200 SCI papers such as IEEE, 15 books and more than 80 national invention patents. He was selected as a Humboldt Scholar in Germany. He has trained more than 70 PhDs and won the honorary titles of National Outstanding Backbone Teacher in Higher Education, National May Day Labor Medal, National Advanced Worker, National Innovation and Competition Award, and Advanced Individual in Hunan Province against the New Crown Epidemic.

Invited Talk I-1

Title: Networked Collective Intelligence in Intelligent Transportation System

Prof. Wenwu Yu

Abstract: In this talk, the multi-agent collective behaviors and some of their potential applications are briefly reviewed. In particular, intelligent transportation system is studied based on networked collective intelligence. We first introduced the 5G technology about networked automatic drive. Then, we discussed several critical problems about network construction, prediction of network traffic, and traffic signal control, which forms the cooperative intelligent system. We also provided some future studies in this topic.



Wenwu Yu received the B.Sc. degree in information and computing science and M.Sc. degree in applied mathematics from the Department of Mathematics, Southeast University, Nanjing, China, in 2004 and 2007, respectively, and the Ph.D. degree from the Department of Electronic Engineering, City University of Hong Kong, Hong Kong, China, in 2010. Currently, he is the Founding Director of Laboratory of Cooperative Control of Complex Systems and the Deputy Associate Director of Jiangsu Provincial Key Laboratory of Networked Collective Intelligence, an Associate Dean in the School of Mathematics, and a Full Professor with the Endowed Chair Honor in Southeast University, China. Dr. Yu held several visiting positions in Australia, China, Germany, Italy, the Netherlands, and the USA. His research interests include multi-agent systems, complex networks and systems, disturbance control, distributed optimization, neural networks, game theory, cyberspace security, smart grids, intelligent transportation systems, big-data analysis, etc. Dr. Yu serves as an Editorial Board Member of several flag journals, including IEEE Transactions on Circuits and Systems II, IEEE Transactions on Industrial Informatics, IEEE Transactions on Systems, Man, and Cybernetics: Systems, Science China Information Sciences, Science China Technological Sciences, ACTA AUTOMATICA SINICA, etc. He was listed by Clarivate Analytics/Thomson Reuters Highly Cited Researchers in Engineering in 2014 -2021. He publishes about 100 IEEE Trans. journal papers with more than 20,000 citations. Moreover, he was awarded a National Natural Science Fund for Excellent Young Scholars in 2013, the National Ten Thousand Talent Program for Young Top-notch Talents in 2014, and the Cheung Kong Scholars Programme of China for Young Scholars in 2016 and for Scholars in 2020. Dr. Yu is also the recipient of the Second Prize of State Natural Science Award of China in 2016.

Invited Talk I-2

Title: Several Important Issues That Are Overlooked When Designing Controllers Using Neural Networks

Prof. Yongduan Song

Chongqing University

Abstract: The “universal” approximation/learning characteristics of neural networks have been widely used in control design. In theory, several critical conditions need to be met at the same time, whether this important feature is established or not. Failure to meet any of these conditions may result in the loss of this characteristic. This report makes a preliminary discussion on this issue and points out that these conditions are often ignored unconsciously or deliberately in most existing NN based control designs in practical applications. At the same time, we come up with a solution to face this problem, by establishing a strategy to make the neural network unit play a full role in the entire process of system operation, to ensure its reliability and effectiveness in the control loop



Yongduan Song, Fellow of IEEE, Fellow of International Eurasian Academy of Sciences, Fellow of Chinese Automation Association. He is currently the Dean of School of Automation, Chongqing University, and the Founding Director of the Institute of Smart Engineering, Chongqing University. He was one of the six Langley Distinguished Professors with the National Institute of Aerospace (NIA), Founding Director of Cooperative Systems at NIA. He has served/been serving as an Associate Editor/Guest Editor for several prestigious scientific journals, including IEEE Transactions on Automatic Control, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Intelligent Transportation Systems, etc. He is the Editor-in-Chief Elect for IEEE Transactions on Neural Networks and Learning Systems, assuming his EiC responsibilities starting January 1, 2022. His research interests extend to intelligent systems, guidance navigation and control, bio-inspired adaptive and cooperative systems.

