Spring 2019 Graduate Seminar Series

Data-Driven Approach for Design and Optimization of Laser-Based Additive Manufacturing: Framework, Challenges, and Partial Solutions

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Wednesday, February 27, 2019, 4:10 pm, 1140 Howe Hall

Abstract
The metal additive manufacturing (AM) process has the potential to propel the United States to a position of worldwide leadership in the production and repair of complex/precious part which will impact automotive, aerospace, biomedical, and other major industries. However, the highly dynamic thermo-physical transitions during the fabrication making it difficult to identify the operational conditions that result in targeted physical and mechanical properties. This variability and the associated uncertainty associated with AM processes leads to inadvertent and inevitable process anomalies (e.g., defects and porosity), causing fabricated parts lack of satisfactory quality to meet the requirements of industrial applications. We propose a theoretical framework to characterize the parameter-process-property relationships of AM, using a combined experimental and analytical approach. By optimizing the process parameters and characterizing in-situ process signals, we have demonstrated that our approach allows for the efficient fabrication full-dense parts with desired geometric accuracy and mechanical properties. Future work aims at transforming the AM procedure to a ‘hands-off’ operation governed by in-situ diagnostics and control which provides for customized parts for targeted applications.

About the Speaker
Dr. Linkan Bian is an associate professor in Industrial and Systems Engineering Department at Mississippi State University. He received his Ph.D. in Industrial and Systems Engineering from Georgia Institute of Technology in 2013 and then joined MSU as an Assistant Professor. Dr. Bian's research interests focus on the analytics of Big Data generated from complex engineering systems, especially advanced manufacturing systems. He has received federal funding from NSF, NIH, DoD, DoE, and industrial companies. Dr. Bian has published over 40 peer-reviewed papers that appear in prestigious journals. He received the Outstanding Young Investigator Award from the IISE, as well as multiple Best Paper Awards. He is an Associate Editor for IISE Transactions on the focus area of Design and Manufacturing.