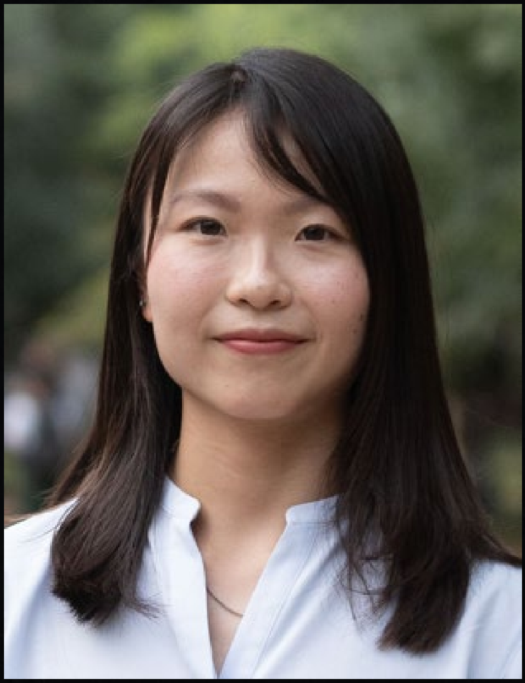
COLLEGE OF ENGINEERING MĀNOA

PROFESSORS & Pizza

Te Faye Yap, Assistant Professor, ME



- Ph.D. in Mechanical Engineering from Rice University.
- Research Interests: Soft Manufacturing, Soft Machines, Additive Manufacturing, Interfacial Phenomena, Temperature-Dependent Reaction Kinetics

Friday, November 14, 2025
12:00 to 1:00 p.m.
Holmes Hall 244,
Bowers + Kubota Lecture Hall
Please RSVP by noon on Wed, Nov. 12:
https://forms.gle/8WavJxxeYb32agqG9

Leveraging Silicone Elastomer Curing to Create Stronger Soft Devices

Silicone elastomers offer a wide range of mechanical and chemical properties. Specifically, their inherent compliance has facilitated significant progress in the field of soft robotics over the past decade. Platinum-catalyzed elastomers are used in the fabrication of most soft robotic components due to their commercial availability and liquid-like properties prior to curing. However, understanding the curing duration at a given temperature for these elastomers often relies on empirical trends. Curing parameters are typically determined through trial-and-error testing which limits the findings to specific geometries and curing conditions. I will present a modeling framework that provides a new understanding of the temperature-dependent curing of platinum catalyzed elastomers. The model, which builds on thermo-rheological experiments, explains how time and temperature affect the viscoelastic behavior of elastomers, and reveals that the curing behavior exhibits self-similarity, characterized by a dimensionless reaction coordinate that indicates the extent of curing. I then leverage this understanding of curing behavior to study the adhesion strength between elastomer layers by demonstrating the utility of the reaction coordinate to pinpoint failure regimes as a function of curing time and temperature. Adhesion between elastomeric components represents a longstanding problem in the field of soft robotics, and improving adhesion will enable new fabrication methodologies. Overall, this work aims to understand and leverage the curing behavior of elastomers as a function of time and temperature to improve elastomer processing and device durability.