IEEE
IAVVC 2023

IEEE International Automated Vehicle Validation Conference
October 16–18, 2023 | Austin, TX, USA

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PROGRAM

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Welcome to 2023 IEEE IAVVC

Dear Participants of the 2023 IEEE IAVVC,

It is with great pleasure and excitement that we extend a warm welcome to all of you to this inaugural IEEE International Automated Vehicle Validation Conference (IAVVC). IEEE IAVVC 2023 marks a significant milestone in the field of automated vehicles, bringing together experts, innovators, and enthusiasts in academia, industry, and government from around the world.

IEEE IAVVC 2023 focuses on the interaction between vehicles and infrastructure through connectivity to support automation and electrification of transportation, and we are looking forward to offering an inspiring lineup of speakers, interactive workshops, and networking opportunities. With the rapid advancements in automation technology, we find ourselves on the cusp of a transformative era. IAVVC 2023 provides a unique platform for us to engage in discussions, share insights, and contribute to shaping the future of automated mobility. As we embark on this exciting journey together, we encourage you to actively participate in all aspects of the conference, share your experiences, and make the most of this collaborative platform.

We extend our sincere gratitude to our organizing committee, sponsors, and all those who have worked tirelessly to make IAVVC 2023 a reality. Your dedication and hard work are truly commendable. Thank you for being a part of this historic event. Together, let us navigate the future of automated mobility and drive positive change for a safer and more sustainable transportation landscape.

Wishing you a productive, enlightening, and enjoyable IEEE International Automated Vehicle Validation Conference 2023 in Austin, Texas!

Warm regards,

Junmin Wang
General Chair, IEEE IAVVC 2023
University of Texas at Austin

Amit Bhasin
General Co-Chair, IEEE IAVVC 2023
University of Texas at Austin

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Amit Bhasin, *University of Texas at Austin*

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Technical Program Committee
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Exhibitor

THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

Keynote Speaker

October 16, 2023 | 09:00 - 10:00
Room: Lil Tex

Sebastian Siegl
Audi

"On the Way to Autonomous Driving with a Focus on Validation Challenges for a Safe Release"

Abstract: The development of autonomous vehicles is making great progress. Autonomous vehicles are already part of normal road traffic in some cities. However, the procedure for a road release and a release in different operational design domains is still a challenge for which there is no established procedure. In order to achieve this, test environments are necessary that allow the most comprehensive statements possible to be achieved for release in the real world. In this talk, it is demonstrated, which automated test methods on closed testing sites are necessary from an OEM perspective for a procedure for a safe release of an automated driving function in different operational design domains.

Bio: After studying computer science Mr. Siegl did his PhD at University Erlangen-Nuremberg and AUDI AG about formal specification and verification of embedded systems. From 2011 until 2015 he was in the software development at AUDI AG for automotive functions and coordinator of testing for serial software development. Starting in 2015, Mr. Siegl took over the verification and validation strategy and management for driving assistance systems and automated driving at AUDI AG. From 2019 until now Mr. Siegl is Product Engineering Owner for verification and validation of automated driving functions LVL2++, LVL3, and LVL4. A major part is the definition and allocation of testing requirements and design of suitable test environments in Software-in-the-loop testing, Hardware-in-the-loop testing and real vehicle testing on public roads and proving grounds, as well as the operation of these activities for verification and validation.

Keynote Speaker

October 17, 2023 | 09:00 – 10:00
Room: Big Tex

Jason JonMichael
U.S. Department of Transportation

"Then, Now and What's Next: Validating Safety in Transportation Automation"

Abstract: Advanced technologies are rapidly transforming the national transportation system. These technologies are already critical components in airplanes, trains, and motor vehicles. In recent years, multiple fatal incidents have underscored the importance of validating the safety of new technologies.

As these technologies become increasingly widespread, the safety of the traveling public depends on effective oversight to ensure automated technologies are safe and work as intended. The Highly Automated Systems Safety (HASS) Center of Excellence has been established by the US Congress to serve as a dedicated workforce within the Department with the necessary skills and expertise to review, assess, and validate the safety of automated technologies.

Jason will take us on a journey of the transportation safety continuum - from the meager beginnings of validating safety in transportation, the evolution of our industry's safety culture, what the future might look like and why.

Bio: Jason JonMichael is a transportation technology expert with more than 30 years in Transportation and Government Technology. His areas of expertise include communications, artificial intelligence, connected, automated, and electric vehicle research, deployment, program development, experiential learning, and operations across all government subdivisions.

Before joining the Highly Automated Safety Systems Center of Excellence, Jason served as an Assistant Director in Austin Transportation where he developed and opened the city's first Smart Mobility Office, focusing on AI in Transportation, Transport Economic Development, Policy, Public-Private Partnerships, Placemaking, Mobility Services, Parking, and Travel Demand Management.

Prior to the City of Austin, JonMichael led public private partnerships that focused on emerging technology program development, management and deployment in transportation as the National Technology Leader for HNTB Corporation.

JonMichael regularly provides insights and advice to industry-related non-profit boards, councils, committees and other organizations. From 2006-2023, JonMichael had been an executive board member and past Chair of the OmniAir® Consortium, helping guide the creation of OmniAir's global certification services.

Keynote Speaker

Tobias Düser
Karlsruhe Institute of Technology (KIT)

"The Metaverse as Validation Platform for Automated Driving – a Game Changer?"

Abstract: Especially in the last ten years, research in the field of validation and deployment of automated driving has intensified enormously. There are many new approaches and methods to overcome the numerous challenges. Virtual testing is considered one of the core technologies with the scalability required to perform the large number of test scenarios.

Virtualization and digital twins are also gaining momentum faster in other areas such as design and production technologies, as well as in entertainment and social media. One important building block is the Metaverse - an immersive, virtual 3D space that will not only change our interpersonal interactions in the future, but also the way we develop future products, systems and services.

Tobias will take you on a journey of how the Metaverse can support the validation and even the deployment process for automated driving. He will talk about new approaches to identifying critical and relevant scenarios, creating content for virtual testing, new business models for validation service providers, and how to engage society in the validation process to drive acceptance and understanding of this new technology.

Bio: Univ.-Prof. Dr.-Ing. Tobias Düser has been head of the IPEK - Institute of Product Engineering at the Karlsruhe Institute of Technology (KIT) since October 2022.

After his studies at the Karlsruhe Institute of Technology and subsequent doctorate at IPEK - Institute of Product Engineering, Tobias Düser held various positions within the AVL Group in the field of innovative development and validation methods. In particular, he worked on novel automation and simulation solutions for test benches. Among other things, he was involved in the development of a new business area, the product portfolio and partner network in the area of Advanced Driver Assistant Systems as well as for Automated Driving. He was a member of the global ADAS/AD leadership circle and also intensively involved in global strategy development.

From 2015, he was responsible for the Advanced Solution Lab at AVL and head of the Karlsruhe branch office. In 2020, he additionally assumed global responsibility for ADAS/AD Virtual Testing Solutions. Tobias Düser and his team worked on virtual and XiL-based validation methods for the validation and testing of Advanced Driver Assistant systems as well as for Automated Driving.

Furthermore, he participates in various working groups such as IAMTS or UNECE.

