INDUSTRIAL & SYSTEMS ENGINEERING
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Structured AI Methods for Real-Time Autonomy in Mobile Robot Systems

BIOGRAPHY

Ashis G. Banerjee is an Associate Professor of Industrial & Systems Engineering and Mechanical Engineering at the University of Washington (UW). Prior to joining UW, he was a Research Scientist at GE Global Research and a Postdoctoral Associate at MIT. He obtained his Ph.D. and M.S. in Mechanical Engineering from the University of Maryland (UMD), College Park, and B.Tech. in Manufacturing Science and Engineering from IIT Kharagpur. Dr. Banerjee has published more than sixty five articles on a broad range of research topics spanning predictive analytics, AI-enabled robotics, and smart manufacturing. He has received several honors including the 2026 AAAI Classic Paper Award, 2019 Amazon Research Award, 2012 Most Cited Paper Award from the Computer-Aided Design journal, and 2009 Best Mechanical Engineering Dissertation Award at UMD. He is an elected Senior Member of the IEEE, an elected Full Member of the Sigma Xi, The Scientific Research Honor Society, and serves as a Senior Editor for the IEEE Robotics and Automation Letters.

ABSTRACT

Structured AI aims to fuse the benefits of classical, analytical techniques with modern-day machine learning approaches by extracting and incorporating the embedded structures in the operating environments. To do so, it draws inspiration from various fields, such as system dynamics, geometry and topology, cognition, and information theory. In this seminar, I will present some of the recent efforts in this direction to augment the visual perception and information gathering capabilities of autonomous mobile ground robots. Extensive evaluations show enhanced generalization capabilities in cluttered and confined indoor spaces, while reducing computational efforts and (training) data requirements.