

IEEE The 16<sup>th</sup> International Conference on Computer Science & Education

(ICCSE 2021)

August 17 – 19.

**Online Conference** 

# Final Program & Book of Abstracts

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## ICCSE 2021 IEEE The 16<sup>th</sup> International Conference on Computer Science and Education

**Final Program & Book of Abstracts** 

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### Welcome to ICCSE

On behalf of the IEEE ICCSE 2021 organizing committee, I am honored and delighted to welcome you to the 16th International Conference on Computer Science and Education (ICCSE 2020). ICCSE is a series of annual conference, which began in 2006 in Xiamen, China. The Conference provides an international forum for presenting the most recent advances in the fields of Computer Science, Education, and related areas of Engineering and Advanced Technologies. Also, the Conference facilitates and promotes information exchange among participants from industry, research laboratories, and academia.

Affected by the epidemic situation, the 16th International Conference on Computer Science & Education (ICCSE 2020) will be held online and in person in Lishui University in Zhejing, China, from August 17-20, 2021. The conference is organized by the China Research Council of Computer Education in Colleges & Universities (CRC-CE), hosted by Lancaster University and Lishui University, and technical supported by the IEEE Education Society. The proceedings of ICCSE 2021 (indexed by EI ) will be published by IEEE and be included in IEEE Xplore digital library. Topics of this year's conference will be focused on Digital Twin Computing as well as its applications in education practices and digital areas. ICCSE 2021 will bring together professors, experts, professionals and researchers from universities, research institutes and related industries to share new research results, ideas and new perspectives on a wide range of Computer Science, especially AI, Education, Data Science and engineering by addressing frontier technical and business issues essential to applications of data science in both higher education and advancing people's life.

Our technical program is rich and varied with 4 keynote speeches: Transforming Manufacturing Industry from Automation to Intelligenization with Industry 4.0 Technologies Scalable and Explainable from Professor MengChu Zhou, Distinguished Professor, Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Fellow of IEEE, IFAC, AAAS and CAA; Computational Design of 3D Arts from Professor Ligang Liu, School of Mathematical Sciences, University of Science and Technology of China. Digital Twining with 21st Century AI: The value of incremental learning and Interpretability from Professor Saman Halgamuge, School of Electrical, Mechanical and Infrastructure Engineering, The University of Melbourne. Some Reliability and Safety Issues in industrial IOT and its applications from Professor Min Xie, City University of Hong Kong, Chair Professor of Industrial Engineering, IEEE Fellow. The success of our conference depends on the many people who have worked with us in planning and organizing the technical program and supporting social arrangements all over the world. In particular, we thank program chairs for their wise advices and suggestions on organizing conference technical program; we thank the conference organizing committee members who have all worked extremely hard for the details and activities of this conference. We are looking forward to meeting you!

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### Keynote Speech I

## Transforming Manufacturing Industry from Automation to Intelligenization with Industry 4.0 Technologies

#### Professor MengChu Zhou

**Distinguished Professor** 

Department of Electrical and Computer Engineering

#### New Jersey Institute of Technology

Fellow of IEEE, IFAC, AAAS and CAA

#### Abstract

Industry 4.0 intends to address a fast-changing and challenging manufacturing environment with diverse demands, short order lead-time and product life cycle, limited capacities, and highly complex process technologies. A manufacturing system integrated with Industry 4.0 technologies, such as AI, machine learning, big data analytics, digital twin, and Internet of Things, is capable of performing real-time monitoring and optimization of manufacturing processes in various aspects from high level strategic resource and production planning down to real-time equipment-level smart dispatching and predictive maintenance. By fully using real-time data and AI, the system is able to help manufacturers shorten production and R&D processes, increase production capacity, reduce production cost, guarantee product quality, and improve product yield. It is suitable to help not only high-tech industries such as semiconductor wafer fabrication, but also conventional labor-intensive sectors. This talk illustrates the transformation of semiconductor manufacturing activities from automation to intelligentization by using Industry 4.0 technologies through real-life wafer fabrication applications.

#### **Speaker Biography**



Prof. MengChu Zhou (Fellow, IEEE) received his B.S. degree in Control Engineering from Nanjing University of Science and Technology, Nanjing, China in 1983, M.S. degree in Automatic Control from Beijing Institute of Technology, Beijing, China in 1986, and Ph. D. degree in Computer and Systems Engineering from Rensselaer Polytechnic Institute, Troy, NY in 1990. He joined New Jersey Institute of Technology (NJIT), Newark, NJ in 1990, and is now Distinguished Professor in Electrical and Computer Engineering.

His research interests are in Petri nets, intelligent automation, Internet of Things, big data, web services, and intelligent transportation. He has over 900 publications including 12 books, 600+ journal papers (500+ in IEEE transactions), 29 patents and 29 book-chapters. He is the founding Editor of

IEEE Press Book Series on Systems Science and Engineering, Editor-in-Chief of IEEE/CAA Journal of Automatica Sinica, and Associate Editor of IEEE Internet of Things Journal, IEEE Transactions on Intelligent Transportation Systems, and IEEE Transactions on Systems, Man, and Cybernetics: Systems. He is a recipient of Humboldt Research Award for US Senior Scientists from Alexander von Humboldt Foundation, Franklin V. Taylor Memorial Award and the Norbert Wiener Award from IEEE Systems, Man and Cybernetics Society, and Excellence in Research Prize and Medal from NJIT. He is a highly cited scholar and ranked top one in the field of engineering worldwide in 2012 by Web of Science. His Google citation count is over 43800 with h-index being 104.