Workshops

Workshop 1: Workshop on Dialogue between Industry and Academia on Automated Vehicle Validation Techniques
10:00 –17:00
Room: Stadium

As we progressively navigate through the automation era, the validation of automated vehicles (AVs) has surfaced as a critical area of interest for both academia and industry. Coupled with the exponential growth in AV technology, the demand for innovative and effective validation methods is ever-increasing. Recognizing this growing need and the relevance of connecting industry perspectives to the academic forefront, we are organizing a full-day workshop co-located with the International Automated Vehicle Validation Conference.

The journey towards full automation in the vehicle industry is not without its unique set of challenges. As we traverse from Level 0 to Level 5 of automation, the complexity and uncertainty in the operating environment become increasingly significant. These complexities bring about numerous challenges for AV validation, including the requirement of large amounts of data for robust testing, the inability to test all real-world scenarios, the demand for high simulation fidelity, and the importance of safety assurance. Ensuring proper AV validation is of significant importance for promoting applications in the automotive industry and academic development.

The primary purpose of this workshop is to provide a platform for exchange, promoting the integration and development of automated vehicle validation technology in both the academic and industrial sectors. The scope of this workshop encompasses industry perspectives on techniques, methodologies, tools, and standards related to AV validation. We are organizing this workshop with the topics including, but not limited to:

1. Current industry practices and challenges in AV validation.
2. Techniques for generating high-fidelity simulation environments.
3. Methods for scenario generation and safety analysis.
4. Regulatory considerations and standards for AV validation.
5. Machine Learning techniques and their validation in the context of AVs.
6. Case studies of successful AV validation from the industry.
7. The future of AV validation: Industry's vision and roadmap.

We hope that this workshop serves not only as an opportunity to understand the approaches, challenges, and future directions, of the industrial sector in AV validation, but also as a chance to comprehend the academic community's perception, suggestion, and solutions to related issues. We aim to promote a deep integration between industry and academia, moving forward together to tackle the technical difficulties in the field of AV. Ultimately, we hope that this symbiotic interaction promises to stimulate the progress of the automated vehicle industry towards safer and more reliable automation.

Organizers:
Yonggang Luo, *Changan Automobile*
Yining Meng, *Changan Automobile*
Sanchu Han, *Changan Automobile*

Speakers:
Stefano Albrecht, *University of Edinburgh*
Ding Zhao, *Carnegie Mellon University*
Xinhang Zhou, *Dailan University of Technology*
Yonggang Luo, *Changan Automobile*
Daniel Watzenig, *Graz University of Technology*
Yuxi Pan, *Research Center of Synkrotron*

Workshop 2: Scenario and Behavior Diversity in Simulation for Autonomous Vehicle Validation
13:55 – 17:00
Room: Balcones

Traffic simulation plays an indispensable and pivotal role in the evaluation and enhancement of autonomous driving planning systems. Once deployed on public roads, autonomous vehicles need to interact with human participants who have diverse social preferences. In order to ensure that autonomous vehicles execute maneuvers that are both safe and efficient across various interactive traffic scenarios, it is crucial to test the robustness of autonomous vehicle algorithms by exposing them to various reactive agents in the simulated environment. The primary objective of this workshop is to foster discussion on how to develop diverse and realistic simulation scenarios and reactive agent behavior for efficient autonomous vehicle validation. In particular, we will focus our discussion on synthesizing simulation scenarios with diverse social characteristics. We plan to discuss methods to quantify social characteristics of driving behavior and various algorithms to synthesize diverse reactive agents with and without data support.

Organizers:
Yuxin Chen, *University of California, Berkeley*
Chenran Li, *University of California, Berkeley*
Wei-Jer Chang, *University of California, Berkeley*
Chen Tang, *University of Texas at Austin*

Speakers:
Daniel Schmidt, *Bosch*
Rohan Chandra, *University of Texas at Austin*
Yuxin Chen, *University of California, Berkeley*
Chenran Li, *University of California, Berkeley*
Wei-Jer Chang, *University of California, Berkeley*

Workshop 3: Verification and Validation of Neural Networks in Automated Vehicles using the Neural Network Verification (NNV) Tool
10:00 – 13:00
Room: Balcones

Machine learning components, especially neural networks, are critical to enabling the vision of automated and autonomous vehicles, as well as in broader autonomous cyber-physical systems (CPS). However, ensuring the reliability of these components to ensure overall system safety is extremely challenging, as illustrated by accidents in motor vehicles and theoretical limitations such as adversarial perturbations. This tutorial will present an overview of state-of-the-art methods for formal verification of neural networks and their usage within automated vehicles and autonomous CPS. The session will begin with an overview of the theoretical foundations and a survey of state-of-the-art methods. Following these foundations, the Neural Network Verification (NNV) software tool (https://github.com/verivital/nnv) will be described and demonstrated for establishing safety, robustness, and other specifications in neural networks and their closed-loop operation in autonomous systems. Interactive demonstrations will show attendees the capabilities of these tools focusing on NNV, as well as industrial applications of these foundational methods, with use cases described in automated ground and aerial vehicles.

Organizers:
Hoang-Dung Tran, *University of Nebraska, Lincoln*
Diego Manzanas Lopez, *Vanderbilt University*
Taylor T. Johnson, *Vanderbilt University*

Speakers:
Hoang-Dung Tran, *University of Nebraska, Lincoln*
Diego Manzanas Lopez, *Vanderbilt University*
Taylor T. Johnson, *Vanderbilt University*

Live Demonstrations

October 16, 2023 | 16:00 – 19:00

<u>**Audi**</u>

The development of autonomous vehicles is making great progress. Autonomous vehicles are already part of normal road traffic in some cities. However, the procedure for a road release and a release in different operational design domains is still a challenge for which there is no established procedure. In order to achieve this, test environments are necessary that allow the most comprehensive statements possible to be achieved for release in the real world. In this talk, it is demonstrated, which automated test methods on closed testing sites are necessary from an OEM perspective for a procedure for a safe release of an automated driving function in different operational design domains.

<u>**Carnegie Mellon University**</u>

SafeBench: Safety-critical Driving Scenario Evaluation
One critical challenge for the deployment of autonomous driving in the real world is their safety evaluation. Most existing driving systems are trained and evaluated on naturalistic scenarios collected from daily life. However, the large population of cars, in general, leads to an extremely low collision rate, indicating that safety-critical scenarios are rare in the collected real-world data. SafeBench is an evaluation platform that contains thousands of safety-critical driving scenarios generated by machine learning algorithms, which evaluate autonomous vehicles under realistic and critical scenarios. In this interactive demo, we will demonstrate safety-critical scenarios and let the users control a car in SafeBench to avoid collision in safety-critical scenarios.

<u>**Clemson University**</u>

Exploring the Vulnerability of Deep Learning Models to Adversarial Attacks
In this eye-opening demonstration, we shed light on the susceptibility of Deep Learning models to Adversarial Attacks. Our groundbreaking research introduces an innovative solution – a robust deep-learning model that harnesses the power of Hybrid Classical-Quantum techniques. Throughout this demonstration, we meticulously assess the real-time performance of classical models in contrast to our cutting-edge Hybrid models, specifically in traffic sign detection.

