MATERIALS SCIENCE AND ENGINEERING (MS&E) SEMINAR SERIES
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Applications of Data Analytics and Machine Learning for Additive Manufacturing

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Abstract: Production of additively manufactured (3D printed) components for safety-critical applications requires high levels of quality assurance, while the use of the technology for medium-scale production is only feasible with a lower part rejection rate than is possible with purely open-loop control schema. At Oak Ridge National Laboratory, we are using advanced data analytics and leveraging Machine Learning to improve these manufacturing processes. As a case study, this talk will present our efforts in data collection and analysis for the laser powder bed fusion and binder jet technologies. Specifically, a novel Convolutional Neural Network architecture has been developed into a machine and camera agnostic algorithm for autonomous detection, classification, and localization of layer-wise powder bed anomalies. Importantly, this algorithm allows for the sharing of learned knowledge between different printing technologies – reducing the total amount of training data which must be annotated. The use of process monitoring for autonomous real-time control of these metal printers will also be discussed.

Biography: Dr. Scime grew up in Morgantown, West Virginia before receiving his bachelor's degree in Mechanical Engineering from the University of Florida and his PhD in Mechanical Engineering from Carnegie Mellon University. In 2018 Dr. Scime joined Oak Ridge National Laboratory (ORNL) as a Postdoctoral Research Associate. Now an Associate Staff Scientist at ORNL's Manufacturing Demonstration Facility, his research applies advanced data analytics techniques to metal Additive Manufacturing (3D Printing). Much of his research focuses on using computer vision techniques and machine learning for processing imaging data, with a special emphasis on the laser powder bed fusion and binder jet printing technologies.

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