He is a life member of Chinese Association for Science and Technology-USA and served as its President in 1999. He is a Fellow of International Federation of Automatic Control (IFAC), American Association for the Advancement of Science (AAAS), Chinese Association of Automation (CAA) and National Academy of Inventors (NAI)

Details can be found at <u>https://web.njit.edu/~zhou/</u>

## Keynote Speech II

#### **Computational Design of 3D Arts**

**Professor Ligang Liu** 

School of Mathematical Sciences

University of Science and Technology of China

#### Abstract

Many real-world optimization problems are multi-objective by nature. Multi-objective evolutionary algorithms are a widely used algorithmic framework for solving multi-objective optimization problems. In this talk, I will briefly explain the basic ideas behind decomposition based multi-objective evolutionary algorithm (MOEA/D). Multitask learning can be naturally modelled as a multi-objective optimization problem. I will introduce a recent application of MOEA/D on multitask learning.

#### **Speaker Biography**



Prof. Ligang Liu is a professor at the University of Science and Technology of China. He received his PhD from Zhejiang University in 2001. He once worked at Microsoft Research Asia, Zhejiang University, and visited Harvard University. His research interests include computer graphics and geometry processing. He serves as the associated editors for many journals and served as the conference co-chairs and the program cochairs of a number of conferences. He serves as the steering committee member of GMP and the secretary of Asia graphics Association. He is an awardee of the National Science Fund for outstanding Young Scholars.

Details can be found at *http://staff.ustc.edu.cn/~lgliu* 

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## Keynote Speech III

## Digital Twining with 21st Century AI: The value of incremental learning and Interpretability

#### Professor Saman Halgamuge

Department of Mechanical Engineering

The University of Melbourne

#### **IEEE Fellow**

#### Abstract

Digital Twin Computing involves not only creating a digital parallel for real world but also facilitating the interaction between other digital twins as well the real world. A digital-physical hybrid society, perhaps reminding the already well known as concept of "hardware in the loop could digitally replicate and mutate copies of digital entities that are copied of real entities. By doing so it can lead to the design of mutated digital twins that do not exist in the real world. Interestingly this can be used from studying viruses in medicine to modelling electricity infrastructure in engineering. This speech refers to three main developments in Deep Learning, which is a major direction of the 21<sup>st</sup> century AI emphasizing their relevance to broader set of applications and in particular to digital twin computing.

- Automated design of neural networks: To reduce the development cost of Deep Neural Networks (DNNs) and to promote the broader use of DNN usage, it is proposed to automate the DNN design, which led to an emerging field called automatic machine learning (Auto-ML). This idea was previously applied by the speaker and others on shallow neural networks using the principle of self-generation/growing [1-4]. Neural Architecture Search (NAS) methods explicitly find DNN architectures for a given supervised learning task. This is achieved by encoding the candidate architecture as a solution in some search space and treating the architecture design as an optimization problem. Growing neural network architectures instead of "searching for the best" has been our alternative strategy to this problem.
- 2. Interpretability of neural networks: Interpretation of such automatically designed DNN is of significant benefit to many applications including digital twin computing as it also allows integration of existing domain/scientific knowledge to the knowledge extracted from data

from real world. Explainable AI (XAI) is an emerging and relevant area of research that has a strong connection to the level of interpretation although it may not fully exploit the different levels of interpretation possible.

3. Incremental Learning or learn from continuously incoming data: Continuously incoming data is a key characteristic of many real-world applications of AI. Experiments conducted in wet-labs and vital epidemiological data collected during a pandemic are two examples of continuous data streams. Analysing such data with efficient use of computing resources described in [5] is a key useful recent development in this direction of research.

#### **Speaker Biography**



Prof. Saman Halgamuge received the B.Sc. Engineering degree in Electronics and Telecommunication from the University of Moratuwa, Sri Lanka, and the Dipl.-Ing and Ph.D. degrees in data engineering from the Technical University of Darmstadt, Germany. He is currently a Professor of the Department of Mechanical Engineering of the School of Electrical Mechanical and Infrastructure Engineering, The University of Melbourne, Australia.

He is a Fellow of IEEE (2017-), a distinguished Lecturer of IEEE Computational Intelligence Society (2018-21) and listed as a top 2% most cited researcher for AI and Image Processing in Stanford database (2020-). His research interests are in AI, machine learning including deep learning, optimization, big data analytics and their applications in energy,

mechatronics, bioinformatics and neural engineering. He graduated 45 PhD students at University of Melbourne and delivered about 50 keynotes at conferences (2000-).

He is currently an honorary Professor of multiple institutions including ANU in Canberra and a distinguished visiting professor of HEBUT in Tianjin. His previous roles include member of the Australian Research Council College of Experts, Associate Dean of Engineering Faculty at University of Melbourne and Head of Engineering School at ANU.

Details can be found at <u>https://findanexpert.unimelb.edu.au/profile/2854-saman-halgamuge</u>

### Keynote Speech IV

## Some Reliability and Safety Issues in industrial IOT and its applications

#### **Professor Min Xie**

Chair Professor of Industrial Engineering

City University of Hong Kong, Hong Kong SAR

#### **IEEE Fellow**

#### Abstract

Internet-of-things have become popular through the rapid development of internet technologies together with new artificial intelligence and machine learning approaches. However, although industries have benefited enormously and there has been a massive productivity improvement, there are new problems and issues related to system safety and reliability. In this talk, we will share some thoughts on the tools and methods to address these problems and it is important to pay attention to them from the design and development stage, as system issues might surface over long period of usage. It is also important to quantify the risk and uncertainties and develop new tools and techniques for industrial IOT applications.

#### **Speaker Biography**



Prof M. Xie has been a Chair Professor of Industrial Engineering at City University of Hong Kong since 2011. Prior to that, he was full professor at National University of Singapore. He received his undergraduate and postgraduate education in Sweden with a PhD from Linkoping University, in 1987. Prof Xie has supervised over 60 PhD students and they hold regular position in finance, industry and academia in different continents.