Hardware Trojan: A Silent Threat in the Intelligent Transportation System
This demonstration highlights the hidden risks of hardware trojans within intelligent transportation systems. Our research underscores the essential requirement for robust security measures to protect public safety and critical infrastructure from potential disruptions.

On-Road X-in-the-Loop (XiL) Validations of CAVs with Mixed Reality
The demo will show a new on-road XiL platform which enables on-road testing of connected and automated vehicles (CAVs) by blending the in-situ real and virtual worlds with mixed reality. The CAVs can be tested on a real road to interact with an unlimited mixture of real and virtual objects and scenarios in a very efficient, cost-effective and safe way. It can be applied to the testing of both autonomous and human-involved CAVs.

Seamless Drone-to-Amazon Cloud Integration: Bridging the Skies with AWS
In this compelling demonstration, we unveil the seamless integration of DJI drones with Amazon AWS cloud services. Our primary objective is to showcase real-time data collection capabilities, where data collected by DJI drones is seamlessly transmitted and stored within the robust infrastructure of Amazon AWS. This demonstration highlights our mission to craft a comprehensive end-to-end solution designed to gather data from drones efficiently and intelligently save it across various Amazon services, all while adapting dynamically to the unique demands of sensor data.

Vision-Based Personal Safety Messages (PSMs) Generation for Connected Vehicles
A real-time vision-based approach to improve pedestrian safety through the accurate detection of pedestrians and the generation of PSMs. The vision-based PSMs are generated in real-time (every 100 milliseconds), and these generated PSMs are used to improve pedestrian safety by developing and sending safety alerts in real-time from a C-V2X device to connected vehicles within its communication range.

<u>**Retrospect**</u>

Autonomous Vehicle Safety Monitoring for Real-Time Risk Management
A holistic risk framework is used to independently monitor the decision-making of AVs and track their risk score in real-time. This generates both a reliable record of its safety score, and an early indicator if its safety margins are insufficiently robust. Use of the safety monitor ensures that non-linear instabilities in safety are detected and controlled to within a safe state, which satisfies the regulatory requirements for field-monitoring and event monitoring. Demonstrations of the risk framework are presented using naturalistic traffic studies in various environments.

<u>**University of Alabama & Clemson University**</u>

GPS Guardians: Cyber-resilient Navigation of Autonomous Vehicles
In this demonstration, we unveil a cutting-edge solution for the real-time detection of sophisticated Global Navigation Satellite System (GNSS) spoofing attacks for autonomous vehicles. Our innovative technology leverages advanced sensor fusion and machine learning algorithms to identify GNSS spoofing attempts as they occur. By showcasing our system's ability to protect navigation systems, we underscore the vital importance of safeguarding GNSS-based navigation systems against evolving cyber threats in an increasingly connected world. Witness firsthand how our solution ensures the reliability of GNSS data, preserving the security of location-based services in real-time.

University of Texas at Austin

A Novel Instrumental System For Immersive Simulation-based Driver-in-the-loop Vehicular Technology Research And Validation

In this demo, a novel driver-in-the-loop instrumental system for automated vehicle research and validation is delineated. Such a setup synergizes a cutting-edge six-degrees-of-freedom moving-base vehicle simulator with an immersive video-audio system, an advanced dSPACE SCALEXIO real-time hardware-in-the-loop simulation computer that runs high-fidelity and customizable digital twins of vehicle systems, sensors, roadway, and traffic, a dSPACE MicroAutoBox, as well as a biosensor suite comprising electroencephalography instrument for brain activities monitoring, electromyography apparatus for forearm muscle responses measurements, and an eye-tracking device for gaze and head movements tracking. The capabilities and versatility of the novel instrumental setup are showcased by demonstrating its utilization in some research projects.

Texas SMARTTrack

Texas SMARTTrack (Safety, Mobility, and Autonomy Research and Testing - TST) is a three-tiered testing facility. Tiers 1 and 2 will be located on the UT Austin Pickle Research Center campus. Tier 3 is an open test bed on public roadways in Austin. This world-class proving ground will bring transportation agencies, university researchers, and private industry together to improve traffic safety, operations and management through smart transportation infrastructure and automated vehicles. TST will provide a safe and controlled proving ground to test emerging technologies and serve as a regional certification center to develop standards. This demonstration allows participants to learn more about TST. The 3D simulator in today's demo lets you virtually experience driving Tier 1 of TST.

Panel

What are the challenges to scale the safety assessment of automated driving systems within regulatory frameworks in global key markets?

Automated driving systems are being developed and tested since many years but only in more recent times first L3 vehicles are commercially available and L4 vehicles are operational only in a very limited way. For highly and fully automated vehicles to scale in deployment both regulatory readiness is needed as well as technology readiness. The panel team will look at the challenges from different angles and try to give answers how they can be overcome also considering the differences in global key markets.

Panelists:
Sebastian Siegl, *Audi*
Tobias Düser, *Karlsruhe Institute of Technology (KIT)*
Daniel Watzenig, *Virtual Vehicle*

Moderator:
Joachim Taiber, *International Alliance for Mobility Testing and Standardization (IAMTS)*

Day At-a-Glance: Monday, October 16, 2023

08:15	**Registration Open** *Room: Atrium*
09:00 – 10:00	**Keynote Speaker** On the Way to Autonomous Driving with a Focus on Validation Challenges for a Safe Release *Sebastian Siegl (Audi)* *Room: Lil Tex*

10:00	**Workshop 1** Workshop on Dialogue between Industry and Academia on Automated Vehicle Validation Techniques *Room: Stadium* ***separate registration required****	**Workshop 3** Verification and Validation of Neural Networks in Automated Vehicles using the Neural Network Verification (NNV) Tool *Room: Balcones* ***separate registration required****

13:00 – 13:55	**Lunch (on your own)**

13:55 – 17:00	**Workshop 1 Continued** Workshop on Dialogue between Industry and Academia on Automated Vehicle Validation Techniques *Room: Stadium* ***separate registration required****	**Workshop 2** Scenario and Behavior Diversity in Simulation for Autonomous Vehicle Validation *Room: Balcones* ***separate registration required****

16:00 – 19:00	**Live Demonstrations** *Room: Atrium & Outdoor Parking Lot*
17:00 – 18:30	**Welcome Reception** *Room: Atrium*

Day At-a-Glance: Tuesday, October 17, 2023

Time		
08:15	**Registration Open** *Room: Atrium*	
09:00 – 10:00	**Opening Remarks & Keynote Speaker** Then, Now and What's Next: Validating Safety in Transportation Automation *Jason JonMichael (U.S. Department of Transportation)* *Room: Big Tex*	
10:00 – 10:15	**Coffee Break**	
10:15 – 12:15	**Session I** Advance Driver Assistance Systems (ADAS) *Room: Stadium*	**Session II** Autonomous Vehicle (AV) System *Room: Balcones*
12:15 – 13:30	**Lunch (on your own)**	
12:45 – 13:30	**Lunch Panel** What are the challenges to scale the safety assessment of automated driving systems within regulatory frameworks in global key markets? *Room: Big Tex*	
13:30 – 15:30	**Session III** Connected / Electric Vehicles *Room: Stadium*	**Session IV** Autonomous Driving *Room: Balcones*
15:30 – 15:45	**Coffee Break**	
15:45 – 17:45	**Session V** Vehicle Perception Systems *Room: Balcones*	**Session VI** Vehicle Security *Room: Stadium*

