

**University of Technology Sydney (UTS) and Shanghai University (SHU)**  
**1<sup>st</sup> UTS SHU Virtual Global Forum on Machine Intelligence**  
**24<sup>th</sup> June 2020 (Wednesday)**

To join the virtual forum, please click on this link – <https://utsmeet.zoom.us/j/94167599527>

**EVENT PROGRAM (Sydney Time):**

TIME	ACTIVITY/PRESENTATION TITLE	SPEAKER
10.30am to 11.00am	Opening Ceremony and Welcome Address	Welcome Address from:  UTS Vice-Chancellor Attila Brungs SHU President Changsheng Liu  Speakers:  Distinguished Professor Jie Lu (UTS) Professor Shugong Xu (SHU) Kun Wang (dual PhD student – UTS-SHU) - <i>Gradient Boosting Based Concept Drift Learning</i>
11.00am to 11.20am	Brain Computer Interface in Human-Autonomy Teaming	Distinguished Professor CT Lin (UTS) 
11.25am to 11.45am	Recent Advances in Machine Vision from GREAT@SHU	Professor Shugong Xu 
11.50am to 12.10pm	Data-efficient Image & Video Segmentation	Dr Yunchao Wei (UTS) 
12.15pm to 12.35pm	Obstacle avoidance path planning and motion control for planer soft gripper	Professor Hang Shi (SHU) 
12.40pm to 1.00pm	Optimal Dispatch of Electrical Vehicle and PV power to Improve the Power Quality of an Unbalanced Distribution Grid	Associate Professor Haiyan (Helen) Lu (UTS) 
1.00pm to 1.20pm	Resilient Information Fusion under Sparse Attack	Professor Xiaoqiang Ren (SHU) 

<b>1.20pm to 2.30pm</b>	BREAK	All
<b>2.30pm to 2.50pm</b>	Fault Diagnosis of Reciprocating Compressor using Convolutional Deep Belief Network	Associate Professor Jinchen (JC) Ji (UTS) 
<b>2.55pm to 3.15pm</b>	Efficient Processing of Convolutional Neural Networks: Simulator, Accelerator and System	Dr Shan Cao (SHU) 
<b>3.20pm to 3.40pm</b>	Design infographics/visual icons for social networks by referencing to the design concept of ancient Oracle Bone characters	Associate Professor Maolin Huang (UTS) 
<b>3.45 pm to 4.05pm</b>	Can Deep Learning Models Reflect and Change Ideas Like Humans?	Dr Xinzhi Wang (SHU) 
<b>4.10pm to 4.30pm</b>	Imitation Learning from One-life Demonstration	Professor Ivor Tsang (UTS) 
<b>4.35pm to 4.55pm</b>	Mining and Learning of the Event Evolution Graph	Professor Xiangfeng Luo 
<b>5.00pm to 5.15pm</b>	Closing Remark	Distinguished Professor Jie Lu

### 11.00am to 11.20am - Title: Brain Computer Interface in Human-Autonomy Teaming

**Abstract:** BCI is widely considered a 'disruptive technology' for the next-generation human-computer interface in wearable computers and devices. In particular, there are incredible potential real-life applications of BCI in augmenting human performance for people in health and aged care. Despite this, there are limitations. Human cognitive functions, such as action planning, intention, preference, perception, attention, situational awareness, and decision-making, although omnipresent in our daily lives, are complex and hard to emulate. Yet, by studying the brain and behaviour at work, a BCI plays an incredibly important role natural cognition.

Discover the latest thinking in the realm of the Brain-Computer Interface in this lecture. Listen the current status of BCI and discusses its three major obstacles: the shortage of wearable EEG devices, the various forms of noise contamination that hinder BCI performance, and the lack of suitable adaptive cognitive modelling. This talk will introduce the fundamental physiological changes of human cognitive functions in the interaction with autonomous machines (autonomy) and explain how to combine the bio-findings and AI techniques to develop monitoring and feedback systems to enhance the cooperation of human and autonomy.

