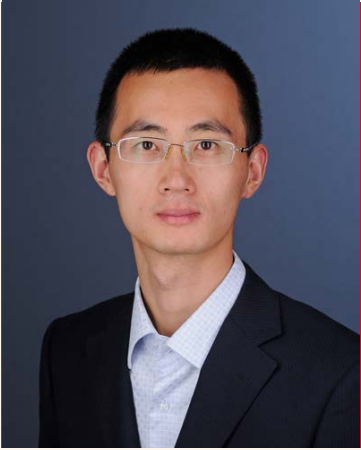


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Reimagining Battery Systems: Holistic Intelligence for Performance and Safety



Huazhen Fang

*Associate Professor,
Mechanical Engineering*

University of Kansas

ABSTRACT:

We are standing on the cusp of a global energy transition towards green energy production and utilization. An enabler of this revolution is lithium-ion batteries for their high energy density, long cycle life, and declining costs. While leading the way in energy storage, lithium-ion batteries also grapple with performance and safety issues. This challenge has raised concerns about their future role in driving the energy transition, while motivating a question that has acquired growing urgency: How can we maximize battery performance and safety in operation?

To address the question, we propose to develop holistic intelligence for battery systems, which combines both hardware and algorithmic design innovations to imbue intelligence into all aspects of battery operation. This presentation will showcase our recent endeavors in this direction, encompassing battery modeling, state monitoring, and system design and management. The technical discussion will focus on enabling holistic intelligence by leveraging advances in systems and control theory, power electronics, and machine learning to achieve high-performance and safety-critical battery systems.

BIOGRAPHY:

Huazhen Fang is an Associate Professor of Mechanical Engineering at the University of Kansas. He received his Ph.D. from the University of California, San Diego in 2014, M.Sc. from the University of Saskatchewan, Canada in 2009, and B.Eng. from Northwestern Polytechnic University, China in 2006. His research interests lie in advanced battery energy storage systems and control with different applications. His work has been sponsored by NSF, DOE, ARL, among others. He received the NSF Faculty Early Career Award in 2019, the University Scholarly Achievement Award at the University of Kansas in 2024, and a Prize Paper Award from IEEE Transactions on Transportation Electrification in 2024. He currently serves as an Associate Editor for IEEE Transactions on Industrial Electronics and IEEE Control Systems Letters.