Day At-a-Glance: Wednesday, October 18, 2023

Time		
08:15	**Registration** *Room: Atrium*	
09:00 – 10:00	**Keynote Speaker** The Metaverse as Validation Platform for Automated Driving – a Game Changer? Tobias Düser (*Karlsruhe Institute of Technology (KIT)*) *Room: Big Tex*	
10:00 – 10:15	**Coffee Break**	
10:15 – 12:35	**Session VII** Vehicle Automation *Room: Balcones*	**Session VIII** Autonomous Vehicle Testing Platform *Room: Stadium*
12:35 – 13:30	**Lunch (on your own)**	
13:30 – 15:30	**Session XI** Autonomy Validation *Room: Balcones*	**Session X** Vehicle-Infrastructure Synergies *Room: Stadium*
15:30 – 15:45	**Coffee Break**	
15:45 – 17:45	**Session XI** Intelligent Infrastructure Systems *Room: Balcones*	**Session XII** Vehicle Safety *Room: Stadium*
17:45 – 18:00	**Closing Ceremony & Award Presentation** *Room: Big Tex*	

Technical Program: Monday, October 16, 2023

09:00 – 10:00
Keynote Speaker: Sebastian Siegl, *Audi*
Session Chair: Joachim Taiber, *International Alliance for Mobility Testing and Standardization (IAMTS)*
Room: Lil Tex

On the Way to Autonomous Driving with a Focus on Validation Challenges for a Safe Release

The development of autonomous vehicles is making great progress. Autonomous vehicles are already part of normal road traffic in some cities. However, the procedure for a road release and a release in different operational design domains is still a challenge for which there is no established procedure. In order to achieve this, test environments are necessary that allow the most comprehensive statements possible to be achieved for release in the real world. In this talk, it is demonstrated, which automated test methods on closed testing sites are necessary from an OEM perspective for a procedure for a safe release of an automated driving function in different operational design domains.

10:00 – 17:00
Workshop 1: Workshop on Dialogue between Industry and Academia on Automated Vehicle Validation Techniques
Room: Stadium

10:00
Opening Remarks

10:05
Invited Talk (remote)
Stefano Albrecht (University of Edinburgh)

11:00
Break

11:10
Invited Talk
Ding Zhao (Carnegie Melon University)

12:10
Contributed Talk (video)
Xinhang Zhou (Dailan University of Technology)

12:25
Lunch (on own)

14:00
Invited Talk (remote)
Yonggang Luo (Changan Automobile)

15:00
Break

15:10
Invited Talk
Daniel Watzenig (Graz University of Technology)

16:10
Contributed Talk (video)
Yuxi Pan (Research Center of Synkrotron)

16:30
Closing Remarks

10:00 – 13:00
Workshop 3: Verification and Validation of Neural Networks in Automated Vehicles using the Neural Network Verification (NNV) Tool
Room: Balcones

10:00
Motivation, Overview, and Introduction to Neural Network Formal Verification and Validation along with Theoretical Foundations

11:00
Neural Network Verification using the NNV Tool for Perception Problems Arising in Automated Vehicles

12:00
Automated Vehicle and Autonomous CPS Verification using the NNV Tool, Covering Feedback Control Systems Incorporating Neural Networks

13:00 - 13:55
Lunch (on your own)

13:55 – 17:00
Workshop 2: Scenario and Behavior Diversity in Simulation for Autonomous Vehicle Validation
Room: Balcones

13:55
Welcome from the Organizers
Yuxin Chen (University of California, Berkeley)
Chenran Li (University of California, Berkeley)
Wei-Jer Chang (University of California, Berkeley)
Chen Tang (University of Texas at Austin)

14:00
Invited Talk (remote)
Daniel Schmidt (Bosch)

14:30
Invited Talk
Rohan Chandra (University of Texas at Austin)

15:00
Invited Talk (remote)
Yuxin Chen (University of California, Berkeley)

15:30
Break

16:00
Invited Talk (remote)
Chenran Li (University of California, Berkeley)

16:30
Invited Talk (remote)
Wei-Jer Chang (University of California, Berkeley)

17:00
Closing Remarks

16:00 – 19:00
Live Demonstrations
Room: Atrium & Outdoor Parking Lot

Carnegie Mellon University

Clemson University

Retrospect Technology, LLC

University of Alabama

University of Texas at Austin

17:00 – 18:30
Welcome Reception
Room: Atrium

09:00 – 10:00
Opening Remarks & Keynote Speaker: Jason JonMichael, *U.S. Department of Transportation*
Session Chairs: Junmin Wang, *University of Texas at Austin* & Amit Bhasin, *University of Texas at Austin*
Room: Big Tex

Then, Now and What's Next: Validating Safety in Transportation Automation

Advanced technologies are rapidly transforming the national transportation system. These technologies are already critical components in airplanes, trains, and motor vehicles. In recent years, multiple fatal incidents have underscored the importance of validating the safety of new technologies. As these technologies become increasingly widespread, the safety of the traveling public depends on effective oversight to ensure automated technologies are safe and work as intended. The Highly Automated Systems Safety (HASS) Center of Excellence has been established by the US Congress to serve as a dedicated workforce within the Department with the necessary skills and expertise to review, assess, and validate the safety of automated technologies. Jason will take us on a journey of the transportation safety continuum - from the meager beginnings of validating safety in transportation, the evolution of our industry's safety culture, what the future might look like and why.

10:00 – 10:15
Coffee Break

10:15 – 12:15
Session I: Advance Driver Assistance Systems (ADAS)
Session Chair: Yunyi Jia, *Clemson University*
Room: Stadium

10:15
Model Predictive Control-Based Trajectory Shaper for Safe and Efficient Adaptive Cruise Control
Anye Zhou (Oak Ridge National Laboratory, United States)
Zejiang Wang (Oak Ridge National Laboratory, United States)
Adian Cook (Oak Ridge National Laboratory, United States)

10:35
Improved Vehicle Safety via Nonlinear Estimation of Tire-Road Force Saturation
Manavendra Desai (Wayne State University, United States)
Azad Ghaffari (Wayne State University, United States)

10:55
Performance of Graph Database Management Systems as Route Planning Solutions for Different Data and Usage Characteristics
Karin Festl (Virtual Vehicle Research GmbH, Austria)
Patrick Promitzer (Virtual Vehicle Research GmbH, Austria)
Daniel Watzenig (Virtual Vehicle Research GmbH, Austria)
Huilin Yin (Tongji University, China)

11:15
Ground Vehicle Generalized Forces and Moment Governor Design via Noncertainty-Equivalent Adaptive Prescribed Performance Control
Xingyu Zhou (University of Texas at Austin, United States)
Heran Shen (University of Texas at Austin, United States)
Zejiang Wang (Oak Ridge National Laboratory, United States)
Hyunjin Ahn (University of Texas at Austin, United States)
Yung-Chi Kung (University of Texas at Austin, United States)
Junmin Wang (University of Texas at Austin, United States)