**Bio:** Chin-Teng Lin received the B.S. degree from the National Chiao-Tung University (NCTU), Taiwan in 1986, and the Master and Ph.D. degree in electrical engineering from Purdue University, West Lafayette, Indiana, U.S.A. in 1989 and 1992, respectively. He is currently a Distinguished Professor, Co-Director of Centre for AI, and Director of CIBCI Lab, FEIT, UTS. He is also invited as the International Faculty of the University of California at San Diego (UCSD) from 2012 and Honorary Professorship of University of Nottingham from 2014.

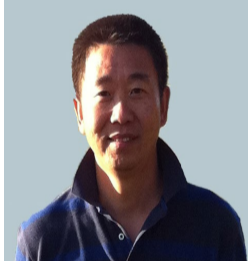
Prof. Lin's research focuses on machine-intelligent systems and brain computer interface, including algorithm development and system design. He has published over 330 journal papers (H-Index 67 based on Google Scholar), and is the co-author of Neural Fuzzy Systems (Prentice-Hall) and author of Neural Fuzzy Control Systems with Structure and Parameter Learning (World Scientific). Dr. Lin served as Editor-in-Chief of IEEE Transactions on Fuzzy Systems from 2011 to 2016, and has served on the Board of Governors of IEEE Circuits and Systems Society, IEEE Systems, Man, and Cybernetics Society, and IEEE Computational Intelligence Society. Dr. Lin is an IEEE Fellow, and received the IEEE Fuzzy Pioneer Award in 2017.



### 11.25am to 11.45am - Title: Recent Advances in Machine Vision from GREAT@SHU

**Abstract:** In this talk, we will discuss a few recent advances in vision tasks from GREAT@SHU team, including text detection, text recognition, face anti-spoofing, and matting etc. Some record breaking results and applications will be presented.

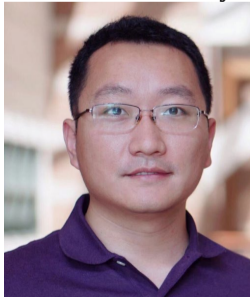
**Bio:** Prof. Shugong Xu is IEEE Fellow, head of the Shanghai Institute for Advanced Communication and Data Science (SICS). In his 20+ years career in research (over 15 years in industrial research labs), he had over 40 issued US/WO/CN patents and published more than 100 peer-reviewed research papers. His work was one of the major triggers to the research and standardization of IEEE 802.11S. He was awarded "National Innovation Leadership Talent" from China government in 2013, IEEE Fellow in 2015. Shugong also won 2017 Award for Advances in Communication from IEEE Communication Society. Shugong received his BS degree from Wuhan University, ME and PhD degrees from Huazhong University of Science and Technology (HUST). His current research interests include artificial intelligence/ machine learning and wireless communication systems.



### 11.50am to 12.10pm - Title: Data-efficient Image & Video Segmentation

**Abstract:** In this talk, Dr. Yunchao Wei will introduce his latest progress on efficient pixel-wise labelling for image/video segmentation, i.e., the Inside-Outside Guidance (IOG) approach for interactive image segmentation and the Memory Aggregation Networks (MANet) for interactive video object segmentation. These two approaches can significantly reduce the human effort in collecting pixel-wise labels, which can be adopted to scale-up training images for many real-world applications, including autonomous driving, medical imagery, robotics, etc.

**Bio:** Dr. Yunchao Wei is currently an assistant professor with the Centre for Artificial Intelligence, University of Technology Sydney. He received his Ph.D. degree from Beijing Jiaotong University, Beijing, China, in 2016. He was a Postdoctoral Researcher at Beckman Institute, UIUC, from 2017 to 2019, working with Prof. Thomas Huang. He is ARC Discovery Early Career Researcher Award (DECRA) Fellow from 2019 to 2021. His current research interests include computer vision and machine learning.



### 12.15pm to 12.35pm – Title: Obstacle avoidance path planning and motion control for planer soft gripper

**Abstract:** The flexibility of multi-segment soft robots enables highly adaptive manipulation tasks in complex and confined environments. However, the obstacle avoidance and motion control for soft robots remain to be difficult tasks when lack of efficient and effective path planning methods and model-less control approaches. This talk introduces our recent research contributing in the following aspects: 1) a framework for obstacle-free path planning in configuration space based on a distorted space method; 2) a gain scheduling motion control strategy tackling the impact of structural nonlinearity. The experiment validations will also be presented in the talk.