Prof Xie has published over 300 journal papers and 8 books, including "Software Reliability Modelling" by World Scientific, "Statistical Models and Control Charts for High-Yield Processes" by Springer, "Computing Systems Reliability" by Kluwer Academic. He recently co-authored "

Cyber-Physical Distributed Systems: Modeling, Reliability Analysis and Applications" that will be published by Wiley later this year. Prof Xie is an elected fellow of IEEE since 2006.

Details can be found at <a href="https://www.cityu.edu.hk/seem/minxie/">https://www.cityu.edu.hk/seem/minxie/</a>

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## Digital Technology- Innovation Forum of Integrating Education with Productive Activities

#### I. Introduction to Digitalization Capability Evaluation System

#### Abstract

Digital technologies are changing the way we live, spur the digitalization in enterprises and become one of the fundamental drivers of enterprise digital transformation. To individuals and enterprises, the most important thing is using the latest technology to do what they already do – but better, and even create new business model.

In this talk, I would like to introduce a Digitalization Capability Evaluation System for both individual and enterprise, and the Digitalization Capability Curriculum System organized by DigiTwin in BigData and Intelligent Computing-Innovation Community of Integrating Education with Productive Activities.

Digitalization Capability Evaluation System consists of Individual Digitalization Capability (IDC) Evaluation and Enterprise Digitalization Capability (EDC) Evaluation. IDC Evaluation is used to assess and cultivate individual's ability of Data Science knowledge and skills associated with Digitalization Capability Curriculum System. EDC Evaluation assesses status of enterprise digital transformation initially, and thereby provides technical supports, consulting, services that enterprises need exactly.



**Wenxing Hong** is Associated professor/ Ph.D. supervisor, Xiamen University. He is also the Dean of the Research Center for Systems and Control, Xiamen University. He has led and participated in more than 15 research projects and funds, including the National Natural Science Foundation of China. His current research interests are in the areas of data mining, big data, artificial intelligence, recommendation systems, and FinTech. He is a member of CCF, and has been serving as the

General Secretary for the International Conference on Computer Science and Education (ICCSE), since 2006, and the Fujian Systems Engineering Society, since 2010. Meanwhile, he attached importance to the integration of production and education, and founded Xiamen DigiTwin Information and Technology Co.,Ltd n 2019, which was selected as High-level Talents "Double Hundred Plan" Enterprise of Xiamen in December, 2019,. DigiTwin launched Innovation Platform of Industry digitalization Capability in Nov.,2020, and now is engaged in providing technical supports services for digital transformation of SMEs.

#### II. The Future of AI and Its Impact on Digital Economy

#### Abstract

The enlarging gap between the new digital business and the traditional industries is causing potential risk and concerns on its long-term sustainability. Artificial Intelligence (AI) is transforming the world and impacting on economy and society. AI will bring multi-facetted and long-term impacts on economy, health, legal, political and regulatory. The development of AI in the next 10 years will be critical to both traditional industries and digital business and its sustainability. While the goal of AI is to realise its technological benefit, different implementation of the big-data driven AI, including the use of data and machine learning algorithms, may lead to variation and complexity in outcomes, sometime even cause misleading and biased results.

Prof. Peng will explore the key impacts of AI on the future digital economy and the need of new generation of AI in the next ten years, particularly the need of new framework to build the trust and cooperation between human intelligence and machine intelligence. Shifting from advancing machine intelligence to finding new ways to empower human to develop ethical and trustworthy artificial intelligence will be vital to enable human-machine partnership and to evolve the sustainable digital economy.



**Peng Yonghong** is a Professor of Artificial Intelligence (Chair) and the Director of the Centre for Advanced Computational Science at the Manchester Metropolitan University (MMU) UK. He has developed the "AI-2030" strategy and is steering the strategic programme of "The Future of AI" at MMU. Prior to that, Prof Peng is a Professor of Data Science and the founding director for the Centre of Research and Innovation in Data Science at the University of Sunderland UK. His

research interest includes AI and Data Science and their application to health informatics, genome and precision medicine. He is the Chair for the Big Data Task Force (BDTF) of IEEE computational intelligence society (CIS), and a member of Data Mining and Big Data Analytics Technical Committee of IEEE CIS. He is also a founding member of the Technical Committee on Big Data (TCBD) of IEEE Communications, and a member of Big Data Task Force of China Information Industry Association (CIIA). He is an Associate Editor for IEEE Transaction on Big Data, IEEE Access, and an Academic Editor of PeerJ and PeerJ Computer Science.

#### III. Text-based Facial Expression Generation for a Talking Face

#### Abstract

This talk will introduce a novel text-based talking-head video generation framework that synthesizes high-fidelity facial expressions and head motions in accordance with contextual sentiments as well as speech rhythm and pauses. To be specific, our framework consists of a speaker-independent stage and a speaker-specific stage. In the speaker-independent stage, we design three parallel networks to generate animation parameters of the mouth, upper face, and head from texts, separately. In the speaker-specific stage, we present a 3D face model guiding attention network to synthesize videos tailored for different individuals. It takes the animation parameters as input and exploits an attention mask to manipulate facial expression changes for the input individuals. Extensive experiments on qualitative and quantitative results demonstrate that our algorithm achieves high-quality photo-realistic talking-head videos including various facial expressions and head motions according to speech rhythms and outperforms the state-of-the-art. Due to the carefully designed framework, only a 5-minute talking-head video of a specific speaker is required to create his/her talking-head video with any speech input. The above work has emerged into lifelike virtual humans, e.g., virtual tutors, non-player characters, virtual assistants, interactive live streaming.



