NSF NANOSCALE SCIENCE AND ENGINEERING GRANTEES CONFERENCE:

NANO AND AI CONVERGENCE

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"Autonomous Experimentation and Nanotechnology"

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Bio: Keith A. Brown is an Associate Professor of Mechanical Engineering, Materials Science & Engineering, and Physics at Boston University. He is also the Associate Chair for Graduate Programs in Mechanical Engineering. He earned an S.B. in Physics from MIT, a Ph.D. in Applied Physics at Harvard University with Robert M. Westervelt, and was an International Institute for Nanotechnology postdoctoral fellow with Chad A. Mirkin at Northwestern University. The KABlab studies approaches to accelerate the development of advanced materials and structures with a focus on polymers. The group employs self-driving labs, additive manufacturing, miniaturization of experiments using scanning probe techniques, and novel platforms for parallel materials development to achieve these goals. Keith has co-authored over 100 peer-reviewed publications, six issued patents, and his work has been recognized through awards including the Frontiers of Materials Award from The Minerals, Metals, & Materials Society (TMS), a Google Faculty Research Award, being recognized as a "Future Star of the AVS," the Omar Farha Award for Research Leadership from Northwestern University, and the AVS Nanometer-Scale Science and Technology Division Postdoctoral Award. Keith served on the Nano Letters Early Career Advisory Board, co-organized a National Academies of Science, Engineering, and Medicine Workshop on AI for Scientific Discovery, and currently leads the MRS Artificial Intelligence in Materials Development Staging Task Force.

Abstract: Autonomous experimentation is the combination of machine learning to select experiments and robotic systems to perform them. Over the past decade, autonomous experimentation systems, or self-driving labs (SDLs), have been demonstrated and used across materials research. Nanotechnology provides unique opportunities and challenges for SDLs due to the small scale of nanomaterials and the unique interactions that are present at the nanoscale. This talk overviews the principles of autonomous experimentation, key milestones in its development to date, and efforts to realize SDLs that study nanoscale materials. This talk will conclude with a vision for the role that interconnected autonomous experimentation systems can play in transforming the pace of modern materials development.