**Bio:** Hang Shi is currently an associate professor at School of Mechanical and Electrical Engineering and Automation, Shanghai University. He received his bachelor degree from Beihang University in 2005, and his master and Ph.D degrees from University of Southern California in 2007 and 2013 respectively. His research interests include soft robotics and environment sensing and target detection of autonomous field robots.



### 12.40pm to 1.00pm – Title: Optimal Dispatch of Electrical Vehicle and PV power to Improve the Power Quality of an Unbalanced Distribution Grid

**Abstract:** In the smart grid, the distributed generations play an important role to manage the distribution grid. The renewable energy sources such as PV solar, wind and the Electric Vehicle's Energy Storage (ES) are the prominent distributed generation sources. The distributed generation (DG) reduces power loss and improves the voltage profile and reliability of a low voltage (LV) distribution grid. However, optimal placement and sizing of DGs need to be planned properly. Several researchers planned to place single or multiple DGs at the optimum node with an optimal amount of power dispatch assuming balanced distribution grid. But the DGs are connected at all node/buses which require an optimum amount of power dispatch and distribution grids are seldom balanced. Moreover, a few research have been conducted for optimizing DG dispatch in an unbalanced distribution grid. This study proposes a method to improve voltage profile and reduce the total power loss by optimizing the PV and EVs power dispatch in an unbalanced distribution grid. The optimization problem was solved by using the Differential evolution (DE) optimization algorithm and the Genetic algorithm (GA) in a case study of an Australian distribution grid. The DE shows faster convergence than the GA. The proposed method reduces 55.72% real power loss of the network. It is also found that the proposed method improves the bus voltage up to 7.65% and increase the bus voltage above 0.95 p.u at all the nodes.

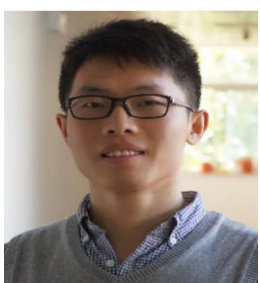
**Bio:** Dr Haiyan (Helen) Lu is an associate professor in School of Computer Science in the Faculty of Engineering and Information Technology, and a core member of the Decision Systems and e-Service Intelligence Research Laboratory in the Centre for Artificial Intelligence at the University of Technology Sydney (UTS). She received her Bachelor and Master Degrees in Harbin Institute of Technology (HIT) China in 1985 and 1988, respectively, and PhD degree from UTS in 2002. Her main research interests are heuristic optimization techniques, forecasting and prediction of time series, ontology-based knowledge representation, recommendation systems and causal relationship, inference and reasoning in data streams. She have published three book chapters, 71 refereed journal papers and 82 refereed international conference papers. She is a senior member of IEEE.



### 1.00pm to 1.20pm – Title: Resilient Information Fusion under Sparse Attack

**Abstract:** In this talk, I will be presenting our recent work about detection and estimation in multi-sensor settings, with a caveat that an unknown subset of the sensors is compromised by an adversary, whose measurements can be manipulated arbitrarily. In particular, an algorithm achieving the best trade-off between security and efficiency for detection, a probabilistic performance metric and an optimal estimator for static state estimation will be talking about.

**Bio:** Xiaoqiang Ren is a professor at the School of Mechatronic Engineering and Automation, Shanghai University, China. He received the B.E. degree in the Department of Control Science and Engineering from Zhejiang University, Hangzhou, China, in 2012 and the Ph.D. degree in the Department of Electronic and Computer Engineering from Hong Kong University of Science and Technology in 2016. He was a postdoctoral researcher in the Hong Kong University of Science and Technology in 2016, Nanyang Technological University, Singapore from 2016 to 2018, and KTH Royal Institute of Technology, Sweden from 2018 to 2019. His research interests include security of cyber-physical systems, sequential decision, and networked estimation and control.



### 2.30pm to 2.50pm – Title: Fault Diagnosis of Reciprocating Compressor using Convolutional Deep Belief Network

**Abstract:** To denoise the raw signal and fuse multiple sources of information for the fault diagnosis of reciprocating compressor, we propose a novel convolutional deep belief network-based method and employs a novel framework fusing multi-source information to improve the fault diagnosis performance. Data from an industrial plant were collected to verify the proposed method. The result demonstrates the proposed method can diagnose the RC faults with the accuracy rate up to 91.89%. In addition, the comparison results with other methods illustrate the superiority of the proposed method in the RC fault diagnosis.