**Yu Ding** is an artificial intelligence expert at Netease Fuxi AI Lab, Hangzhou, China. He is leading a research and development team focusing on making a lifelike virtual human. His work has been applied in online education and games, e.g., virtual tutors, non-player characters, virtual assistants, interactive live streaming. He has published over 40 journal and conference papers (e.g., CVPR, ICCV, AAAI, IJCAI, IEEE TAC). His research interests include talking-face generation, full-body animation generation, multimodal computing, affective computing, nonverbal communication (face, gaze, and

gesture), and embodied conversational agent. He won first places both in the ICCV2021-ABAW facial Expression and Action Unit Challenges.

## **Invited Sessions**

#### Topic 1: Robot Perception and Learning for enhanced Robot Autonomy

#### **Chairs**:

Session Chair:

Ze Ji, Cardiff University, jiz1@cardiff.ac.uk

#### Session Co-Chair:

Jing Wu, Cardiff University, wuj11@cardiff.ac.uk

#### Abstract

Research in Artificial Intelligence for Robot Autonomy has improved tremendously over the last decade. In recent years, attentions have been focused on tasks with increased task and environment complexities. Two main areas are considered highly challenging, namely robot perception and robot learning. It is envisaged that an enhanced robot cognitive capability can be achieved through deploying advanced multi-modal perceptual capabilities, and continuous self-learning to understand the environment, predict situations via machine/deep learning, and support humans for real-world problems.

This session is intended to provide a forum for colleagues in the robotics and AI communities to share their experiences and discuss the recent advances in the following fields of autonomy to robots and unmanned systems, providing capabilities of advanced situation awareness, multi-modal sensing, robot active learning, localization and mapping, optimal path planning, human robot collaboration, robot grasping & manipulation and so on.

This invited session will collect papers of the following subjects, but not limited to:

- Artificial Intelligence, including machine learning and deep learning,
- Robot learning for enhanced skills
- Robot perception, including robot vision, SfM, tactile sensing etc
- o Mobile robot autonomous navigation, including SLAM, path planning, and task allocation
- o Intelligent Robots for Digital manufacturing, including Digital Twin and Cyber-Physical Systems
- o Data-driven or intelligent measurement and metrology technologies
- Smart robotics-enabled production, including case studies
- Human pose tracking and estimation
- Human robot/machine interaction and collaboration
- Multi-modal human robot/machine interfaces

#### **Short Bio of Chairs**



#### Ze Ji

Dr. Ze Ji is a senior lecturer of Robotics and Autonomous Systems at Cardiff School of Engineering, Cardiff University. He received his PhD (2007) from Cardiff University, MSc in computer science from the University of Birmingham and BEng in Electronics Engineering from Jilin University respectively. He has broad experience obtained from both industry and academia in robotics, including indoor mobile robots, humanoid robots, and outdoor

unmanned autonomous surface vehicles. In particular, he has been focusing on research areas of robot navigation, simultaneous localization and mapping (SLAM), robot vision, in-situ monitoring for smart manufacturing, fault diagnosis and self-validating sensors, acoustic and tactile sensing, machine learning, swarm intelligence, and robot task planning.



#### Jing Wu

Dr. Jing Wu a lecturer in the School of Computer Science and Informatics at Cardiff University. She received PhD in Computer Science from the University of York and received MSc and BSc in Computer Science from Nanjing University, China. She has broad interests and research experience in computer vision. Her main research interests lie in the area of 3D reconstruction, visual understanding, and their applications. To reconstruct 3D information from 2D is a low-

level vision problem, and assists many mid- and high-level vision tasks, such as segmentation, tracking, recognition, etc. Currently, she has particular interests in visual SLAM, micro-scale 3D surface imaging, and 3D face modelling and processing. The chairs are members of the Research Centre for Artificial Intelligence, Robotics and Human-Machine Systems (IROHMS) at Cardiff University.

#### Topic 2: VR, AR, and MR Technologies in Education

#### **Chairs:**

#### Session chair:

Carsten Lecon, Aalen University (Germany)

#### Abstract

Virtual 3D Learning Environments are not only used for the visualization of complex learning matters, but get increasing importance in learning environments (currently, accelerated by the Corona pandemic). Students for example act as avatars in artificially generated worlds, in which they learn, develop, and present simultaneously. Full immersion is possible by so called head mounted displays, for example the HTC Vive or the Oculus Rift. Nowadays, these are less expensive, so that many users can use this technique. Furthermore, Augmented Reality (AR) und Mixed Reality (MR) applications become more and more important in industrial application - and also in learning environments.

Topics are included but not limited to:

- Virtual 3D Environments for collaborative learning
- $\circ$   $\,$  AR and VR Learning Settings for Higher Education and School Education  $\,$
- o Teaching VR/ AR/ MR techniques in Higher Education
- $\circ$   $\;$  Didactic and pedagogical aspects when designing VR/ AR/ MR applications
- Evaluation of AR/ VR / MR applications
- Kinetosis in VR environments

#### **Short Bio of Chairs**



#### Carsten Lecon

- Prof. Dr. Carsten Lecon Computer science, Technical University Braunschweig, Germany.
- Software Quality Assurance (Siemens AG, Braunschweig)
- Database systems, Media archives (University Luebeck, Germany)
- Virtual University of Applied Sciences (FH Luebeck, Germany)
- Since 04/2004 Professor for media computer science (Aalen University for Applied Sciences, Germany)
- Teaching: Foundations of digital media, VR/AR technologies, audiovisual media, game programming
- Research: E-/VR-Learning, kinetosis in VR environment, live motion capture

#### Topic 3: Computer Programming in education: From kindergarten to university

#### **Chairs:**

#### Session Chair:

Li ZHENG, Tsinghua University, China zhengli@tsinghua.edu.cn

#### Session Co-Chair:

Chao LI, Tsinghua University, China li-chao@tsinghua.edu.cn

#### Abstract

Computer Programming in education is an open session in ICCSE 2021 and the theme is From kindergarten to University. We are soliciting submissions for the following thematic tracks (but not limited to):

- Case Study Analysis (K-12, Higher Education, Vocational Education)
- o Curriculum Standards (Frameworks, Models, Standards)
- Educational Assessments (Platform, Tools)
- Online and Offline Hybrid Teaching Mode (Theory, Practice)
- Flipped Classroom (Theory, Practice)

It is an ideal forum for sharing ideas, learning about development and interacting with colleagues in these fields.

