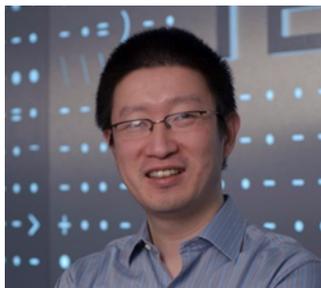


Artificial Intelligence-Enhanced Nanomanufacturing

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Abstract: As a research discipline, nanomanufacturing involves the design, characterization, and fabrication of nanostructures that exploit the physical and chemical phenomena at nanoscale. It is critical to various industrial and commercial applications such as energy storage, flexible electronics, and health care. However, manipulation of materials at nanoscale faces multiple challenges. At the design stage, tailoring the structure topology and composition to produce the desired functional properties has long been relying on expert knowledge. At the manufacturing stage, nanomanufacturing processes involve multiple factors that affect the reproducibility, reliability, and quality of the final products. In recent years, artificial intelligence (AI) has been increasingly considered as having the potential in complementing physical domain knowledge and better resolving the aforementioned challenges. By leveraging data from process sensors and advanced computational infrastructure, AI enables optimization in material design, high-fidelity process-structure-property modeling and effective product quality assurance.

This talk presents an overview of the basic building blocks of AI and highlights AI's applications to material design, manufacturing process modeling, and quality assurance. It demonstrates the potential of AI in enhancing physical science with data science to facilitate the design, monitoring and optimization in nanomanufacturing.

Bio: Professor Nicholas X. Fang is Professor of Mechanical Engineering at the Massachusetts Institute of Technology. Professor Fang earned his B.S. and M.S. degrees in Physics from Nanjing University, China; and Ph.D. degree in Mechanical Engineering from the University of California at Los Angeles. He joined the M.I.T. faculty in 2011. Prior to that, he worked as assistant professor of Mechanical Engineering at the University of Illinois at Urbana-Champaign. Professor Fang teaches and conducts research in the area of micro/nanotechnology. Professor Fang's research programs have focused on the engineered optical and acoustic metamaterials. While the main efforts focuses on new insights of material and device design from fundamental approaches, his group also actively pursue the applications in the areas of energy conversion, communication, and biomedical imaging. Professor Fang has been the recipient of several awards and honors recognizing his research and teaching efforts, including the UIUC Award of Excellence in Advising; the selected Professional of the Year 2010 in Higher Education by Cambridge Who's Who; the ICO Prize from the International Commission of Optics; the NSF CAREER Award; the Society of Manufacturing Engineering Outstanding Young Investigator Award; Technology

Review Magazine's 35 Young Innovators Award; the ASME Chao and Trigger Young Manufacturing Engineer Award and the ASME Pi Tau Sigma Gold Medal Award