11:35
Neural Network Framework for Collision Avoidance in Connected Vehicle Environments
Rawa Adla (Florida Polytechnic University, United States)
Jean Bezerra (Florida Polytechnic University, United States)

11:55
A Novel Robust Full-Speed Adaptive Cruise Control for Intelligent Vehicles
Yanjun Ren (Southeast University, China)
Tong Shen (Southeast University, China)
Fanxun Wang (Southeast University, China)
Mingzhuo Zhao (Southeast University, China)
Xin Bai (Southeast University, China)
Guodong Yin (Southeast University, China)

10:15 – 12:15
Session II: Autonomous Vehicle (AV) System
Session Chair: Kavya Divakarla, *NVIDIA*
Room: Balcones

10:15
Reducing Conservativeness of Polytopic Linear-Parameter-Varying Robust Vehicle Sideslip Angle Observer Through Minimum-Area Convex Quadrilateral Design
Xingyu Zhou (University of Texas at Austin, United States)
Hyunjin Ahn (University of Texas at Austin, United States)
Heran Shen (University of Texas at Austin, United States)
Yung-Chi Kung (University of Texas at Austin, United States)
Zejiang Wang (Oak Ridge National Laboratory, United States)
Junmin Wang (University of Texas at Austin, United States)

10:35
From Simulation to the Race Track: Development, Testing, and Deployment of Autonomous Racing Software
Markus Schratter (Virtual Vehicle Research GmbH, Austria)
Martin Kirchengast (Virtual Vehicle Research GmbH, Austria)
Max Ronecker (Technische Universität Graz, Austria)
Sebastian Riepl (Virtual Vehicle Research GmbH, Austria)
Tobias Renzler (Virtual Vehicle Research GmbH, Austria)
Daniel Watzenig (Virtual Vehicle Research GmbH, Austria)

10:55
Communication Method for Automated Vehicles to Reduce Pedestrian Inefficiency and Anxiety During Crossing Cases Using a Closed-Road Environment
Masahiro Taima (Keio University, Japan)
Tatsuru Daimon (Keio University, Japan)

11:15
Adaptive Path-Following Control for Ground Vehicles Using a Switching Non-Quadratic Lyapunov Function
Xingyu Zhou (University of Texas at Austin, United States)
Zejiang Wang (Oak Ridge National Laboratory, United States)
Junmin Wang (University of Texas at Austin, United States)

11:35
Safety-Critical Lane Change Control of Autonomous Vehicles on Curved Roads Based on Control Barrier Functions
Zehua Shi (Southeast University, China)
Haoji Liu (Southeast University, China)
Ziyi Liu (Southeast University, China)
Tingting Li (Southeast University, China)
Zhe Shi (Southeast University, China)
Weichao Zhuang (Southeast University, China)

11:55
Real-Life Implementation and Comparison of Authenticated Path Following for Automated Vehicles Based on Galileo OSNMA Localization
Selim Solmaz (Virtual Vehicle Research GmbH, Austria)
Georg Nestlinger (Virtual Vehicle Research GmbH, Austria)
Karl Diengsleder-Lambauer (Virtual Vehicle Research GmbH, Austria)
Roman Lesjak (Joanneum Research Forschungsgesellschaft mbH, Austria)
Susanne Schweitzer (Joanneum Research Forschungsgesellschaft mbH, Austria)
Jose Vallet García (Finnish Geospatial Research Institute, Finland)

12:15 - 13:30
Lunch (on your own)

12:45 - 13:30
Lunch Panel
Moderator: Joachim Taiber, *International Alliance for Mobility Testing and Standardization (IAMTS)*
Room: Big Tex

What are the challenges to scale the safety assessment of automated driving systems within regulatory frameworks in global key markets?

Sebastian Siegl, *Audi*
Tobias Düser, *Karlsruhe Institute of Technology (KIT)*
Daniel Watzenig, *Virtual Vehicle*

13:30 - 15:30
Session III: Connected / Electric Vehicles
Session Chair: Yaozhong Zhang, *Argonne National Laboratory*
Room: Stadium

13:30

Decentralized V2X Priority Maneuver Coordination: Evaluation in Small Scale Scenarios
Daniel Maksimovski (Technische Hochschule Ingolstadt / CARISSMA, Germany)
Christian Facchi (Technische Hochschule Ingolstadt / CARISSMA, Germany)

13:50

Multi-User Real-Time Controllable Connected Cars Testing Platform
Burak Senkus (Marmara University, Turkey)
Mujdat Soyturk (Marmara University, Turkey)

14:10

Use of Connected Vehicle Data to Identify Signal Timing Plans on Signalized Arterial Corridors
Shoaib Mahmud (Iowa State University, United States)
Christopher Day (Iowa State University, United States)
Anuj Sharma (Iowa State University, United States)
Tingting Huang (Etalyc Inc., United States)

14:30

Remaining Driving Range Estimation of Medium-Duty Electric Trucks During Delivery
Hyunjin Ahn (University of Texas at Austin, United States)
Xingyu Zhou (University of Texas at Austin, United States)
Heran Shen (University of Texas at Austin, United States)
Yung-Chi Kung (University of Texas at Austin, United States)
Junmin Wang (University of Texas at Austin, United States)

14:50

Hierarchical Control for Distributed Drive Electric Vehicles Considering Handling Stability and Energy Efficiency
Xinxiu Li (Southeast University, China)
Guodong Yin (Southeast University, China)
Yanjun Ren (Southeast University, China)
Fanxun Wang (Southeast University, China)
Ruiqi Fang (Southeast University, China)
Ang Li (Southeast University, China)

15:10

Personalized Electric Vehicle Range Prediction Based on Self-Supervised Driving Pattern Clustering
Magdy Eissa (Tennessee Technological University, United States)
Pingen Chen (Tennessee Technological University, United States)

13:30 – 15:30
Session IV: Autonomous Driving
Session Chair: Kavya Divakarla, *NVIDIA*
Room: Balcones

13:30

Learn to Race: Sequential Actor-Critic Reinforcement Learning for Autonomous Racing
Ran Liu (Southeast University, China)
Weichao Zhuang (Southeast University, China)
Feifan Tong (Southeast University, China)
Guodong Yin (Southeast University, China)

13:50

Lane Change Trajectory Prediction Based on Chinese Highway Ramp Scenarios
Chunlong Qiu (Southeast University, China)
Shanxing Zhou (Southeast University, China)
Haoji Liu (Southeast University, China)
Weichao Zhuang (Southeast University, China)
Chen Jiang (Southeast University, China)
Feifan Tong (Southeast University, China)

14:10

Path Tracking of Tracked Vehicle with Variable Preview Distance and Differential Compensation
Xin Bai (Southeast University, China)
Guodong Yin (Southeast University, China)
Fanxun Wang (Southeast University, China)
Yanjun Ren (Southeast University, China)
Tong Shen (Southeast University, China)
Zhangcheng He (Southeast University, China)

14:30
Research on Fuzzy Logic Adaptive Sliding Mode Control for Autonomous Vehicles Considering Road Roll Angle
Ang Li (Southeast University, China)
Guodong Yin (Southeast University, China)
Fanxun Wang (Southeast University, China)
Tong Shen (Southeast University, China)
Ruiqi Fang (Southeast University, China)
Xinxiu Li (Southeast University, China)

