

Seminar

"Enabling future manufacturing: Additive manufacturing, machine learning and cybersecurity "

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abstract

Integration of the design, manufacturing and qualification stages in a digital manufacturing (DM) cyber-physical system allows designing parts based on the specific capabilities of a manufacturing method. The general purpose manufacturing machines such as 3D printers have become an integral part of the DM because they can manufacture a wide variety of parts without the need for specialized tools. Many industrial parts have been redesigned using optimization and machine learning methods to save weight and improve functionality and are manufactured by the AM methods. The talk will present examples of advancements in the AM and characterization methods, specifically for soft viscoelastic materials, which are extensively used in soft robotics and biomedical applications. Many of these applications involve significant intellectual property in the material design or application development. The network connectivity of the DM and the advancements in the machine learning algorithms have also made the system more vulnerable to intellectual property theft and reverse engineering. The next generation of DM platforms need to be secure and resilient against various cyber-physical threats; e.g., the machine learning methods used for materials design and characterization can also be used to reverse engineer the part design and printer tool path. Novel cybersecurity methods need to become an integral part of the future manufacturing systems to protect from sabotage and intellectual property theft.

biosketch

Dr. Nikhil Gupta is a Professor in the Mechanical and Aerospace Engineering Department at the New York University Tandon School of Engineering. He is also affiliated with Center for Cybersecurity. His research interests include developing lightweight materials, additive manufacturing and materials characterization methods. His research on additive manufacturing security is supported by The National Science Foundation, Secure America Institute and industry. He is currently serving on editorial boards of Materials Science and Engineering A and Materials Processing and Characterization journals. Dr. Gupta has 7 issued US patents and has authored over 220 journal papers and book chapters, which have been cited over 10,000 times. He has served as the Chair of the Composite Materials Committee of The Minerals, Metals and Materials Society, membership secretary of the American Society for Composites and co-chair of the 2019 Annual Technical conference of the American Society for Composites.



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