

# AutoCAS (Autonomous Mobility CAS)

## Autonomous Mobility Circuits and Systems Workshop (AutoCAS 2024)

- **Onsite:** Room Leo 1.
- **Date & Time:** 9:00 – 12:30, 22 May 2024 (Wednesday)

This year's AutoCAS Workshop continues to see growing interest in Autonomous Mobility Circuits and Systems (AutoCAS) as the technological front advances rapidly and the evolution of autonomous vehicles based on electronic systems continues. Beyond engine control, they play an essential role in safety, driver assistance, and communications. Highly reliable circuits and systems covering areas such as artificial intelligence (AI), sensing, signal processing, and V2X communications are essential to ensure smooth operation of autonomous vehicles.

In this changing environment, new electronic systems aim to configure the vehicle's behavior through software in a more intuitive way. The field of circuit and system design tailored for autonomous mobility represents an important investment focus for semiconductor companies and is forecast to have significant revenue and growth trajectories. Our CAS community needs expanded opportunities for interaction and collaboration with experts exploring new trends in autonomous mobility CAS. This is essential to foster technological progress and dominance.

Accordingly, AutoCAS 2024 is ready to showcase pioneering contributions that address CAS-centric challenges arising from autonomous mobility components such as memory, sensors, ECUs, and deep neural network (DNN) processors. This workshop is intended to be a connecting point for researchers to gain insight into cutting-edge methodologies and determine their pros and cons. This valuable exposure prepares them to innovate and refine circuits and systems while imagining the needs of complex vehicles. The structure of the workshop will include a single plenary track featuring insights from six leading figures from industry and academia.

Building on this content, this year's AutoCAS Abstract has been updated to reflect last year's achievements and this year's technical challenges and expectations. As technology continues to advance, we expect the AutoCAS community to be at the forefront of innovation and drive the advancement of circuits and systems for a new era of automobiles.

## AutoCAS 2024 Program Schedule

Time (GMT+9)	Title	Presenter
9:00 – 09:05	Opening	Kyung Ki Kim, General Chair
09:05 – 09:45	<b>Unsolvable Analog Design Challenges Need Breakthrough AI Technologies</b>	Xi Jiang (Synopsys)
09:45 – 10:25	<b>AI Benchmarking for Complex and Real-time Automotive Systems</b>	Mostafa El-Khamy (Samsung)
10:25 – 11:05	<b>Simulation Platform of Adversarial Attacks for AI in Autonomous Driving</b>	Yi (Estelle) Wang (Product Cybersecurity & Privacy Office)
11:05 – 11:20	Coffee Break	
11:20 – 11:30	<b>The Era of Automotive Electrification</b>	Preet Yadav, NXP, India (Moderator of the Panel Discussion, IEEE CASS Delhi Chapter Chair)
11:30 – 13:00	Panel Discussion on <b>“The Era of Automotive Electrification”</b>	Hany Elhak (Synopsys), Xi Jiang (Synopsys), Yi (Estelle) Wang (Product Cybersecurity & Privacy Office)
13:00	Farewell	

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## #1. Unsolvable Analog Design Challenges Need Breakthrough AI Technologies



Xi Jiang, Principal Engineer, application consultant, Synopsys, Singapore.

**Abstract :** With the growing demand for automotive chips, analog IC designers are struggling to solve great challenges including how to migrate analog IP across technology nodes and how to unlock new power and performance metrics we didn't think were even possible. At Synopsys, we are already demonstrating how AI technologies are helping to solve what used to be unsolvable tasks in digital design. Can we apply the same for analog? What are the specific challenges the analog community is facing? And, how can breakthrough EDA technologies bridge the productivity gap, specifically in advanced technology nodes, and the engineering resources gap.

**Speaker's short-bio :** Xi Jian is a principal engineer at Synopsys focusing on analog application consulting in Singapore. Xi Jiang has over 20 years of analog design and EDA experience spanning multiple EDA companies. He helps analog design engineers in Singapore and Malasia solve the most challenging design automation and circuit simulation problems. Xi Jiang received his bachelor's degree in electrical engineering from Shanghai Shiao Tong University and his master's degree in electrical engineering from National University of Singapore.



