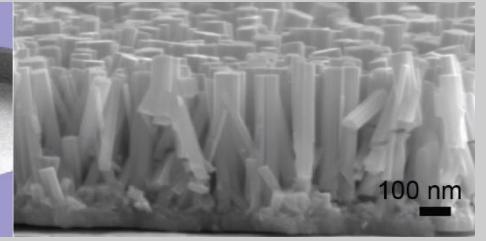
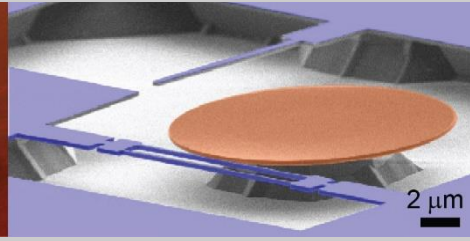
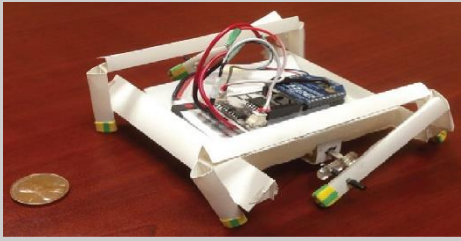




# WPI

## MECHANICAL ENGINEERING



### WPI ME Graduate Seminar Series 2019-2020

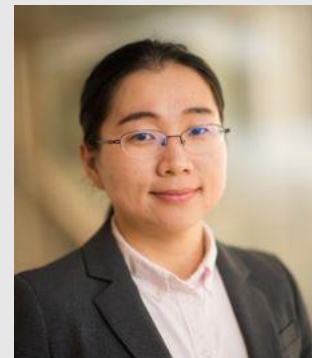
## Ultrasonic Enhancement on Resistance Spot Welding of Lightweight Materials

Xun Liu, Ph.D.  
Assistant Professor  
Welding Engineering Program  
Department of Material Science and Engineering  
The Ohio State University

**10:00-10:50 am, Wednesday, May 6**

**Zoom: <https://wpi.zoom.us/j/97890110980>**

### About the Speaker



Dr. Xun Liu earned her PhD degree in Mechanical Engineering from University of Michigan in 2016. She also holds two MS degrees—one in Materials Science and Engineering and the other in Mechanical Engineering—also from University of Michigan. Her bachelor degree is in Mechanical Engineering from Huazhong University of Science and Technology (P.R. China) in 2011. Dr. Liu has a variety of research interests that center on development and analysis of innovative advanced manufacturing process, including solid state joining of dissimilar materials, specifically on friction stir welding, friction stir spot welding, electrically assisted manufacturing process, power ultrasonic, incremental forming, 4D printing of multi-material structures. In addition, her research involves advanced material characterizations and material mechanical behavior analysis to reveal the underlying process-structure-properties relationship in manufacturing processes. Dr. Liu's expertise extends to both experimental and computational research at the continuum scale.

Multi-material structure is one of the key enablers for modern lightweight vehicles. Accordingly, development of reliable, economical and efficient dissimilar material joining technologies is of great practical value. Resistance spot welding (RSW) is an extensively used joining processes in automotive industry based on its high degree of automation and production rate. However, successful dissimilar material joints can hardly be achieved with RSW due to their distinctly different physical properties, process and metallurgical incompatibilities. This talk focuses on an innovative ultrasonic resistance spot welding (URW) process, which integrates high-power ultrasonic vibrations into conventional RSW and shows several superiorities. Comprehensive experimental studies on URW of advanced high strength steel (AHSS), aluminum alloy and dissimilar AHSS to aluminum alloy are performed. Mechanical properties and microstructure of the URW welds are compared with those of RSW welds at different electrical current conditions. Fundamental principles of ultrasonic benefits in enhancing RSW will be illustrated based on the several nonlinear physical phenomena induced by ultrasonic energy, including acoustic streaming, cavitation and acoustic softening effects.