#### **Short Bio of Chairs**



#### Li Zheng

Dr. Li Zheng is a Professor in School of Computer Science and Technology at Tsinghua University. She is a committee member of Higher Education Guidance Committee of Ministry of Education China, and Vice Chairman of Association of Computing Education in Chinese Universities. Her research interests lie mainly in the areas of computer applications, computer education and educational information technology. As editor-in-chief, she has

published more than twenty textbooks, one national quality textbook-C++ Language Programming and four quality courses of Beijing. She presided a number of projects of National High Technology Research and Development Program 863, as well as projects of national support plans and projects of the Chinese Ministry of Education.

As project lead, she presided over drafting GB/T36642-2018 "Information Technology, Learning, Education and Training Online Courses" etc., nine national standards for Education Informatization. As co-editor, she drafted the International Standard: ISO/IEC 19788-1:2011. She also presided over the R&D project of Group standards for the National Coding Test Adolescents (T/CERACU/AFCEC/SIA/CNYPA 100), five group standards for the "Computer Core Curriculum Specification", and as the first drafter, drafted "T/CERACU/204-2020 Computer Core Curriculum Specification -Programming". She received many awards including the National Teaching Achievement Award, Beijing Teaching Achievement Award, Science and Technology Award by Chinese Ministry of Education, Beijing Science and Technology Award, Science and Technology Progress Award of Chinese Institute of Electronics, etc.



#### Chao Li

Dr. Chao LI is an Associate Professor of BNRist (Beijing National Research Center for Information Science and Technology), Tsinghua University, Beijing, P.R. China. She got the Ph. D degree from Department of Computer Science and Technology, Tsinghua University in 2006 and worked in the area of data and knowledge engineering since then. LI's research interests also include Big Data and Machine Intelligence related applications in education,

health and digital archives. Her recent courses include C++ Programming, Distributed Data System in the classroom and corresponding MOOCs' buildings, operation, standardization, evaluation and analysis to help students achieve more efficient learning.

#### **Topic 4: Digital Society and Digital Transformation**

#### **Chairs:**

#### **Session Chair:**

Binyue Cui, Hebei University of Economics & Business, binyuec@heuet.edu.cn

#### Session Co-Chair:

Wei Zhou, Beijing Jiaotong University, wzhou@bjtu.edu.cn

Yanting Tong, Wuhan University of Technology

#### Abstract

The digital economy has increased dramatically during the past several years. The surge of ICT (Information Communication Technology) makes it available for us to integrate new advanced information technologies into our society and local culture. Meanwhile, ICT drives the changes in enterprises' business models and even business ecosystems by leveraging digital technologies and competences. With ICT, enterprises access to their customers by new information technologies, and provide customers with personalized services based on big data analysis.

Digital society drives production and life more effectively and more conveniently than ever. E-Government and e-Commerce simplify the way people work and live; The implementation of ICT based systems collect, store, access, manage and disseminate the environmental data and information; People enjoy roaming in museums or virtual heritages online at whenever they want; New information technologies facilitate the data management and remote diagnoses in health ware fields, etc.

This session will focus on how to take the best use of ICT to improve our society in certain areas. We welcome contributions of the technical as well as the non-technical aspects of digital society and digital transformation in enterprises or organizations.

This invited session will collect papers of the following subjects, but not limited to:

- e-Government / e-Governance
- e-Business / e-Commerce
- o e- Environment
- o e-Culture an e-Health
- ICT based information systems
- Digital transformation

#### **Short Bio of Chairs**



#### Binyue Cui

Dr. Binyue CUI is an Associate Professor, Dept. of Information Management, School of Management Science and Engineering, Hebei University of Economics and Business. She graduated from School of Information Science, Nagoya University, Japan, and received her Ph.D degree (information Science) in 2012. As a post-doc researcher, she worked at Nagoya University in Japan from 2012-2013. She has published over 30 academic papers in journals

and international conference proceedings and served as editor, reviewer of several academic journals. She presided and participated many research projects. Her research interests lie mainly on Data Science and the applications in Enterprise Digital Transformation, Education, e-Culture, etc.



#### Wei Zhou

Dr. Wei ZHOU, Senior Researcher of Computer and Information Technology, Beijing Jiaotong University. She received the B.Eng. degree from Hebei University of Science and Technology, the M.Eng. degree from Beijing University of Technology, and the Ph.D. degree from Nagoya University (Japan). As visiting scholar, she visited Lawrence Berkeley National Laboratory

from 2018-2019. Her main research interests include Data Science and System Engineer, Education Technology, Information Services. She has published many papers of international conference, journals, and served on some editorial boards.



#### Yanting Tong

Dr. Yanting TONG, is an Associate Professor, Dept. Visual Communication Design, School of Art and Design, Wuhan University of Technology. Her researches focus on visual communication, intangible heritages protection by digital methods, contemporary exploration to the illustration of Chinese traditional festival etc. She Presided and participated three key research projects of Hubei provincial social science foundation, and participated a young scholars supporting project of National Social Science Foundation. She

also presided three independent innovation projects of Wuhan University of Technology, and published more than ten academic papers, obtained four Design Patents. She received the Second Prize of Hubei Province University Teaching Achievement Awards (ranked second). As supervising teacher, she instructed students to take part in many domestic competitions of professional design, and her teams won many awards.