## #2. AI Benchmarking for Complex and Real-time Automotive Systems

Mostafa El-Khamy, Senior Principal Engineer, Samsung DSRA (Device Solutions Research America), USA.

**Abstract :** Artificial Intelligence (AI) and Deep Neural Network (DNN) algorithms are becoming increasingly ubiquitous in automotive for enhanced safety through robust perception and real-time decision making, improved efficiency by optimization of routes and charging or fuel stops, and proactive maintenance through sensor monitoring and failure prediction. AI is also being deployed inside the cabin for ensuring driver awareness through driver monitoring for behavior, drowsiness, or lack of attention, and providing timely alerts.

Adoption of AI assistants and conversational AI is also picking up for personalized automotive infotainment systems to allow a better driver and passenger experience.

While there is a fast pace of development of both AI Algorithms and AI Processors for the automotive industry, there is a lack of industry standard benchmarks that define representative AI benchmarks for the automotive industry. We, MLCommons and AVCC, present a community-driven and open approach to AI benchmarking with the purpose of defining and developing the automotive industry standard AI benchmark. The goal is to create a public channel for the CAS (Circuit and Systems) and Automotive industries to define and drive this benchmark. The benchmark suite considers the essential AI tasks for automotive, the candidate DNNs to run such tasks, realistic driving datasets, and the SW framework to run the benchmark. Developing representative benchmarks is always a challenge, and to be successful, we welcome involvement from the automotive industry, SOC industry, AI industry, and academia.

**Speaker's short-bio :** Mostafa El-Khamy (S'01---M'07---SM'12) received his Ph.D. and M.S. degrees from the California Institute of Technology (Caltech), USA, and his M.S. and B.S. degrees from Alexandria University, Egypt, all in Electrical Engineering. He received his MBA from the Edinburgh Business School, UK. He is a Senior Principal Engineer with Samsung DSRA (Device Solutions Research America). He is also the Co-Chair of the MLPerf Mobile Working Group for AI benchmarking. Dr. El-Khamy is an Adjunct Professor at the Faculty of Engineering, Alexandria University, and was a founding faculty member of Egypt-Japan University for Science and Technology (E-JUST). Previously, he was at Qualcomm R&D, San Diego. His research interests include the theory and practice of artificial intelligence in multimedia and communication systems. He is the recipient of the URSI Young Scientist Award, the Caltech Atwood Fellowship, the Alexandria University Scientific Incentive Award, the Samsung Best Paper Award, and the Samsung Distinguished Inventor Award.



### **#3. Simulation Platform of Adversarial Attacks for AI in Autonomous Driving**

Yi (Estelle) Wang, Head of Product Cybersecurity & Privacy Office (PCSO) Singapore.

**Abstract :** This presentation offers a comprehensive introduction to the Cybersecurity assessment framework tailored for AI within the realm of "software-defined vehicles" (SDVs). Initially, we outline the anticipated evolution of full-stack IoT architecture

solutions, spanning from cloud infrastructure to end-user terminals, and from dedicated platforms to scalable systems. Subsequently, we provide an overview of international regulations and standards governing the ethical use of AI, particularly in the context of SDVs.

Moreover, we address the growing concern of adversarial attacks, including perturbation, which pose significant threats to AI algorithms deployed in autonomous driving scenarios. To mitigate these risks, we propose a robust cybersecurity assessment framework specifically designed for evaluating AI algorithms in automotive applications. Additionally, we introduce a CARLA-based Adversarial Attack Assessment simulation environment, facilitating convenient and faster prototyping for enhanced cybersecurity measures.

