



26th IEEE International Conference on Intelligent Transportation Systems ITSC 2023

Bilbao, Spain
September 24 - 28, 2023

Special Session Proposal

- Title:

Safe-Critical Scenario Understanding in Intelligent Transportation Systems (SCSU-ITS)

- Modality:

Half-day

- Scope (no longer than 4 pages), including the following sections:

Great progress has been made for current intelligent transportation systems. Various advanced techniques, such as autonomous driving, road-vehicle cooperation, high-speed railway, etc., have attracted great attention for building a safe, comfortable, enjoyable, and smart travel experience. With this beautiful vision for future transportation systems, safe-critical scenario understanding (**SCSU-ITS**) is becoming a hot problem and the barrier that cannot be ignored. SCSU-ITS is universal and can be found in multiple applications, such as fault detection of railway and vehicles, communication interference of connected vehicles, accident detection or prediction, road crash detection, etc. In sometimes, the ability for tackling these safe-critical scenarios reflects the core property for the practical implementation of transportation systems. However, because of the long-tailed distribution, SCSU-ITS is still challenging. For example, the fault in railway and vehicles owns diverse patterns and are hard to be found, especially for the tiny cracks. The communication interference of connected vehicles may be with irregular frequency and different attack modes. Road accident may involve different road participants and interactions, and is hard to be detected especially for the severe road conditions.

Some recent works have been aware of this and develop many methods with the few-shot, zero-shot, and risk evaluation techniques, and various data sensors, such as vision, 3D-LiDAR, etc. have been the popular configuration in autonomous driving or road sensing systems. Meanwhile, digital twin or parallel intelligence have been used to argument the safe-critical scenarios and boost the performance. Nevertheless, the sensing error, environment noise, and the scene perception bias still have large influence on SCSU-ITS. In addition, with the development of generative methods in artificial intelligence, such as DALL-E 2, SCSU-ITS will face large shock by fake scenarios or adversarial attacks. Therefore, it is urgent to

find the new models and benchmarks in SCSU-ITS, such as the virtual-real data collaboration, distribution diffusion, multi-modality understanding, few or zero shot learning, human-machine hybrid intelligence, causal inference, and so on. Based on this session, we want to absorb and contribute excellent insight in SCSU-ITS, and promote the development of intelligent transportation in new era.

The areas of interest of this Special Session include but not limited to following topics:

- ✧ Few shot or zero shot learning in SCSU-ITS;
- ✧ Safe-critical scenario generation and domain adaptation;
- ✧ Attack detection or fake scenario detection for SCSU-ITS;
- ✧ Casual inference for SCSU-ITS;
- ✧ Human-in-the-loop for SCSU-ITS;
- ✧ Fault detection and prediction in various transport carriers;
- ✧ Traffic accident or anomaly detection or prediction;
- ✧ Parallel vision in SCSU-ITS;
- ✧ Digital twins in SCSU-ITS;
- ✧ Road damage detection and prediction;
- ✧ Object detection, re-identification, tracking, trajectory or location prediction in SCSU-ITS;
- ✧ Communication failure detection and prevention in connected vehicles;
- ✧ Point cloud processing in SCSU-ITS;
- ✧ Multiple sensor data fusion for SCSU-ITS;
- ✧ Edge computing for SCSU-ITS;
- ✧ New benchmarks and models for SCSU-ITS;
- ✧ New applications within SCSU-ITS.

- Organizers (names, affiliations, emails, and short bio):



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Jianwu Fang is an Associate Professor in College of Transportation Engineering, Chang'an University, Xi'an, China. He received the Ph.D. degree in SIP (signal and information processing) from University of Chinese Academy of Sciences, China in 2015. He is currently the Director and an Associate Professor with Department of BigData Management and Application and Laboratory of Traffic Vision Safety (LOTVS). He has published over 60 papers on top-ranked journals and conferences, such as IEEE-TITS, IEEE-TNNLS, IEEE-TCYB, IEEE-TIE, IEEE-TCSVT, AAI, ICRA, ITSC, etc. He is the coauthor of the CAA Joint Standard "Evaluation Methods and Dataset Standards for Traffic Participant Behavior Understanding and Trajectory Prediction". He was a postdoctoral researcher in Institute of Artificial Intelligence and Robotics, Xi'an Jiaotong University from 2016 to 2022. He is a visiting scholar at NExT++, School of

Computing, National University of Singapore. He has been the chair for many workshops or sessions in some top-ranked conferences, such as IEEE Intelligent Transportation Systems Conference (ITSC'22) session on “Parallel Vision for Intelligent Vehicles”, IEEE Intelligent Vehicles Symposium (IV'18) workshop on “Traffic Scene Understanding of Automated Vehicles”, Pre-conference on ICRA 2021/2022 and IROS 2021/2022.