Invited Talk I-3

Title: Adaptive Graph Construction based Machine Learning

Prof. Jiye Liang

Shanxi University

Abstract: In graph machine learning, the association information in the data is modeled by graphs and considered as an substantial factor, which breaks the basic assumption of traditional machine learning, i.e. the Independent and Identical Distribution. Therefore, it is expected to trigger a new learning paradigm. High-quality graphs are crucial to graph machine learning. However the graph construction faces dual challenges: (1) the data distribution is unknown and complex, and (2) the requirements of learning tasks are varied. In response to it, an adaptive graph construction method is proposed, which can cope with the above two challenges simultaneously. As two specific application scenarios, the graph based semi-supervised learning and the graph embedding based unsupervised dimensionality reduction are used for illustrating the working mechanism and advantages of the proposed method. As a general solution, the adaptive graph construction method is expected to play a greater role in other graph machine learning problems.



Jiye Liang, Professor of Shanxi University, CCF Fellow, Director of the Key Laboratory of Computational Intelligence and Chinese Information Processing of the Ministry of Education, Member of the Special Committee on Artificial Intelligence and Blockchain Technique, Science and Technology Commission of the Ministry of Education, Deputy Director of Committee on Artificial Intelligence and Pattern Recognition, CCF. His research interests mainly include data mining, machine learning and artificial intelligence. And he has published more than 200 papers in important journals and conferences such as AI, JMLR, IEEE TPAMI, IEEE TKDE, ML, ICML, AAAI, etc.

Invited Talk I-4

Title: Structure Identifiability of Networked Dynamic Systems and Beyond

Prof. Tong Zhou

Tsinghua University

Abstract: Networked dynamic systems (NDS) have been attracting research attentions for a long time. With technology developments, especially those in communications and computers, the scale of an NDS becomes larger and larger. Moreover, some new issues also arise, such as attack prevention, random communication delay/failure, etc. In addition, recent marvelous success in artificial intelligence greatly stimulates constructions of artificial NDSs with a huge number of nodes. On the other hand, some classic problems including revealing the structure of an NDS from measurements, computationally efficient conditions for NDS controllability/ observability verifications, etc., still remain challenging.

In this talk, a model is introduced for a large scale NDS in which subsystems are connected through their internal outputs in an arbitrary way, and subsystems may have distinctive dynamics. A matrix rank based necessary and sufficient condition is given for the global identifiability of subsystem interactions, which leads to several conclusions about NDS structure identifiability when there is some a priori information. This matrix also leads to an explicit description for the set of subsystem interactions that can not be distinguished from experiment data only. Importance of “structure identifiability degree” is also revealed through numerical simulations, with a discussion on its influences on model prediction capabilities and system performances.



Tong Zhou received the B.S. and M.S. degrees from the University of Electronic Science and Technology of China, China, in 1984 and 1989, respectively, another M.S. degree from Kanazawa University, Japan, in 1991, and the Ph.D. degree from Osaka University, Japan, in 1994. After visiting several universities in The Netherlands, Japan and China, he joined Tsinghua University, Beijing, China, in 1999, where he is currently a Professor of control theory and control engineering. His current research interests include networked dynamic systems, distributed/robust estimation and control, system identification and their applications to real-world problems in molecular cell biology and communication systems. Dr. Zhou was a recipient of the First-Class Natural Science Prize in 2020 from the Chinese Association of Automation (CAA), a recipient of the First-Class Natural Science Prize in 2003 from the Ministry of Education, China, and a recipient of the National Outstanding Youth Foundation of China in 2006. He has served as an Associate Editor of the IEEE TRANSACTIONS ON AUTOMATIC CONTROL, and is now on the editorial board of AUTOMATICA. He is an IEEE Fellow and a CAA Fellow.