**Bio:** Dr Jinchun (JC) Ji is currently an Associate Professor of Mechanical Engineering at School of Mechanical and Mechatronic Engineering, University of Technology Sydney (UTS). He is a leading researcher in the general areas of dynamics, vibration and control, with over 110 journal publications. His current research interests include nonlinear dynamics and bifurcation control of nonlinear systems, dynamics and control of wind turbines, consensus and synchronization of networked systems, coordination control of multi-agent systems, dynamics of time-delayed nonlinear systems, vehicle system dynamics, condition monitoring and fault diagnosis, fatigue analysis and strength-based design, dynamics of predator-prey systems, and the coordination control of robotic systems. Currently, he is an associate editor for two top international journals, namely, International Journal of Bifurcation and Chaos, and Journal of Vibration and Control.



### 2.55pm to 3.15pm – Title: Efficient Processing of Convolutional Neural Networks: Simulator, Accelerator and System

**Abstract:** Convolutional neural networks (CNN) have been widely deployed in a number of applications due to their strong learning and feature extraction ability. To meet the ever-increasing accuracy requirements from various applications, neural network models have become more complicated and diversified. However, hardware processing of CNNs are still not efficient enough to meet the throughput and hardware cost requirement. In this talk, a CNN simulator for fast inference, simulation and hardware evaluation will be introduced. Based on that, a hardware accelerator is presented for mainstream CNNs, such as VGGNet. Meanwhile, a face recognition prototype system which is implemented on heterogeneous hardware with customized CNN accelerator will also be presented.

**Bio:** Shan Cao received her B.S. degree and Ph.D. degree in Microelectronics from Tsinghua University, China, in 2009 and 2015 respectively. She was a postdoc in School of Information and Electronics, Beijing Institute of Technology during 2015 and 2017. She is currently an assistant professor in Shanghai University. Her current research interests include wireless communication systems, channel encoding and decoding, machine learning algorithms and hardware accelerations. She has published over 40 peer-reviewed journal and conference papers, and received young eastern scholar in 2017.



### 3.20pm to 3.40pm – Title: Design infographics/visual icons for social networks by referencing to the design concept of ancient Oracle Bone characters.

**Abstract:** This presentation talk about the use of pictogram design concept in ancient China for the development of a set of today's "graphic icons" or "infographics" in modern social network visualization systems. these graphic icons should be close to sensory symbols that derive their expressive power from their ability to use the perceptual processing power of the brain without learning. Therefore, with the use of such a set of "sensory symbols" we aim to achieve the identification of corresponding physical objects (or their attributes) to be performed within the pre-attentive time limit.

**Bio:** Associate Professor Mao Lin Huang is an internationally recognized Data Visualization Scientist, known for his expertise in Hierarchical Data Visualization & Online Graph Visualization. As one of the world leading scientists in the field, Mao invented or co-invented many data visualization techniques. Among them, eight are included in the TreeVis [A Visual Bibliography of Tree Visualization ([www.treevis.net](http://www.treevis.net))] as part of the 318 Most Remarkable methods recorded in the entire 306 years history of hierarchical data visualization, from 1714 to 2020. These are: 1) SpaceOptimized Tree, 2) EncCon Tree 2D, 3) Radial Edgeless Tree, 4) EncCon Tree 3D, 5) Treemap Bar, 6) Angular Treemap, 7) Golden Rectangle Treemap, 8) Pansy Tree. The "Treemap Bar" technique has already made a Significant Social Impact world wide. It was disseminated to at least 6,000,000+ (6 millions) users in the world by Microsoft Co. & Tableau Software for providing them with business intelligence and advanced data analytics facility.



