Soft Robotics: Design and Fabrication of Intelligent Material Systems

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As advanced as modern machines are, the building blocks have changed little since the Industrial Revolution: structures, motors and gears are typically rigid, bulky and heavy. In contrast, soft robots offer the compliance and low-weight necessary to make them safe for working in close proximity to humans, as well as allowing them to squeeze into tight spaces, handle fragile objects, and be robust in collisions. The combination of elastically deformable substrates with soft actuators and sensors will allow a robot to be folded or compressed and placed into a volume much smaller than its deployed size, making transportation easier. During this talk, I will describe my group's progress towards soft active materials for actuation, sensing, and stiffness control. I will emphasize our work on flexible, stretchable sensors embedded with liquid metals and manufacturability of conductive composites. Finally, I will show several prototype soft-bodied systems that incorporate these sensors and variable stiffness actuators to achieve distributed intelligence and functionality.

Rebecca Kramer is an Assistant Professor of Mechanical Engineering at Purdue University. She holds the degrees of B.S. from Johns Hopkins University, M.S. from the University of California at Berkeley, and Ph.D. from Harvard University. Her lab, the Faboratory, contains a leading facility for the rapid design, fabrication, and analysis of materially soft and multifunctional systems. Her research expertise is in stretchable electronics, responsive material actuators, soft material manufacturing, and soft-bodied control. Dr. Kramer currently serves as an Associate Editor and Editorial Board member of Frontiers in Robotics and AI: Soft Robotics. She has delivered over 50 international presentations, including an interactive presentation at NASA's Technology Day on Capitol Hill. She has authored over 30 technical publications in journals, proceedings and books, and currently holds four US patents. She is the recipient of the NSF CAREER Award, the NASA Early Career Faculty Award, the AFOSR Young Investigator Award, the ONR Young Investigator Award, and was named to the 2015 Forbes 30 under 30 list.

Social Period following the seminar

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