

University of California, Irvine

THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

MSE 298 SEMINAR

FALL 2025: MSE IN THE SPOTLIGHT

**Professor
Yoonjin Won
Mechanical and Aerospace
Engineering**



RESEARCH TALK: *INTELLIGENT LEARNING STRATEGIES FOR THERMAL SCIENCE IN THE AI ERA*

Abstract: Multiphase phenomena are observed in our everyday life in nature and many industrial applications, ranging from dew condensation on insects, water harvesting, electronics cooling, climatology prediction, hydrogen generations, and manufacturing. While the fundamentals of multiphase processes have been studied for over a century, key scientific questions remain regarding the fundamental mechanisms governing complex phenomena. The intricate interplay between the evolution of phase boundaries and mass transport results in nonlinear behavior, where subtle changes in one parameter can have profound and unexpected effects on others. The multimodal, multidimensional, and transient nature of these processes presents challenges for investigation and comprehension. Additionally, interpreting experimental data and predicting multiphase phenomena remain significant challenges. To address these challenges, our research group seeks to integrate cutting-edge computer vision and machine learning strategies. This talk will briefly discuss potential game-changing innovations for electronics cooling in the heat transfer domain. I will highlight examples demonstrating how AI technologies enable learning, understanding, and prediction of the dynamic nature of multiphase phenomena. AI-driven algorithms can analyze vast amounts of data from sensors embedded in electronic devices, predicting thermal behaviors and dynamically adjusting cooling mechanisms. Machine learning models can be trained to identify patterns in heat generation and dissipation, allowing for predictive cooling strategies, thus extending the lifespan of components on cooling systems.

Bio: She is currently a Professor of Mechanical and Aerospace Engineering at the University of California, Irvine, with courtesy appointments in Electrical Engineering and Computer Science, and Materials Science Engineering. Dr. Won's research focuses on multiphase thermal science, integrating AI for science and experiment, scientific machine learning, and materials design. She is a leader of the DoD funded multi-university research initiative (MURI), ML4Heat. She is a recipient of the National Science Foundation CAREER Award, the ASME Electronic & Photonic Packaging Division Early Career Award, the ASME Electronic & Photonic Packaging Division Women Engineer Award, the ASME ICNMM Outstanding Leadership Award, the Emerging Innovation/Early Career Innovator from UCI Beall Innovation Center, Faculty Excellence in Research Awards (Mid-Career) from UCI, and numerous best paper and poster awards. Yoonjin Won received her B.S. degree in Mechanical and Aerospace Engineering from Seoul National University, and her M.S. and Ph.D. degrees in Mechanical Engineering from Stanford University. For more information on Dr. Won's qualifications and research group, please visit won.eng.uci.edu.

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TIME: 2:00 - 3:20 PM

**LOCATION: McDonnell Douglas Engineering
Auditorium**