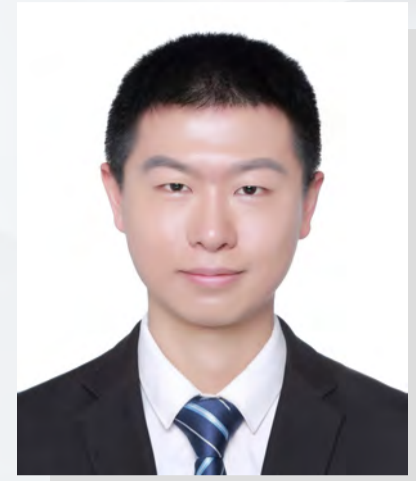




Multi-scale and Multi-material Additive Manufacturing



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Abstract

Additive Manufacturing (AM) has been widely recognized as a disruptive manufacturing technology for various applications thanks to its capability of fabricating 3D objects with unprecedented geometric complexity and multiple functionalities. Also, AM enables revolutionary designs by using complex 3D shapes and heterogeneous materials. The structures with various material compositions and geometric feature sizes spanning from 10 μm up to 200 mm have a wide variety of interesting properties. However, the fabrication of such multi-scale and multi-material structures requires the integration of micro-, meso- and macro-scale manufacturing processes. How to develop AM processes to effectively and efficiently design and fabricate such structures with various engineering materials is still an open question.

In this talk, I will discuss multi-scale and multi-material AM from the perspective of process and our methods to address the critical fabrication challenges. More specifically, this talk includes: (1) a novel in-situ-transfer vat photopolymerization process to fabricate microscale fluidic channels at 10 microns level; (2) a new hopping light vat photopolymerization process to fabricate millions of microscale features over macroscale surface; (3) a vibration-assisted separation method for large area constrained-surface-based vat photopolymerization process; (4) a new type of automatic reusable supports for additive manufacturing processes; and (5) an innovative printhead design to enable the printing of highly viscous materials.

About the Speaker

Dr. Yang Xu obtained his Ph.D. degree in Industrial and Systems Engineering, M.S. degree in Computer Science from the University of Southern California, and M.S. and B.S. degrees in Mechanical Engineering and Automation from Beihang University. Now he is a Postdoctoral Fellow at the University of California, Berkeley.

His research interests include multi-scale and multi-material additive manufacturing (AM) processes and new designs for AM-enabled applications. Dr. Yang Xu has published his research work in prestigious journals in the field of manufacturing and materials, including **Nature Communications**, **Additive Manufacturing**, **Advanced Materials**, and **Small**. One of his first-authored conference papers received the **Best Paper Award** at the 2020 Manufacturing Science & Engineering Conference. In 2022, Dr. Yang Xu was given the **Best Ph.D. Dissertation Award** in USC's Epstein Department of Industrial and Systems Engineering and the William F. Ballhaus Jr. Prize for Excellence in Graduate Engineering Research - Viterbi Engineering School's Best Ph.D. Dissertation Award (runner-up).