PROFESSOR SHUNQIAO SUN
UNIVERSITY OF ALABAMA

REDEFINING MILLIMETER-WAVE AUTOMOTIVE RADAR FOR AUTONOMOUS DRIVING: ADVANCED SIGNAL PROCESSING AND MACHINE LEARNING APPROACHES

ABSTRACT

Millimeter wave automotive radars are highly reliable in all-weather environments and are indispensable for both advanced driver assistant systems (ADAS) and autonomous vehicles. The presentation will highlight recent advancements that continue to push the boundaries of what's possible in automotive radar technology for fully autonomous driving. Key topics include the use of sparse arrays synthesized with multi-input multi-output (MIMO) radar technology to achieve enhanced angular resolution, innovative waveform designs for mitigating mutual interference between automotive radars, and high-resolution direction-of-arrival (DOA) estimation from a single snapshot. We will also address the challenges of applying MIMO radar theories in automotive contexts, including the use of model-based deep neural networks for high-resolution DOA estimation and the integration of domain-knowledge-guided deep learning in radar perception for autonomous vehicles. Finally, we will discuss future directions for automotive radar, with a focus on enhanced collaborative sensing through the use of multiple automotive radar systems.

BIO

Shunqiao Sun received the Ph.D. degree in electrical and computer engineering from Rutgers, The State University of New Jersey, New Brunswick, NJ, USA, in January 2016.

He is currently a tenure-track Assistant Professor, after joining the Department of Electrical and Computer Engineering, at the University of Alabama, Tuscaloosa, AL, USA. in August 2019. From 2016-2019, he was with the radar core team of Aptiv, Technical Center Malibu, California, where he has worked on advanced radar signal processing and machine learning algorithms for self-driving vehicles and lead the development of direction-of-arrival estimation techniques for next-generation short-range radar sensor which has been used in over 120-million automotive radar units. His research interests lie at the interface of statistical and sparse signal processing with mathematical optimizations, automotive radar, MIMO radar, machine learning, and smart sensing for autonomous vehicles.

Dr. Sun received the U.S. National Science Foundation (NSF) CAREER Award (2024) and CRII Award (2022). He received the 2016 IEEE Aerospace and Electronics Systems Society (AESS) Robert T. Hill Best Dissertation Award for his thesis "MIMO radar with Sparse Sensing". He authored a paper that won the Best Student Paper Award at 2020 IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM). He is an elected member of IEEE Sensor Array and Multichannel (SAM) Technical Committee (2024-2026). He is Vice Chair of IEEE Signal Processing Society (SPS) Autonomous Systems Initiative (ASI) (2023-2024). He has co-organized the 1st and 2nd Workshop on Signal Processing for Autonomous Systems (SPAS) at International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2023 in Rhodes, Greece and ICASSP 2024 in Seoul, Korea, respectively. He has co-organized over a dozen special sessions on automotive radar signal processing, machine learning and sparse arrays at IEEE SPS and AESS flagship conferences. He is an Associate Editor of IEEE Signal Processing Letters and IEEE Open Journal of Signal Processing. He is a Senior Member of IEEE.

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4:25pm - 5:30pm

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