**Speaker's short-bio** : Dr. Yi (Estelle) Wang has been working as Head of Product Cybersecurity & Privacy Office (PCSO) Singapore, Software and Central Technologies, at Continental Automotive since July 2016 (with a 2008 Ph.D. degree from Nanyang Technological University, Singapore). Dr. Wang is leading three teams: the automotive advanced research and governance team, consulting and engineering team, and the security operations team. In addition, she is with deep knowledge of ISO/SAE 21434 and UNECE R155/R156 based on physically participating in working group meetings. She is an expert with cybersecurity industrial standards, e.g., ISO 2700x and ISO 26262. She is familiar with data protection and privacy regulations: GDPR and Asia regional regulations (Singapore PDPA and Chinese PIPL). Advanced leading research topics are including but not limited to applied post quantum cryptography, applied lightweight cryptography, cybersecurity for artificial intelligence (adversarial model), embedded security for IoTs, data anonymization for personal privacy.

Dr. Wang is honored with "Top Women in Security ASEAN 2021" 2021 and 2022 (Singapore, Phillips, Indonesia, Malaysia, Cambodia, and Thailand), "Top Women in Security – Singapore Country Award" and "Top 20 Women in Cybersecurity Singapore 2020" by Public Security Society. She brought the know-how to the Singapore Cybersecurity ecosystem through guest lectures with the Singapore Institute of Technology in 2019. She is motivated to be valuable in various domains, actively contributing to her company, the IEEE non-profit community, and the Singapore ecosystem. She firmly believes that investing effort in mentoring and coaching young talents will contribute to creating a better future.

With more than 20 years of experience in various embedded security topics, she is active in academic activities, has published more than 54 international top journal/conference papers, and holds 13 industrial patents. She was Chair of the IEEE Circuit and System Society (CASS) chapter Singapore 2022-2023, Associate Editor of IEEE Transactions on Circuit and System II 2020-2022, and Chair for IEEE Standard of Hardware Security under IEEE Circuits and Systems Society Standards Activities Subdivision..



#### #4. Panel Discussion on **“The Era of Automotive Electrification”**

Moderator: Preet Yadav, NXP, India

**Abstract:** **“AutoCAS2024”** is a special initiative by the CASS team to invite experts to talk and promote the latest developments and offerings from their organization in the Automotive domain to a wider audience comprising students, faculty, industry and research enthusiasts. These sessions will enable a peer-to-peer platform to discuss, discover, define and dissipate knowledge on the Automotive industry roadmap.

**Moderator’s short Bio:** Yadav Preet is R & D SOC Technical Program Manager for Automotive Group at NXP Semiconductors. Prior to re-joining NXP in his second stint, he was working with Wipro as Analog Practice Head, Distinguished Member of Technical Staff (DMTS) - Wipro Senior Member, leading Analog & Mixed Signal Practice globally in VLSI Technology Group.

He has close to two decades of enriched Research & Development experience in the diversified Semiconductor industry. His expertise includes Analog and Mixed Signal (AMS) design & verification, core technology development of Process Design Kits (PDK) and Electronic Design Automation (EDA). He received B. Tech. degree in ECE from Kurukshetra University and M. Tech. degree in VLSI Design & CAD from Thapar Institute of Engineering & Technology.

In past he worked at Semiconductor Complex Ltd. and, Cadence Design Systems. During his first stint at Freescale/NXP Semiconductor, he worked on development of Process Design Kits, leading handful of technologies from matured to advance nodes. Further, he worked on Analog and Mixed Signal SOC Verification in Automotive Microcontrollers and Processors R & D at NXP.

He is leading Northern Region Electronics Forum (NEF) in collaboration with India Electronics & Semiconductor Association (IESA) & VLSI Society of India (VSI). He is Associate Editor of IEEE Sensors Alert. He is Member of IEEE CEDA India Council, Executive Committee member of IEEE Circuits and Systems Society (CAS), Bangalore Chapter. Member of IEEE CAS Committee on Digital Communication and IEEE Education Activities Committee. He received President Award in Scouts & Guides and accoladed with various awards/certificates of merit throughout his academics and industrial endeavor.

## **AutoCAS 2024 Organizing Committee**

### **General Co-Chair**

**Kyung Ki Kim**

Daegu University, Korea

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### **General Co-Chair**

**Preet Yadav**

NXP, India

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