### 3.45 pm to 4.05pm – Title: Can Deep Learning Models Reflect and Change Ideas Like Humans?

**Abstract:** In recent years, great progress has been achieved in deep learning models learning, which has been gradually applied to tasks such as text and image classification, agent behavior planning. The black-box decision making process of deep learning models stand out which prevent their industrialization. Model interpretation, as one way to reveal model working mechanism, has drawn a lot of attention. However, there is still gap between how to generate and how to use interpretation. In this presentation, we not only focus on interpreting deep learning models but also employ interpretation to improve the performance of deep learning models, which allow models to reflect and change ideas like humans. Cases in improving sequence text classification and deep reinforcement learning through interpretation will be reported.

**Bio:** Xinzhi Wang is currently an lecturer at School of Computer Engineering and Science, Shanghai University, Shanghai, China. She got her Ph.D. degree from Tsinghua University in 2019. She visited Carnegie Mellon University(CMU) for one year in 2017-2018. Her recent research focuses on natural language and image processing, including sentiment analysis, AI transparency, agent action planning and agent action intervention.



### 4.10pm to 4.30pm – Title: Imitation Learning from One-life Demonstration

**Abstract:** Imitation learning in a high-dimensional environment is challenging. Most inverse reinforcement learning (IRL) methods fail to outperform the demonstrator in such a high-dimensional environment, e.g., Atari domain. To address this challenge, we propose a novel reward learning module to generate intrinsic reward signals via a generative model. Our generative method can perform better forward state transition and backward action encoding, which improves the module's dynamic modeling ability in the environment. Thus, our module provides the imitation agent both the intrinsic intention of the demonstrator and a better exploration ability, which is critical for the agent to outperform the demonstrator. Empirical results show that our method outperforms state-of-the-art IRL methods on multiple Atari games. Moreover, our method achieves performance that is up to 5 times the performance of the demonstration.

**Bio:** Ivor W Tsang is an ARC Future Fellow and Professor of Artificial Intelligence, at University of Technology Sydney (UTS). He is also the Research Director of the UTS Flagship Research Centre for Artificial Intelligence (CAI). His research focuses on transfer learning, feature selection, learning from noisy supervision, big data analytics for data with extremely high dimensions in features, samples and labels. He has 200 research papers published in top-tier journals and conferences. According to Google Scholar, he has more than 14,000 citations and his H-index is 56. In 2009, Prof Tsang was conferred the 2008 Natural Science Award (Class II) by MOE, China, which recognized his contributions to kernel methods. In 2013, Prof Tsang received his prestigious Australian Research Council Future Fellowship for his research regarding Machine Learning on Big Data. In 2019, his Journal of Machine Learning Research paper titled "Towards ultrahigh dimensional feature selection for big data" received the International Consortium of Chinese Mathematicians Best Paper Award. In 2020, Prof Tsang was recognized as the AI 2000 AAAI/IJCAI Most Influential Scholar in Australia. In addition, he had received the IEEE Transactions on Neural Networks Outstanding 2004 Paper Award in 2007, the 2014 IEEE Transactions on Multimedia Prize Paper Award, and a number of best paper awards and honors from reputable international conferences, including the Best Student Paper Award at CVPR 2010. He serves as an Area Chair/Senior PC for NeurIPS, ICML, AISTATS, AAAI and IJCAI.



### 4.35pm to 4.55pm – Title: Mining and Learning of the Event Evolution Graph

**Abstract:** 1) Event Mining, Extraction and Detection, 2) Automatic Division of Multi-granularity Events, 3) Causal Event Extraction and the Construction of the Event Evolution Graph.

**Bio:** Xiangfeng Luo is a professor in the School of Computer Engineering and Science, Shanghai University, China. He received the master's and PhD degrees from the Hefei University of Technology in 2000 and 2003, respectively. He was a postdoctoral researcher with the China Knowledge Grid Research Group, Institute of Computing Technology (ICT), Chinese Academy of Sciences (CAS), from 2003 to 2005. His main research interests include Web Wisdom, Cognitive Informatics, and Text Understanding. He has authored or co-authored more than 50 publications and his publications have appeared in IEEE Trans. on Automation Science and Engineering, IEEE Trans. on Systems, Man, and Cybernetics-Part C, IEEE Trans. on Learning Technology, Concurrency and Computation: Practice and Experience, and New Generation Computing, etc. He has served as the Guest Editor of ACM Transactions on Intelligent Systems and Technology. Dr. Luo has also served on the committees of a number of conferences/workshops and more than 40 PC members of conferences and workshops.