Invited Talk I-5

Title: Evolutionary Computation Made Practical

Prof. Ke Tang

Southern University of Science and Technology

Abstract: Over the past 50 years, Evolutionary Computation (EC) has gradually developed as a powerful tool for complex real-world problems. However, the trial-and-error nature of EC has also led to several drawbacks, particularly in the sense of the efficiency and trustworthiness, which prevent even wider applications of EC. In this talk, recent approaches for improving EAs in these aspects will be presented.



Ke Tang is a Professor at the Department of Computer Science and Engineering, Southern University of Science and Technology (SUSTech). Before joining SUSTech in January 2018, he was with the School of Computer Science and Technology, University of Science and Technology of China (USTC), first as an Associate Professor (2007-2011) and then as a Professor (2011-2017). His major research interests include evolutionary computation and machine learning, as well as their applications. He has published more than 180 papers, which have received over 10000 Google Scholar citations. He is a recipient of the IEEE Computational Intelligence Society Outstanding Early Career Award and the Natural Science Award of Ministry of Education (MOE) of China, and was awarded the Newton Advanced Fellowship (Royal Society) and the Changjiang Professorship (MOE of China). He is an Associate Editor of the IEEE TRANSACTIONS ON EVOLUTIONARY COMPUTATION and served as a member of Editorial Boards for a few other journals.

Invited Talk II-1

Title: Behavior Intelligence: Model and Cognitive Computation

Prof. Fuchun Sun

Tsinghua University

Abstract: Behavior AI based behaviorism paradigm, emphasizes that perception serves behavior and how behavior enhances the closed-loop process of perception. It is a dynamic mapping and closed-loop AI while symbolism and connectionism AI are open one. To deal with behavior AI, a new cognitive model “Bcent”, short for Brain body co-development, is proposed to regard perception and behavior as two physical processes, dubbed as Perception Body and Behavior Body, respectively; meanwhile, the reasoning part connecting Perception Body and Behavior Body is called Cognition Body, which mainly accomplishes knowledge inference and cognitive development. In a nutshell, Perception Body and Behavior Body are physically structured and coordinate with each other under the command of Cognition Body. Bcent is a unity of learning, cooperation and promotion towards sensing, cognitive learning and action. In this talk, we will first introduce the theoretical methods and functional realization of the three core bodies in Bcent. Then the main research results of the multimodal perception, behavior-based active perception and imitation learning are presented as well. Next, the applications of these theoretical methods in UAVs, mobile robots and oropharyngeal-swab robot are reported. Finally, the development trend of Bcent-based behavior AI is prospected.



Dr. Fuchun Sun is professor of Department of Computer Science and Technology, Tsinghua University, and deputy director of State Key Lab. of Intelligent Technology & Systems, Beijing, China. He serves as Vice Chairman of Chinese Association for Artificial Intelligence and Executive Director of Chinese Association for Automation. His research interests include robotic perception and skill learning, Cross-modal Learning and intelligent control. He has won the Champion of Autonomous Grasp Challenges in IROS2016 and IROS 2019. He is elected as IEEE Fellow and CAAI Fellow in 2019, CAA Fellow in 2020.

Dr. Sun is the recipient of the excellent Doctoral Dissertation Prize of China in 2000 by MOE of China and the Choon-Gang Academic Award by Korea in 2003, and was recognized as a Distinguished Young Scholar in 2006 by the Natural Science Foundation of China. He served as the EIC of the Journal of Cognitive Computation and Systems, and associated editors of IEEE Trans. on Neural Networks and Learning Systems during 2006-2010, IEEE Trans. On Fuzzy Systems since 2011, IEEE Trans. on Cognitive and Development Systems since 2018 and IEEE Trans. on Systems, Man and Cybernetics: Systems since 2015.

Invited Talk II-2

Title: Current Status and Prospects of Adaptive Learning Technology in Intelligent Education

Prof. Enhong Chen

University of Science and Technology of China (USTC)

Abstract: In recent years, the intelligent education system has developed rapidly, more and more learners have participated in online autonomous learning activities, and accumulated a large amount of educational learning data. How to make use of these data to develop intelligent education integrating big data, artificial intelligence technology and provide effective intelligent services for learners is an important task at present. As a key application of intelligent education, adaptive learning aims to provide each student with personalized learning activities through big data analysis technology, adjust learning content and improve learning efficiency. This report will focus on adaptive learning technologies and applications, the effective representation of educational resources, assessment of students' cognitive state, and the current situation of adaptive learning strategies. In addition, sharing application cases of typical adaptive intelligent education systems and looking forward to possible future development directions.



