NUS | Centre for Additive Manufacturing
National University of Singapore

NUS | Department of Mechanical Engineering College of Design and Engineering
National University of Singapore

Multi-domain AI for Metal Additive Manufacturing

Speaker:	**Dr. Bingbing Li**
Date:	**Wednesday, 28 June 2023**
Time:	**10.00am to 11.00am**
Venue:	**Seminar Room EA-02-11**
	Block EA, Level 2, College of Design & Engineering, NUS
	9 Engineering Drive 1, Singapore 117575
Host:	**Prof Jerry Fuh**

ABSTRACT:

Real-time detection of defection in metal additive manufacturing (MAM) is critical not only for facilitating post-build part interrogation and qualification but also for developing closed-loop control systems that can anticipate the need for local variations during the build process. Optical and acoustic sensors are commonly used as process monitors, and data analysis approaches have been developed to correlate the process signatures with porosity. The proposed AI agent system "Multi-domain AI for Metal Additive Manufacturing (MAIMAM)" will advance fundamental AI research in multi-domain knowledge representation learning, differentiable reasoning, and promote use-inspired AI research to accelerate AI-powered innovation and best practices for MAM. The fundamental AI research will build upon Multi-domain Knowledge Graph (KG) under four thrusts: 1) KG initialization with supervised initial KG construction with documents, data, and models; 2) model and KG learning such as self-supervised learning from domain data, energy-based model in latent space for modeling discrete data and structures, energy-based correction of directed graphical models, data ingestion and normalization; 3) KG reasoning and learning such as combining symbolic reasoning with representation learning for KG reasoning, data-driven learning of causal graphs with KG, reasoning and learning of multi-domain KG by exploring interactive causality; and 4) KG validation such as planning, data acquisition, and model validation.

ABOUT THE SPEAKER:

Dr. Bingbing Li is a Visiting Associate Professor in the Department of Mechanical Engineering at NUS. Dr. Li is an Associate Professor of Manufacturing Systems Engineering at California State University Northridge (CSUN) since 2014, and serves as the Associate Director of NASA Autonomy Research Center for STEAHM (ARCS), Co-Director of DOE Industrial Assessment Center (IAC) at UC Irvine and CSUN (SMART IAC), Director of Laboratory for Sustainable and Additive Manufacturing (LSAM). Dr. Li is also the Affiliate Faculty at the Terasaki Institute for Biomedical Innovation. He has published over 60 peer-reviewed journal and conference papers and secured 19 external grants, which brings his CSUN career total to $2.0 million as a PI and over $6 million as a Co-PI. Dr. Li conducts research in Additive Manufacturing, AI-powered Design and Manufacturing, and Sustainable Manufacturing, mainly funded by NASA, DOD, DOE, NSF, CEC and industrial partners. Dr. Li is one of the Faculty Mentors of the NASA funded Autonomy Research Center for STEAHM (ARCS), NIH funded Building Infrastructure Leading to Diversity (BUILD) Promoting Opportunities for Diversity in Education and Research (PODER), and USDE funded HSI-STEM/ AIMS2 (Attract, Inspire, Mentor and Support Students). He is the Faculty Advisor of the Society of Manufacturing Engineers (SME) Student Chapter S327, and CSUN Chinese Students and Scholars Association (CSSA).

ALL ARE WELCOME TO ATTEND