

3D Point Cloud Data Modeling, Analysis and Control for Quality Qualification and Improvement in Additive Manufacturing

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• 1:30PM - 2:30PM

ABSTRACT

Advancements in contactless 3D scanning technology have made in situ 3D profiling of printed parts readily available. This data, represented as high-dimensional, unstructured 3D point cloud data, holds immense potential for enhancing process control and quality assurance in Additive Manufacturing (AM). In this presentation, a series of recent research endeavors will be explored, including: 1) functional qualification of 3D-printed parts via physical and digital twins using contrastive learning and hard sampling techniques; 2) 3D profile evolution modeling considering heterogeneous inputs by using the Koopman operator theory and machine learning algorithms; 3) predictive control of 3D profiles propagation using nonlinear dynamic model with heterogeneous active control inputs; and 4) dynamic 3D shape morphing behavior modeling, optimization and control using continuous normalizing flow methods for 4D printing.

BIOGRAPHY

Dr. Jianjun Shi is the Carolyn J. Stewart Chair and Professor in School of Industrial and Systems Engineering, with a joint appointment in School of Mechanical Engineering, both at Georgia Institute of Technology. Dr. Shi is a member of the National Academy of Engineering (NAE) of the USA, an Academician of the International Academy for Quality (IAQ), a Fellow of five professional societies, including ASME, IISE, INFORMS, ISI, and SME. Dr. Shi's research focuses on data enabled manufacturing, in-process quality improvement, system informatics and control.