#### Topic 5: Biological Information and Artificial Intelligence

#### Chairs:

#### Session Chair:

Hiroki TAKADA, University of Fukui, takada@u-fukui.ac.jp

#### Abstract

In today's world, where digital images and videos are flooding our homes, academically examing the safety of viewing them is necessary. In this section, the new development of biosignals and biosignal processing are introduced and utilized in this field and the suroundings. In connection with 5G technology, biosignals and their utilization have been attracting attention. The application of artificial intelligence, which has made remarkable progress in recent years, to this field will also be discussed.

This invited session will collect papers of the following subjects, but not limited to:

- Machine Learning/AI
- Computer-Human Interaction
- o Control and Communication
- Deep Learning
- Mechatronics and Robotics
- Visualization of Big Data
- o Techniques, Models, and Algorithms

#### **Short Bio of Chairs**



#### Hiroki Takada

Dr. Hiroki TAKADA, is a tenured Professor in the Department of Human and Artificial Intelligent Systems, the Graduate School of Engineering, University of Fukui. He is also the Co-Director of the Nonlinear Science Lab. His research is centered on the nonlinear analysis of time sequences. In his research, mathematical models have been obtained from the data sequences

in Economics, Meteorology, and Erectrophysiology based on the stochastic process theory. He also received the Organization Contribution Award from the International Conference of Computer Science and Education (ICCSE) in 2020. Dr. Takada also serves as an editor in Environmental Health and Preventive Medicine and an editor-in-chief of Forma. He is a member of IEEE, Physical Society of Japan, and other organizations.

#### Topic 6: Intelligent maintenance for Industrial automation systems

#### **Chairs**:

#### Session chair:

Haidong Shao, Hunan University, China, hdshao@hnu.edu.cn

#### **Co-Chairs**:

Haiyang Pan, Anhui University of Technology, China, pansea@sina.cn

Zhiyi He, Guangzhou University, China, hezhiyihnu@126.com

#### Abstract

Nowadays, industrial automation system plays an important role in modern industry. With the rapid development of science and technology, modern industrial automation system is more and more precise, integrated and complicated. With high demands on reliability, safety, and availability in industrial automation systems, fault diagnosis and intelligent maintenance have been important research topics in recent years. Modern automation industries enable the availability of a large amount of historical data. As a result, data-driven modeling, diagnosis, and prognosis have attracted a lot of attention. This session will focus on how to improve the safety and efficiency of industrial automation systems.

Topics are included but not limited to:

- Effective information extraction and fusion of multi-source signals
- o Online monitoring, intelligent diagnosis and prediction
- o Health Condition Evaluation
- Closed-loop control
- Intelligent maintenance

#### **Short Bio of Chairs**



#### Haidong Shao

Dr. Haidong Shao is an Assistant Professor in the College of Mechanical and Vehicle Engineering, Hunan University, Changsha, China. He received the B.S. degree in Electrical Engineering and Automation and the Ph.D. degree in Vehicle Operation Engineering from School of Aeronautics, Northwestern Polytechnical University, Xi'an, China, in 2013 and 2018,

respectively. From 2019 to 2021, he was a Postdoctoral Fellow in Luleå University of Technology, Luleå, Sweden. Thus far, he has published more than 30+ SCI-indexed papers, including 10 ESI Highly Cited Papers, 1 ESI Hot Paper and 1 IOP Publishing Highly Cited Paper. He served as Guest Editor of Measurement Science and Technology, Youth Editorial Board Member of International Journal of Hydromechatronics. He has led various prestigious international conferences, including the Program Chair of the 2021 IEEE ICCSE, the Program Committees of the 2021 ICMVIT and 2021 CIMIA, the Session Chairs of the IEEE Global Rel&PHM-2020 Shanghai and the 2020 ICSMD. He has hosted one project funded by the National Natural Science Foundation of China (NSFC), one sub-project funded by the National Key Research and Development Program of China, and one project funded by the Natural Science Foundation of Hunan Province. His current research interests include fault diagnosis, intelligent prognosis, maintenance decision, and information fusion.



#### Haiyang Pan

Dr. Haiyang Pan is an Assistant Professor in Mechanical Engineering Department, Anhui University of Technology, Ma'anshan, China. He received Ph.D. degree in Mechanical Engineering from Hunan University, Changsha, China, in 2019. He is the Guest Editor of Shock and Vibration, Committee Member of Viser Mechanical Engineering Expert Database, and Senior Member of China Society of Mechanical Engineering. Meanwhile, he is also the reviewer

of IEEE Transactions on Industrial Electronics, Mechanical Systems and Signal Processing, ISA Transactions, Advanced Engineering Informatics and Mechanism and Machine Theory. He has won many National Natural Science Foundation of China, Natural Science Foundation of Anhui Province and Key Program of Natural Science Research of Higher Education in Anhui Province. He has published more than 60 SCI/EI papers (3 papers are ESI Highly Cited Papers), with a total of more than 600 citations, and H-index is 12. He participated in writing a monograph on machine learning and fault diagnosis, and won the second prize of Anhui Science and Technology Award (Natural Science). His research interests include machinery health monitoring, fault diagnosis, signal processing and pattern recognition.