14:50
Sideslip Angle Estimation of Uncertain Vehicle System Based on Robust Extended Kalman Filter
Zhangcheng He (Southeast University, China)
Guodong Yin (Southeast University, China)
Yanjun Ren (Southeast University, China)
Tong Shen (Southeast University, China)
Jinxiang Wang (Southeast University, China)
Ruiqi Fang (Southeast University, China)

15:10
A Bootstrapped DQN-Based Decision-Making Method for Autonomous Driving Vehicles
Yinglei Wang (Southeast University, China)
Jinhao Liang (Southeast University, China)
Yanbo Lu (Southeast University, China)
Guodong Yin (Southeast University, China)

15:30 – 15:45
Coffee Break

15:45 – 17:45
Session V: Vehicle Perception Systems
Session Chairs: Sebastian Siegl, *Audi* & David Fridovich-Keil, *University of Texas at Austin*
Room: Balcones

15:45
Convolutional Neural Networks for Interpreting Unclustered Radar Data in Automotive Applications
Yung-Chi Kung (University of Texas at Austin, United States)
Xingyu Zhou (University of Texas at Austin, United States)
Heran Shen (University of Texas at Austin, United States)
Hyunjin Ahn (University of Texas at Austin, United States)
Junmin Wang (University of Texas at Austin, United States)

16:05
Phenomenological Range-Reflectivity Limits for Lidar Models and Feature Validation Approach
Relindis Rott (Virtual Vehicle Research GmbH, Austria)

16:25
Introducing L-Shaping for a Streamlined LiDAR-Based Perception in Urban Platooning
Daniel Baumann (Karlsruhe Institute of Technology, Germany)
David Kraus (Karlsruhe Institute of Technology, Germany)
Nicole Kechler (Karlsruhe Institute of Technology, Germany)
Leo Fiedler (Karlsruhe Institute of Technology, Germany)
Eric Sax (Karlsruhe Institute of Technology, Germany)
Niranjana Venkatesh (EBUSCO N.V, Netherlands)

16:45
Terrain Depth Estimation for Improved Inertial Data Prediction in Autonomous Navigation Systems
Norbert Markó (Institute for Computer Science and Control, Hungary)
Tamás Szirányi (Institute for Computer Science and Control, Hungary)
Áron Ballagi (Széchenyi István University, Hungary)

17:05
RotICP: A Spherical-Based Distance Algorithm for Rotation Search and Point Cloud Registration
Kenan Ahmic (Technische Universität Graz, Austria)
Adnan Tahirovic (University of Sarajevo, Bosnia)
Daniel Watzenig (Technische Universität Graz, Austria)
Michael Stolz (Technische Universität Graz, Austria)

17:25

Improving the Environmental Perception of Autonomous Vehicles Using Deep Learning Based Audio Classification

Sagar Dasgupta (University of Alabama, United States)
Kazi Shakib (University of Alabama, United States)
Finley Walden (University of Alabama, United States)
Mizanur Rahman (University of Alabama, United States)

15:45 – 17:45
Session VI: Vehicle Security
Session Chair: Mizanur Rahman, *University of Alabama*
Room: Stadium

15:45

Ensuring Trustworthy Automated Road Vehicles: A Software Integrity Validation Approach

Dominik Püllen (University of Passau, Germany)
Felix Klement (University of Passau, Germany)
Alexey Vinel (Karlsruhe Institute of Technology, Germany)
Stefan Katzenbeisser (University of Passau, Germany)

16:05

Wheel-Leg Collaborative Control for Wheel-Legged Robots Based on MPC with Preview

Zheng Pan (Shanghai Jiao Tong University, China)
Boyuan Li (Shanghai Jiao Tong University, China)
Hui Jing (Guilin University of Electronic Technology, China)
Zhihua Niu (Shanghai Jiao Tong University, China)
Rongrong Wang (Shanghai Jiao Tong University, China)

16:25

Residual Risk Management Strategies at System Level Presented for ACC/LKA Behavioural Competencies

Selim Solmaz (Virtual Vehicle Research GmbH, Austria)
Georg Stettinger (Infineon Technologies AG, Germany)
Franz Wotawa (Graz University of Technology, Austria)

16:45

Data-Driven Defenses Against Adversarial Attacks for Autonomous Vehicles

Omar A. Azim (South Carolina Governor's School, United States)
Lex Baker (South Carolina Governor's School, United States)
Reek Majumder (Clemson University, United States)
Abyad Enan (Clemson University, United States)
Sakib M. Khan (Clemson University, United States)
Mashrur A. Chowdhury (Clemson University, United States)

17:05

Threats of Trojan Incursion in Transportation Hardware

Jean Michel Tine (Clemson University, United States)
Sefatun-Noor Puspa (Clemson University, United States)
Reek Majumder (Clemson University, United States)
Comert Gurcan (Benedict College, United States)
Mashrur A. Chowdhury (Clemson University, United States)
Yingjie Lao (Clemson University, United States)

17:25

Risk Monitoring and Mitigation for Automated Vehicles: A Model Predictive Control Perspective

Kailin Tong (Virtual Vehicle Research GmbH, Austria)
Fengwei Guo (Graz University of Technology, Austria)
Selim Solmaz (Virtual Vehicle Research GmbH, Austria)
Martin Steinberger (Technische Universität Graz, Austria)
Martin Horn (Technische Universität Graz, Austria)

09:00 – 10:00
Keynote Speaker: Tobias Düser, *Karlsruhe Institute of Technology (KIT)*
Session Chair: Joachim Taiber, *International Alliance for Mobility Testing and Standardization (IAMTS)*
Room: Big Tex

The Metaverse as Validation Platform for Automated Driving – A Game Changer?

Especially in the last ten years, research in the field of validation and deployment of automated driving has intensified enormously. There are many new approaches and methods to overcome the numerous challenges. Virtual testing is considered one of the core technologies with the scalability required to perform the large number of test scenarios. Virtualization and digital twins are also gaining momentum faster in other areas such as design and production technologies, as well as in entertainment and social media. One important building block is the Metaverse - an immersive, virtual 3D space that will not only change our interpersonal interactions in the future, but also the way we develop future products, systems and services. Tobias will take you on a journey of how the Metaverse can support the validation and even the deployment process for automated driving. He will talk about new approaches to identifying critical and relevant scenarios, creating content for virtual testing, new business models for validation service providers, and how to engage society in the validation process to drive acceptance and understanding of this new technology.

