COLLEGE OF ENGINEERING, COMPUTER SCIENCE, & TECHNOLOGY

Seminar in Interdisciplinary STEM Research

September 12 – Thursday, 3:05-4:20 PM PST

Location: E&T A-256

HOSTED BY CREST-CATSUS AND SIKAND SITI CENTERS

Bolei Deng, PhD

Director of the Computational Design and Metamaterials Lab (CDM Lab)

Bolei Deng is an Assistant Professor at the Guggenheim School of Aerospace Engineering at the Georgia Institute of Technology. Graduating with a B.S. in Engineering Mechanics from Zhejiang University in 2016, he later earned his Ph.D. in Mechanical Engineering and Material Science from Harvard University in 2021, under the guidance of Prof. Katia Bertoldi. Following this, he undertook a joint postdoctoral position at MIT between the Computer Science and Artificial Intelligence Laboratory (CSAIL) and the Department of Mechanical Engineering.

His research primarily focuses on employing artificial intelligence for the design and optimization of mechanical metamaterials across various scales. He has a keen interest in understanding and leveraging nonlinear behaviors, including nonlinear dynamics, multistabilities, and fracture. His work spans from developing ultra-strong and tough metamaterials to innovations in robotics, mechanical computing, and physical intelligence. For more please visit: boleideng.com

Contact-based Mechanical Communication

Abstract: Communication among particle robots is essential for advancing swarm intelligence. Traditionally, these robots rely on electronic communication systems, requiring sensors to receive signals, transducers to send them, processors to interpret the data, and batteries to power the system. In this work, we propose an alternative electronics-free communication strategy for particle robots, achieved through physical contact between architected tentacles. Instead of a central controller, the communication protocols are embedded in the geometry of the tentacles and can be fine-tuned through external vibrations. We also explore the extension of this mechanism to aerospace applications using 3D cube-based structures, where vibration propagation within the structure could allow precise control over the opening of specific connectors via their natural frequencies—similar to how electromagnetic waves convey information to cell phones, but without the use of electronics.

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