#### Zhiyi He

Dr. Zhiyi He is an Associate Professor in the School of Mechanical and Electrical Engineering, Guangzhou University, Guangzhou, China. He received the M.S. degree in Mechanical Engineering and the Ph.D. degree in Mechanical Engineering from Hunan University, Changsha, China, in 2016 and 2020, respectively. As the first author, he has published 12 SCI-indexed academic papers in international journals (including one ESI Highly Cited Paper), such as IEEE

Transactions on Industrial Electronics, Mechanical Systems and Signal Processing, KnowledgeBased Systems and Advanced Engineering Informatics. He has also served as a reviewer of several top-ranked academic journals. He has participated in a number of projects funded by the National Natural Science Foundation of China (NSFC), and sub-projects funded by the National Key Research and Development Program of China. His main research interests are machine learning, equipment condition monitoring, and intelligent operation and maintenance.

## Topic 7: Virtual Simulation Technology Empowers Online Experiment and Online teaching

#### **Chairs:**

#### Session chair:

Fengxia Li, School of Computer Science and Technology, Beijing Institute of Technology, lfx\_lfx@bit.edu.cn

#### **Co-Chairs:**

Jingfeng Xue, School of Computer Science and Technology, Beijing Institute of Technology, xuejf@bit.edu.cn

Yue Yu, School of Computer Science and Technology, Beijing Institute of Technology, yuyue@bit.edu.cn

#### Abstract

MOOC (Massive Open Online Courses) /SPOC (Small Private Online Courses) gets many new points and research achievements for online teaching in recent years. These developments bring the challenges for the online experiment. Virtual simulation technologies which include VR/AR and computer simulation promote online teaching resource construction. The promotion could improve the quality of the online courses. This invited session is intended to provide a forum for colleagues to share their experiences and new research achievements in online experiment construction and the online courses improvement.

Topics are included but not limited to:

- Virtual Simulation Technology for Online Experiments.
- Virtual experiment for online teaching.
- Online teaching resource construction.
- Mixed Teaching Mode based on MOOC/SPOC.
- Analysis of Online Learning Behavior.

- Intelligent Tutoring Systems for MOOC/SPOC.
- Online Teaching Environment and Supporting Technology.
- Virtual experiment for online teaching.
- Online teaching resource construction.
- Mixed Teaching Mode based on MOOC/SPOC.
- Analysis of Online Learning Behavior.
- Intelligent Tutoring Systems for MOOC/SPOC.
- $\circ$  ~ Online Teaching Environment and Supporting Technology.

#### **Short Bio of Chairs**



#### Fengxia Li

Fengxia Li is a professor in School of Computer Science and Technology at Beijing Institute of Technology. She is the Beijing Famous teacher, the chief of the National Virtual Simulation Experiment Teaching Center. She is in charge of College Computer MOOC and C Programing MOOC with more than 1,600,000 students. Her research interest is computer simulation and computer education. She received many awards including the National Teaching Achievement

Award of China, Beijing Teaching Achievement Award, etc.



#### Jingfeng Xue

Dr. Jingfeng Xue is a professor in School of Computer Science and Technology at Beijing Institute of Technology. He received a PhD in computer science and technology from Beijing Institute of Technology in 2003. He is a committee member of Higher Education Guidance Committee of Ministry of Education China. His research interest is computer network and software engineering.



#### Yue Yu

Dr. Yue Yu is an associate professor in Beijing Institute of Technology. She received an MSc degree in automatic control from Beihang University, Beijing, China, in 2010 and a PhD from Ecole centrale de Lille, Lille, France, in 2013. Her fields of interests are virtual reality, computer simulation, and computer education. She is in charge of the National Natural Science Foundation of China. She received many awards including the National Teaching Achievement

Award of China, Beijing Teaching Achievement Award, etc.

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## **Program at a Glance of ICCSE 2021**

(Aug 17-19, 2021)

	Date & Time			Program	Room	
	Beijing time (GMT+8)	Lancaster, UK time (GMT+1)	US Eastern time (GMT-4)	Parallel discussion is subject to Beijing time	Online conference time	
Tues AM/P M	Beijing August 17	Lancaster, UK August 17	US Eastern August 16			
	09:00-21:00	02:00-14:00	21:00- 9:00(+1)	<b>Registration</b> Online meeting System Test Play ICCSE's Promo Video	Tencent & VooV Meeting Software	
	Beijing August 18 AM	Lancaster, UK August 18 Before Dawn	US Eastern August 18 Night			
	08:40-09:00	01:40-02:00	20:40-21:00	Play ICCSE's Promo Video		
	09:00-09:15	02:00-02:15	21:00-21:15	Opening Ceremony		
Wed. AM	09:15-10:05	02:15-03:05	21:15-22:05	Keynote Speech I Transforming Manufacturing Industry from Automation to Intelligenization with Industry 4.0 Technologies Prof. MengChu Zhou New Jersey Institute of Technology		
	10:05-10:55	03:05-03:55	22:05-22:55	Keynote Speech II Computational Design of 3D Arts Professor Ligang Liu University of Science and Technology of China	Tencent & VooV Meeting Software	
	10:55-11:05	03:55-04:05	22:55-23:05	Rest		
	11:05-11:55	04:05-04:55	23:05-23:55	Keynote Speech III Digital Twining with 21st Century AI: The value of incremental learning and Interpretability Professor Saman Halgamuge The University of Melbourne		
Wed. PM	Beijing August 18 PM	Lancaster, UK August 18 AM	US Eastern August 18 Before Dawn			
	13:00-13:50	06:00-06:50	01:00-01:50	Keynote Speech VI Some Reliability and Safety Issues in industrial IOT and its applications Professor Min Xie City University of Hong Kong, Hong Kong SAR		
	13:50-14:00	06:50-07:00	01:50-02:00	Rest		
	14:00-14:50	07:00-07:50	02:00-02:50	Digital Technology-Integration of production and education	Tencent & VooV Meeting Software	