Professor En-Hong Chen, executive dean of School of Data Science and vice dean of School of Computer Science of University of Science and Technology of China(USTC), CCF Fellow, IEEE Senior Member, winner of the National Science Fund for Distinguished Young Scholars (in 2013), scientific and technological innovation leading talent of 'Ten Thousand Talent Program', the leader of the "Big data Analysis and Application" team, winner of Natural Science of the Ministry of Education and winner of Wu Wenjun's Artificial Intelligence Science and Technology Progress Award. His research interests are data mining, intelligent education, especially social network analysis and recommender systems. He is the chair of several important academic conferences in the field of data mining and knowledge discovery, including ICKG2020 and CNCC2015, and the editorial board of many important journals at home and abroad, including IEEE TKDE and ACM Artist. He has published more than 100 papers on high-level academic journals (such as TKDE, TOIS, etc.) and international important academic conferences (such as KDD, SIGIR, etc.) in related fields. Representative papers were selected as ESI highly cited papers. Winner of ACM KDD 2018 Best Student Paper Award, IEEE ICDM 2011 Best Research Paper Award and ACM KDD 2008 Best Application Paper Award "and so on.

Invited Talk II-3

Title: Trusted Multi-modality Learning with Uncertain Information

Prof. Qinghua Hu

Tianjin University

Abstract: Multimodal learning has been widely used in many applications. However, there are usually various uncertainties underlying multimodal data, including (attribute/label) noise, (modality) incompleteness, and (correlation) dynamicity, challenging current multimodal learning models. It is critical to address these challenges for real-world applications. In this talk, we will briefly review our proposed techniques for these uncertainties to provide trustworthy multimodal learning techniques, and also introduce several typical applications using these techniques.



Dr. Qinghua Hu is the Beiyang Chair Professor of Tianjin University, the Deputy Director of the Department of Intelligence and Computing and the Director of the School of Artificial Intelligence, and the National Outstanding Youth. He is mainly engaged in research on uncertainty AI, autonomous machine learning and cross-modal learning. He has received support from the National Merit Youth Program, the National Natural Science Foundation of China, the National Outstanding Youth Science Foundation of China, and the National Key Research and Development Program of China. He has achieved a series of results in uncertainty modeling of big data, uncertainty-sensitive machine learning algorithms, and intelligent unmanned system environment perception considering uncertainty, and has published more than 200 academic papers in IEEE TPAMI, IJCV, TKDE, TFS, ICCV, CVPR, NeurIPS, IJCAI, etc, and has been granted more than 20 patents. He currently serves as an editorial board member of IEEE Trans. on Fuzzy Systems, Journal of Automation, Journal of Electronics, Journal of Intelligent Systems, Chinese Journal of Graphics, and Control and Decision Making.

Invited Talk II-4

Title: Computational Psychophysiology Based Emotion Analysis for Mental Health

Prof. Bin Hu

Beijing Institute of Technology

Abstract: Computational psychophysiology is a new direction that broadens the field of psychophysiology by allowing for the identification and integration of multimodal signals to test specific models of mental states and psychological processes. Additionally, such approaches allows for the extraction of multiple signals from large-scale multidimensional data, with a greater ability to differentiate signals embedded in background noise. Further, these approaches allows for a better understanding of the complex psychophysiological processes underlying brain disorders such as autism spectrum disorder, depression, and anxiety. Given the widely acknowledged limitations of psychiatric nosology and the limited treatment options available, new computational models may provide the basis for a multidimensional diagnostic system and potentially new treatment approaches