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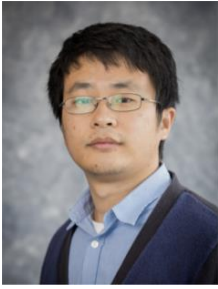
Yi Jin is a Professor with Beijing Jiaotong University, Beijing, China. She received the Ph.D. degree in signal and information processing from the Institute of Information Science, Beijing Jiaotong University, Beijing, China, in 2010, and was a Visiting Scholar with the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, from 2013 to 2014. Her research interests include computer vision, pattern recognition, image processing, and machine learning. She has served as an Associate Editor for Journal of Electronic Imaging and served as Publication Chair of IEEE BESC, and Program Committee Member of IEEE ICSP. She is also the reviewer of IEEE TIP, TMM, TIFS and IJCV. She has published 70 research papers in recent five years, including IEEE/ACM journals and CCF Top conferences, such as CVPR, AAI, ICCV, ACM MM. She won IEEE CS Runner-up Best Paper Awards in 2022.



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Chen Lv is a Nanyang Assistant Professor at School of Mechanical and Aerospace Engineering, and the Cluster Director in Future Mobility Solutions, Nanyang Technological University, Singapore. He joined NTU and founded the Automated Driving and Human-Machine System (AutoMan) Research Lab since June 2018. His research focuses on intelligent vehicles, automated driving, and human-machine systems, where he has published 4 books, over 100 papers, and obtained 12 granted patents. He serves as Associate Editor for IEEE T-ITS, IEEE TVT, and IEEE T-IV. He received many awards and honors, selectively including the IEEE IV Best Workshop/Special Session Paper Award in 2018, Automotive Innovation Best Paper Award in 2020, the winner of Waymo Open Dataset Challenges at CVPR 2021 and 2022, Machines Young Investigator Award in 2022, and Nanyang Research Award (Young Investigator) 2022.

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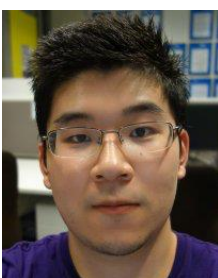


Hongkai Yu received the Ph.D. degree in computer science and engineering from University of South Carolina, Columbia, SC, USA. He is currently an Assistant Professor in the Department of Electrical Engineering and Computer Science at Cleveland State University, Cleveland, OH, USA. His research interests include computer vision, machine learning, deep learning, intelligent transportation system, and intelligent vehicles. He has published about 50 papers including many prestigious conferences and journals, such as CVPR, ICCV, AAI, ACM MM, IEEE T-IP, IEEE T-MM, IEEE T-CSVT, etc. He is the Area Chair of ACM MM 2022 and IEEE MIPR 2022. He is also serving in the Editorial Board of the journal Green Energy and Intelligent Transportation. His research has been supported by several grants of NSF, NAS, ODOT, ODHE, AWS, etc.



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Cen Chen received his PhD degree in Computer Science, Hunan University, China. Currently, he works as a Scientist III in Institute for Infocomm Research (I2R), Agency for Science, Technology and Research (A*STAR), Singapore. Part time PhD supervisor of National University of Singapore and Nanyang Technological University, and winner of special allowance for AI talents in Singapore. Main research field: efficient intelligent computing and intelligent application. He has published more than 60 articles in international conference and journals of machine learning algorithms and parallel computing, such as IEEE TITS, IEEE-TC, IEEE-TPDS, IEEE-TNNLS, IEEE-TCYB, AAI, ICDM, ICPP, HPCA, DAC and many more.



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Zhedong Zheng is a research fellow at NExT++, School of Computing, National University of Singapore. He received the Ph.D. degree from the University of Technology Sydney, Australia, in 2021 and the B.S. degree from Fudan University, China, in 2016. His research interests include robust learning for multimedia retrieval, generative learning for data augmentation, and unsupervised domain adaptation. He has published 30 papers in highly selective venues such as CVPR, ICCV, ACM MM, TMM, IJCV and TPAMI with a citation of **7,000+** times in Google Scholar. Six of the research papers are elected as ESI highly-cited papers. He received the IEEE Circuits and Systems Society Outstanding Young Author Award of 2021. He has served as the reviewer and program committee (PC) member for multiple conferences and journals, including TPAMI, TMM, IJCV, CVPR, ICCV, ECCV, IJCAI, AAI

and ACM Multimedia, and organized a special session on reliable retrieval at ICME 2022. Besides, he is also invited as a keynote speaker at CVPR 2020, and 2021, and a tutorial speaker at ACM Multimedia 2022.

- Intended audience and expected attendance of the special session:

The scholars and students in SCSU-ITS or other related topics.

- Materials and equipment needed for the special session:

A seminar room with projector and about 30 seats.

- Contact details of the proposers (email, postal address, etc.):

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