				innovation forum	
	14:50-15:00	07:50-08:00	02:50-03:00	Rest	
	15:00-17:00	08:00-10:00	03:00-05:00	Parallel Discussion: WeA1、WeB1、WeC1	Tencent & VooV Meeting Software
Thur. AM	Beijing August 19 AM	Lancaster, UK August 19 Before Dawn	US Eastern August 18 Night		
	08:30-10:30	01:30-03:30	20:30-22:30	Invited Session: ThA1、ThB1、ThC1	
	10:30-12:30	03:30-05:30	22:30-24:30	Parallel Discussion: ThA2、ThB2 Poster Presentation ThP1、ThP2、ThP3	
Thur. PM	Beijing August 19 PM	Lancaster, UK August 19 AM	US Eastern August 19 Before Dawn		Tencent & VooV Meeting Software
	14:00-16:00	07:00-09:00	02:00-4:00	Parallel Discussion: ThA3、ThB3 Poster Presentation ThP4、ThP5、ThP6	
	16:00-16:15	09:00-09:15	04:00-04:15	Closing Ceremony	Tencent & VooV Meeting Software

## **Best Paper Award**

We will select 6 Best Paper Awards in the International Conference on Computer Science and Education annually. How is the Best paper selected? The figure below illustrates the process of Best Paper Award evaluation.



The processing of Best Paper selection

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## **Best Poster Award**

We will select 2 Best Poster Awards in the International Conference on Computer Science and Education annually. How is the Best Poster selected? The figure below illustrates the process of Best Poster Award evaluation.



The processing of Best Poster selection

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## **Introduction of Presentations, ICCSE 202**1

#### (Oral & Poster)

ICCSE aims to provide an open and effective platform to exchange the ideas for CS and Education field. Generally, all accepted papers should be presented in one of the two methods: a. Oral Presentation, b. Poster Presentation.

#### **Oral Presentation:**

- Session Number: Invited Sessions: WeC1, ThuA1, ThuB1, ThuC1; Parallel discussion: WeA1, WeB1; ThA2-3, ThB2-3.
- Oral Presentation Time: 15 minutes, including discussion. (Please check your schedule in technical program)
- 3. Each speaker is required to meet his/her session chairs in the corresponding session rooms 10 minutes before the session starts and copy the PPT/PDF file to the computer.
- 4. Each session room is equipped with a projector and a laptop (with Microsoft Windows, Microsoft Power-Point, and PDF reader). Please make sure that your files are compatible and readable with our operation system by using commonly used fonts and symbols.

#### **Poster Presentation:**

1. Session Number: WeP, ThP.

Posters are required to be condensed and attractive. The format pls. refer to the next page "**Poster Orientation and Size**". (Tape and other materials will be provided on site, and volunteer-assistants will give necessary help).

2. Authors should check the precise schedule concerning poster presentation by the Website of ICCSE2021 or instruction material on the Conference Day.

#### **Poster Orientation and Size**

A typical academic poster should have a two, three or four-column layout, with variations.

• Poster in landscape format

include a header with three or four columns depend on the demands.

• Poster in portrait format

Include a header with two columns.

#### Poster should be submitted by instructions below:

- Pdf document with the name: Paper ID + paper title. pdf
- The pdf document size will no more than 5M
- Send poster to: ieee.iccse@gmail.com
- Deadline: Aug. 12, 2021

#### Examples



Fig.1 Portrait format

- poster in portrait format: 36" wide x 48" high (91.44 x 121.92 cm) (Fig.1)
- poster in landscape format: 48" wide x 36" high (121.92 x 91.44 cm) (Fig.2)



Fig.2 Landscape format

#### **PowerPoint Tips: Page Setup**

- Open PowerPoint and choose a 'blank' slide. 1.
- 2. On the navigation bar, bring the "Design" ribbon to the forward. (Fig.3)



Fig.3

Fig.4

- Choose "Slide Size" and select "Custom Slide Size". (Fig.4) 3.
- 4. In the Slide Size dialogue window, enter in the size of the poster: eg. 48" wide and 36" high. (Fig. 5)
- 5. Begin the design process and add content to your poster.

	Format Shape * *
	SHAPE OPTIONS TEXT OPTIONS
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Star San John stad for Star New Headings New Headings	Text direction Horizontal
Fig.5	Fig.6



#### \* How to prevent text boxes from auto-sizing

When adding text boxes to your slide, entering text can change the shape of the box. To fix this: Right click (or Ctrl+click) on the text box, choose "Format Shape", "Text Options", "Text Box", and select "Do not Autofit". (Fig.6) This Page Intentionally Left Blank

## **Session Chairs Index**

Session Title	Session#	Chair	Chair's Affiliation	Country	Time
Educational Technology I	WeA1	Ze Ji	Cardiff University	UK	Aug.18
Online learning	WeB1	Li Chao	Tsinghua University	China	Aug.18
Digital Society and Data science	WeC1	Hiroki Takada	University of Fukui	Japan	Aug.18
Invited Session : Digital Society and Digital Transformation	ThA1	Binyue Cui	Hebei University of Economics & Business	China	Aug.19
Invited Session : Intelligent Maintenance for Industrial Automation Systems	ThB1	Haidong Shao	Hunan University	China	Aug.19
Invited Session : Legal Intelligence and Judicial Big Data	ThC1	Weng Yang	Sichuan University	China	Aug.19
Educational Technology II	ThA2	Li Fengxia	Beijing Institute of Technology	China	Aug.19
Computer Science	ThB2	Wang Qing	Tianjin University	China	Aug.19
Educational Technology III	ThA3	Li Zheng	Tsinghua University	China	Aug.19
Educational Technology VI	ThB3	Hu Jie	Zhejiang University	China	Aug.19
Data Science & Al	ThP1				
Industrial Design	ThP2				
Computer Science	ThP3				
Educational Technology	ThP4				
Digital Society	ThP5				
Legal Intelligence and Judicial Big Data	ThP6				

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