Bin Hu is a Professor of Beijing Institute of Technology, a Director of Gansu Provincial Key Laboratory of Wearable Computing and Adjunct Professor of Computing Department at Open University. His research areas focus on affective computing and computational psychophysiology. He is currently an Institution of Engineering and Technology (IET) fellow, and a State Specially Recruited Experts of China. He is Chair of TC Computational Psychophysiology at IEEE SMC and Vice-Chair on the China Committee of International Society for Social Neuroscience. He is also currently serving as a member of the Steering Committee of Computer Science and Technology at the Chinese Ministry of Education. He was a recipient of many research awards, including the 2014 China Overseas Innovation Talent Award, the 2016 Chinese Ministry of Education Technology Invention Award, the 2018 Chinese National Technology Invention Award, and the 2019 Chinese National Invention Patent Gold Award. He was Chair or Steering Committee Member of many international conferences. He was the Guest Editor of Science supplement “Advances in Computational Psychophysiology” by the American Association for the Advancement of Science. He is currently Editor-in-Chief of IEEE Transaction on Computational Social Systems and Associate Editor of IEEE Transaction on Affective Computing.

Invited Talk II-5

Title: Data and Knowledge Driven Industrial Energy Prediction and Scheduling

Prof. Jun Zhao

Dalian University of Technology

Abstract: Industrial energy resource saving is capable of not only improving the enterprise profits, but also carrying out the significant strategy meaning for our country. Given the fixed technical process and equipment, its optimization scheduling is the most important approach for such a goal. A class of data-driven predictive scheduling methodology is proposed, and the quantitative uncertainty, and the semantic characteristics of the energy data, the short-term prediction model, the prediction interval one and the long-term model are respectively reported, and a rolling optimization technique with the procedures of prediction-scheduling-validation is proposed. The mentioned approaches have been successfully applied to a number of industrial enterprises in our country.



Prof. Zhao is now with the School of Control Science and Engineering, Dalian University of Technology. His research interests include data-driven modeling and optimization for industry system. He was the recipient of Distinguished Young Scholar funding supported by NSFC, and the recipient of Young Scholar of Yangtze River from Ministry of Education of China. He has authored or co-authored over 100 technical publications in refereed journals and conference proceedings. He serves as associate editors for several top tier journals including *Control Engineering Practice*, *IEEE TNNLS*, *Information Sciences*, etc.

Invited Talk III-1

Title: Advances in Autonomy Intelligence and Hybrid Intelligence of Unmanned Systems

Prof. Xin Xu

National University of Defense Technology

Abstract: With the increasing demand for various unmanned system applications in industry, medical treatment, national defense and other fields, it is necessary to study and explore the theories and methods to improve the autonomous ability and man-machine cooperation ability of unmanned systems in complex and uncertain environments. Based on the analysis of relevant technical requirements, the report introduces the research progress in autonomous intelligence of unmanned system, especially intelligent perception based on bionic principle, online reinforcement learning and transfer reinforcement learning, as well as the man-machine cooperation mechanism based on machine learning. It provides some research progress of autonomous perception of intelligent unmanned vehicle and man-machine cooperative driving. Finally, the further work is analyzed and prospected.



Dr. Xin Xu is a full professor with the College of Intelligence Science and Technology, National University of Defense Technology. He received the Distinguished Young Scholars' Funds of National Natural Science Foundation of China in 2018. His main research fields include machine learning and autonomous control of robots and intelligent unmanned systems. He was a recipient of the second-class National Natural Science Award of China and 2 first-class Natural Science Awards of Hunan Province. He has published 2 monographs and more than 170 papers. His representative papers have been published in IEEE TNNLS, IEEE TSMC: Systems, IEEE TPAMI, J. AI research, Information Sciences, J of Filed Robotics, IEEE TCST, IEEE TITS, IEEE TIE, IEEE / ASME T-Mechatronics and other journals. He is associate editor of IEEE Transactions on SMC: Systems, Information Sciences, International Journal of Robotics and Automation, associate Editor-in-Chief of CAAI transactions on Intelligence Technology, and an Editorial Board Member of the Journal of Control Theory and Applications.