10:00 – 10:15
Coffee Break

10:15 – 12:35
Session VII: Vehicle Automation
Session Chair: Kavya Divakarla, *NVIDIA*
Room: Balcones

10:15

eHMI Communication Device for Automated Vehicles Using Object Detection Algorithm
Masahiro Taima (Keio University, Japan)

10:35

Influences of eHMI in Automated Vehicles on the Recognition and Confirmation Behavior of Following Drivers
Masahiro Taima (Keio University, Japan)
Tatsuru Daimon (Keio University, Japan)

10:55

How Uncertainty Affects Test Results for Driving Automation
Felix Reisgys (Daimler Truck AG, Germany)
Christian Steinhauser (FZI Forschungszentrum Informatik, Germany)
Andreas Schwarzhaupt (Daimler Truck AG, Germany)
Eric Sax (Karlsruhe Institute of Technology, Germany)

11:15

Impact of Solar Radiation and Ambient Temperature on the Early Lifetime Estimation of an Automotive LiDAR
Stephanie Grubmüller (Virtual Vehicle Research GmbH, Austria)
Pamela Innerwinkler (Virtual Vehicle Research GmbH, Austria)
Marlies Mischinger-Rodziewicz (Virtual Vehicle Research GmbH, Austria)
Selim Solmaz (Virtual Vehicle Research GmbH, Austria)
Horst Lewitschnig (Infineon Technologies Austria AG, Austria)
Konstantin Posch (Infineon Technologies Austria AG, Austria)

11:35

An Optimized Hybrid Transformer-Based Technique for Real-Time Pedestrian Intention Estimation in Autonomous Vehicles
Mohamed Galloul (American University in Cairo, Egypt)
Mariam Aboelwafa (NewGiza University, Egypt)
Yasser Gadallah (American University in Cairo, Egypt)

11:55

Process Assurance for Object Detection Through Deep Neural Networks to Accomplish the Autonomous Aerial Refueling Task
Danielle Clement (Lockheed Martin Corporation, United States)
Sarah Mottino (Lockheed Martin Corporation, United States)
Donald Costello (United States Naval Academy, United States)

10:15

A Reliable 79GHz Band Ultra-Short Range Radar for ADAS/AD Vehicles Using FMCW Technology
Zie Eya Ekolle (Yokohama National University, Japan)
Ryuji Kohno (Yokohama National University, Japan)
Hideki Ochiai (Yokohama National University, Japan)
Sawada Sadamasa (Infineon Technologies Japan K.K., Japan)
Ishikawa Ikenji (Infineon Technologies Japan K.K., Japan)
Ikeda Hiroshi (Infineon Technologies Japan K.K., Japan)
Ohashi Naomi (Infineon Technologies Japan K.K., Japan)

10:35

A Novel Tool Set for Simulating and Optimizing Autonomous On-Demand People Mover Systems
Peter Krebs (FH Campus Wien, Austria)
Elaheh Gol Hashem (FH Campus Wien, Austria)
Bernd Wacke (FH Campus Wien, Austria)

10:55

Structured Testing Framework for ADAS Algorithm Development
Sachin Fernando (University of Waterloo, Canada)
Ansar Khan (University of Waterloo, Canada)
Roydon Fraser (University of Waterloo, Canada)
William Melek (University of Waterloo, Canada)

11:15

Transnational Testing, Operation and Certification of Automated Driving Systems: Perspective from testEPS and Central System EUREKA Projects – Mid-Term Results
Jakob Reckenzaun (Virtual Vehicle Research GmbH, Austria)
Relindis Rott (Virtual Vehicle Research GmbH, Austria)
Martin Kirchengast (Virtual Vehicle Research GmbH, Austria)
David J. Ritter (Virtual Vehicle Research GmbH, Austria)
Pamela Innerwinkler (Virtual Vehicle Research GmbH, Austria)
Selim Solmaz (Virtual Vehicle Research GmbH, Austria)
Christoph Pilz (Virtual Vehicle Research GmbH, Austria)
Markus Schratter (Virtual Vehicle Research GmbH, Austria)
Arno Eichberger (Technische Universität Graz, Austia)
Tomislav Mihalj (Technische Universität Graz, Austia)
Leander B. Hörmann (Linz Center of Mechatronics, Austria)
Albert Pötsch (Linz Center of Mechatronics, Austria)
Patrick Lul (Joanneum Research Forschungsgesellschaft mbH, Austria)
Stefan Ladstätter (Joanneum Research Forschungsgesellschaft mbH, Austria)
Thomas Strasser-Krauss (TOM Robotics GmbH, Austria)
Gabor Borocz (AVL List GmbH, Hungary)
Edina Gyimesi (AVL List GmbH, Hungary)
Lisa Wurzinger (AVL List GmbH, Austria)
Thomas Schlömicher (AVL List GmbH, Austria)
Gabor Soos (Magyar Teleco, Hungary)
Dániel Ficzere (Magyar Teleco, Hungary)
Viktor Tihanyi (Budapest University of Technology and Economics, Hungary)
Zsolt Szalay (Budapest University of Technology and Economics, Hungary)
Attila Földi (Bimfra kft., Hungary)

11:35

A Proposed Safety Case Framework for Automated Vehicle Safety Evaluation
Jeffrey Wishart (Science Foundation Arizona/Arizona Commerce Authority, United States)
Junfeng Zhao (Arizona State University, United States)
Braeden Woodard (Arizona State University, United States)
Gavin O'Malley (Arizona State University, United States)
Hengcong Guo (Arizona State University, United States)
Shujauddin Rahimi (Arizona State University, United States)
Sunder Swaminathan (Arizona State University, United States)

11:55

Validation Process of the Computer Simulation of a Test-Purpose Self-Driving Vehicle
Rudolf Krecht (Széchenyi István University, Hungary)
Miklós Unger (Széchenyi István University, Hungary)
Áron Ballagi (Széchenyi István University, Hungary)

12:15

Statistical Consideration of the Representativeness of Open Road Tests for the Validation of Automated Driving Systems

Jacob Langner (FZI Forschungszentrum Informatik, Germany)
Romy Pohl (FZI Forschungszentrum Informatik, Germany)
Joshua Ransiek (FZI Forschungszentrum Informatik, Germany)
Philip Elspas (Dr. Ing. h.c. F. Porsche AG, Germany)
Eric Sax (FZI Forschungszentrum Informatik, Germany)

12:35 - 13:30
Lunch (on your own)

13:30 - 15:30
Session IX: Autonomy Validation
Session Chair: Mizanur Rahman, *University of Alabama*
Room: Balcones

13:30

A Novel Instrumental System for Immersive Simulation-Based Driver-in-the-Loop Vehicular Technology Research and Validation

Xingyu Zhou (University of Texas at Austin, United States)
Zejiang Wang (Oak Ridge National Laboratory, United States)
Adrian Cosio (Sandia National Laboratories, United States)
Heran Shen (University of Texas at Austin, United States)
Hyunjin Ahn (University of Texas at Austin, United States)
Yung-Chi Kung (University of Texas at Austin, United States)
Mikhaela Sample (University of Texas at Austin, United States)
Michael Moore (University of Texas at Austin, United States)
Andrea Gold (University of Texas at Austin, United States)
Heidi Ross (University of Texas at Austin, United States)
Kristie Chin (University of Texas at Austin, United States)
Junmin Wang (University of Texas at Austin, United States)

13:50

A Novel Concept for Identifying Critical Test Scenarios for the Validation of Automated Driving Functions

Clemens Kurz (Karlsruhe Institute of Technology, Germany)
Eva-Maria Knoch (Karlsruhe Institute of Technology, Germany)
Frank Gauterin (Karlsruhe Institute of Technology, Germany)