Invited Talk III-2

Title: Research on Recursive Filtering for Time-Varying Systems in the Sense of Energy-Saving and Secure Transmission

Prof. Hongli Dong

Northeast Petroleum University

Abstract: Improving quality and efficiency is a long-term strategic measure for China's oil industry to achieve high-quality development, and the intellectualized transformation of oilfields is imperative. With the development of information technology and the continuous advancement of smart oilfields construction, the application of wireless communication networks is becoming more and more extensive. Sensors rely on the networks to transmit production data in real time, which plays an important role in ensuring the smooth operation of oilfields. As the oilfield networks continue growing, the problems of energy saving and safety during information transmission are becoming increasingly prominent. In order to ensure the sustainable development of China's petroleum industry, energy saving and security are always the basic requirements for the smart oilfield construction. How to ensure the accuracy of production data under the energy-saving wireless transmission mechanism, and how to ensure the reliability of production data in the case of network being attacked are extremely challenging issues. The recursive filtering method is used as the key technology to study the above problems, and the corresponding filters are designed for cases including 1) the recursive filtering for linear time-varying systems under the duty cycle transmission mechanism based on collaborative prediction; 2) the recursive filtering for complex networks with random coupling strengths under the event-triggered transmission mechanism; 3) the security filtering for complex networks with uncertain coupling strengths subject to deception attacks; 4) the security filtering for nonlinear time-varying systems under deception attacks and the duty cycle transmission mechanism; and 5) the recursive filtering for the natural gas pipeline flow system in the sense of energy-saving and secure transmission. Then, the purpose is achieved of ensuring the accuracy and reliability of production data on the premise of energy saving and security wireless transmission.



Prof. Hongli Dong received the Ph.D. degree in control science and engineering from the Harbin Institute of Technology, Harbin, China, in 2012. From 2009 to 2010, she was a Research Assistant with the Department of Applied Mathematics, City University of Hong Kong, Hong Kong. From 2010 to 2011, she was a Research Assistant with the Department of Mechanical Engineering, The University of Hong Kong, Hong Kong. From 2011 to 2012, she was a Visiting Scholar with the Department of Information Systems and Computing, Brunel University London, London, U.K. From 2012 to 2014, she was an Alexander von Humboldt Research Fellow with the University of Duisburg--Essen, Duisburg, Germany. She is currently a Professor with the Artificial Intelligence Energy Research

Institute, Northeast Petroleum University, Daqing, China. She is also the Director of the Heilongjiang Provincial Key Laboratory of Networking and Intelligent Control, Daqing. Her current research interests include robust control and networked control systems.

Invited Talk III-3

Title: Research on Virtual Sample Generation for Label Data in Supervised Learning

Prof. Qunxiong Zhu

Beijing University of Chemical Technology

Abstract: Now the data-driven method becomes a promising alternative and one of the research hotspots. It is well known that even in big data era, small sample problems cannot be ignored. From the perspective of data processing, studying how to enlarge data samples effectively is not only a key research direction in the field of artificial intelligence, but also entitling very theoretical significance and practical values. Virtual sample generation (VSG) is a promising technology which generates plenty of new virtual samples by the information acquired from small sample sets, improving the accuracy of the forecasting model. To overcome the problem of insufficient label data used in data-driven modeling algorithms of supervised learning, This report will focus on the VSG methods based on the improved CGAN, input-training neural network, autoencoder neural network and Kriging interpolation. Process industry case studies are carried out and the simulation results are given and analyzed.



Dr. Qunxiong Zhu is now a Professor of the College of Information Science and Technology at the Beijing University of Chemical Technology, China. He is also the director of the Engineering Research Center of Intelligent Process System Engineering, Ministry of Education of China. He has been the President of the Beijing Association of Automation, an executive member of Chinese Association of Automation (CAA), CAA Fellow, the Vice-Chairman of Technical Committee on Process Control of CAA, a member of Chemical Industry and Engineering Society of China (CIESC), the Vice-Chairman of Technical Committee on IT application of CIESC. His research interests include computational intelligence and industrial applications, process modeling and system optimization, fault diagnosis and alarm management, virtual reality and digital twin.