14:10

A Study on the Paradigm Shift in the Validation of Automated Vehicles

Tobias Düser (Karlsruhe Institute of Technology, Germany)
David Fischer (Karlsruhe Institute of Technology, Germany)
Jonas Freyer (Karlsruhe Institute of Technology, Germany)

14:30

An X-in-the-Loop (XIL) Testing Framework for Validation of Connected and Autonomous Vehicles

Prakhar Gupta (Clemson University, United States)
Rongyao Wang (Clemson University, United States)
Tyler Ard (Clemson University, United States)
Jihun Han (Argonne National Laboratory, United States)
Dominik Karbowski (Argonne National Laboratory, United States)
Ardalan Vahidi (Clemson University, United States)
Yunyi Jia (Clemson University, United States)

14:50

Online Testing of Autonomous Vehicles

Kim Fowler (Campbell University, United States)
Ryler Debuhr (Metglas Inc., United States)

15:10

On the Validation of Adversarial Threats to Cooperative Unmanned Aerial Systems for Search and Rescue Missions

Linda Capito Ruiz (Ohio State University, United States)
Keith Redmill (Ohio State University, United States)

13:30

Quantifying the Impact of Automated Vehicles on Traffic
Martin Sigl (BMW AG, Germany)
Binnert Prins (BMW AG, Netherlands)
Christoph Schütz (BMW AG, Germany)
Sebastian Wagner (BMW AG, Germany)
Frederik Schulte (Delft University of Technology, Netherlands)
Daniel Watzenig (Technische Universität Graz, Austria)

13:50

Operational Design Domain Qualification Framework for Remotely Driven Vehicles in Urban Environment
Ole Hans (Vay Technology GmbH, Germany)
Mariana Avezum (Vay Technology GmbH, Brazil)
Stanislav Borysov (Vay Technology GmbH, Ukraine)
Hans-Leo Ross (Vay Technology GmbH, Germany)
Jürgen Adamy (Technical University of Darmstadt, Germany)

14:10

CiThruS2: Open-Source Virtual Environment for Simulating Real-Time Drone Operations and Piloting
Emilian Gałązka (Tampere University, Finland)
Arttu Leppäaho, Jarno Vanne (Tampere University, Finland)

14:30

Context-Aware Policy for Route Planning and Feasible Vehicle Technologies
David Kraus (Karlsruhe Institute of Technology, Germany)
Carolin Junk (Karlsruhe Institute of Technology, Germany)
Marco Stang (Karlsruhe Institute of Technology, Germany)
Eric Sax (Karlsruhe Institute of Technology, Germany)

14:50

Short-Range Radar for Use in Vehicle Lateral Guidance and Control
Richard Bishel (Vechatronics, United States)

15:10

Cooperative Automated Emergency Braking for CAVs Under Time-Varying Communication Delays
Shahriar Hasan (Mälardalen University, Sweden)
Svetlana Girs (Mälardalen University, Sweden)
Elisabeth Uhlemann (Mälardalen University, Sweden)

15:45

Dynamic Collaborative Path Planning for Remote Assistance of Highly-Automated Vehicles
Domagoj Majstorović (Technical University of Munich, Germany)
Frank Diermeyer (Technical University of Munich, Germany)

16:05

System Design and Validation of a Decentralized Automated Vehicle Compute System for Energy Efficiency
Aadi Kothari (Virginia Polytechnic Institute and State University, United States)
Ryan Gerdes (Virginia Polytechnic Institute and State University, United States)
Thomas Billington (Virginia Polytechnic Institute and State University, United States)
Rohan Jaggannagari (Virginia Polytechnic Institute and State University, United States)

16:25

Lithium-Ion Battery State of Charge Estimation by L_1 Robust Observer
Heran Shen (University of Texas at Austin, United States)
Xingyu Zhou (University of Texas at Austin, United States)
Hyunjin Ahn (University of Texas at Austin, United States)
Yung-Chi Kung (University of Texas at Austin, United States)
Junmin Wang (University of Texas at Austin, United States)

16:45
Energy-Centric Cooperative Onramp Merging Strategy: An Analytical Solution
Zejiang Wang (Oak Ridge National Laboratory, United States)
Anye Zhou (Oak Ridge National Laboratory, United States)
Adian Cook (Oak Ridge National Laboratory, United States)
Yunli Shao (Oak Ridge National Laboratory, United States)
Guanhao Xu (Oak Ridge National Laboratory, United States)
Max Chen (Oak Ridge National Laboratory, United States)

17:05
Real-Time Traffic Flow Parameters Prediction Through Internet of Vehicles
Mizanur Rahman (University of Alabama, United States)
Mashrur A. Chowdhury (Clemson University, United States)
Jerome McClendon (Clemson University, United States)

17:25
Digital Twin of Physical Intersection to Trajectory-Based Traffic Signal Controller
Andalib Shams (Iowa State University, United States)
Christopher Day (Iowa State University, United States)
Shoaib Mahmud (Iowa State University, United States)

15:45 – 17:45
Session XII: Vehicle Safety
Session Chair: Kavya Divakarla, *NVIDIA*
Room: Stadium

15:45
Development of a Novel Steering System for 4WD 4WS Electric Vehicles Enabling Holonomic Motion
Junghyun Choi (Electronics and Telecommunications Research Institute, Korea)
Youngsik Jin (Electronics and Telecommunications Research Institute, Korea)

16:05
Model Validation of Adaptive Cruise Control in Vehicles Utilizing Real-World Driving Data
Yaozhong Zhang (Argonne National Laboratory, United States)
Jihun Han (Argonne National Laboratory, United States)
Namdoo Kim (Argonne National Laboratory, United States)
Dominik Karbowski (Argonne National Laboratory, United States)

16:25
Object Control and Dynamic Execution Software for Automated Vehicle Testing in Complex Scenarios
Victor Jarlow (AstaZero, Sweden)
Samuel Thorén (AstaZero, Sweden)
Timo Kero (AstaZero, Sweden)

16:45
Safe Planning with Game-Theoretic Formulation, Reachability Analysis and Reinforcement Learning
Xu Shang (Virginia Polytechnic Institute and State University, United States)
Shahabedin Sagheb (Virginia Polytechnic Institute and State University, United States)
Azim Eskandarian (Virginia Polytechnic Institute and State University, United States)

17:05
Unveiling the Road Ahead: An MPC-Based Approach for Autonomous Intersection Navigation with Occlusion
Zheyu Zhang (Loughborough University, United Kingdom)
Jingjing Jiang (Loughborough University, United Kingdom)
Wenhua Chen (Loughborough University, United Kingdom)

17:25
Impact of Thermal Aging on Winding Insulation Loss-of-Life Fraction Using H∞ Algorithm for Integrated Permanent Magnet In-Wheel Motor
Maliheh Hashemi (Technische Universität Graz, Austria)
Michael Stolz (Technische Universität Graz, Austria)
Daniel Watzenig (Technische Universität Graz, Austria)

17:45 – 18:00
Farewell & Best Paper Award Presentation
Session Chairs: Junmin Wang, *University of Texas at Austin* & Amit Bhasin, *University of Texas at Austin* and Pingen Chen, *Tennessee Technological University* &
Mizanur Rahman, *University of Alabama*
Room: Big Tex

The University of Texas at Austin Commons Conference Center Building Map

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