Invited Talk III-4

Title: Visual Foundation Models and Applications

Prof. Jiwen Lu

Tsinghua University

Abstract: This talk will first overview the research and development trend of visual foundation models from two aspects: network architecture and learning principles. Then, some research progress made by the intelligent vision group at the Department of Automation of Tsinghua University will be introduced, such as object detection and segmentation, object classification and recognition, image and video retrieval, and 3D reconstruction and recognition



Jiwen Lu is currently an Associate Professor with the Department of Automation, Tsinghua University. His current research interests include computer vision and pattern recognition. He has co-authored more than 100 research papers in PAMI/IJCV/CVPR/ICCV/ECCV. He serves as the General Co-Chair for the International Conference on Multimedia and Expo (ICME) 2022, the Program Co-Chair for the International Conference on Multimedia and Expo 2020, the International Conference on Automatic Face and Gesture Recognition (FG) 2023, and the International Conference on Visual Communication and Image Processing (VCIP) 2022. He serves as the Co-Editor-in-Chief for Pattern Recognition Letters, an Associate Editor for the IEEE Transactions on Image Processing, the IEEE Transactions on Circuits and Systems for Video Technology, and the IEEE Transactions on Biometrics, Behavior, and Identity Sciences. He was a recipient of the National Natural Science Funds for Distinguished Young Scholar. He is a Fellow of IAPR.

Invited Talk III-5

Title: Operation Optimization and Predictive Control for Distributed Systems

Prof. Shaoyuan Li

Shanghai Jiao Tong University

Abstract: There is a class of complex plant-wide systems which are composed of many physically or geographically divided subsystems. Each subsystem interacts with some so called neighboring subsystems by their states and inputs. The technical target is to achieve a specific global performance of the entire system.

The distributed (or decentralized) framework, where each subsystem is controlled by an independent controller, has the advantages of error-tolerance, less computational effort, and being flexible to system structure. Thus the distributed control framework is usually adopted in this class of system, in spite of the fact that the dynamic performance of centralized framework is better than it. Thus, how to improve global performance under distributed control framework is a valuable problem.

This talk systematically will introduce the different distributed predictive control for the plant-wide system, including the system decomposition, classification of distributed predictive control, unconstraint distributed predictive control and the stabilized distributed predictive control with different coordinating strategies for different purposes, as well as the implementation examples of distributed predictive control. The major new contribution of this book is to show how the distributed MPCs can be coordinated efficiently for different control requirements, namely the network connectivity, error tolerance, performance of entire closed-loop system, calculation speed, etc., and how to design distributed MPC.



Shaoyuan Li received his PhD degree in Automatic Control and Applications from Nankai University of China in 1997 and he was a Post Doctor in the Department of Automation in Shanghai Jiao Tong University from March 1998 to March 2000. He is Chair Professor at School of Electronic Information and Electrical Engineering, and the Chinese Dean of SJTU Paris Elite Institute of Technology, Shanghai Jiao Tong University. He is Vice president of Chinese Association of Automation, Deputy Director of Automation Teaching Steering Committee, the Ministry of Education, and Member of the State Council Discipline Evaluation Committee (Control Science and Engineering). His research areas include model-predictive control, adaptive control, intelligent control and industrial applications. He has published more than 200 papers in leading journals both at home and abroad. He is the PI of over 20 projects supported by the National Nature Science Foundation of China (NSFC), the High Technology Research and Development Program of China and Shanghai Science and Technology Commission. His main achievements won the First Prize of the 2006 Shanghai Natural Science Award (ranking the first), the Second Prize of the first Yang Jiache Science and Technology

Award in 2010, the First Prize of the Natural Science Award of CAA in 2016 (ranking the first), the Second Prize of the 2017 National Natural Science Award (ranking the second), the Outstanding Prize of Shanghai Teaching Achievement Award in 2017 (ranking the first), and the First Prize of National Teaching Award by Ministry of Education in 2018 (ranking the first). In 2008, he was awarded with the National Outstanding Youth Fund by NSFC. Moreover, he was entitled Shanghai Elite Teacher and nominated for Baogang Outstanding Teacher Award. He was also enlisted National Bai-Qian-Wan Talent Plan.