EML WEBINAR

ZOOM: HTTPS://EMLWEBINARS
THURSDAY, 24 SEPTEMBER 2026
10 AM BOSTON, 10 PM BEIJING
4 PM PARIS, 3 PM LONDON

RITU RAMAN

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

TISSUE ENGINEERING BIOLOGICAL ACTUATORS FOR BIOHYBRID ROBOTS

All voluntary movement in humans and many other biological creatures is powered by skeletal muscle, controlled by peripheral nerves, and supplied by blood vessels. These tissues work together to form biological actuators that can efficiently generate dynamic forces while adapting their form and function to changing environmental stimuli. Our lab develops biofabrication tools to build multicellular and functional models of vascularized and innervated muscle. Tissue engineering such biological actuators enables powering “biohybrid” robots that dynamically sense and adapt to their environments. This talk will discuss our work on creating predictive design frameworks and fabrication methodologies to deploy adaptable and sustainable muscle-actuated robots capable of behaviors such as walking, swimming, and gripping. Since these robots are composed of living tissues, we will showcase how they can respond to gain-of-function cues (exercise) and loss-of-function cues (injury) from their environment. Finally, we will outline the advantages, challenges, and future directions of deploying engineered biological actuators for applications in soft robotics.

Ritu Raman is the Eugene Bell Career Development Associate Professor of Mechanical Engineering at MIT. Her lab is centered on tissue engineering biological actuators for applications in regenerative medicine and biohybrid robotics. Ritu’s research has received several recognitions including the Presidential Early Career Award for Scientists and Engineers (PECASE), the National Science Foundation CAREER Award, the Army Research Office Early Career Award, and the Office of Naval Research Young Investigator Award, as well as Rising Star Junior Faculty Awards from the Biomedical Engineering Society and the American Society of Mechanical Engineers. She has been named a National Academy of Engineering (NAE) Grainger Frontiers of Engineering Fellow and National Academy of Sciences (NAS) Kavli Frontiers of Science Fellow, and included on both the Forbes 30 Under 30 and MIT Technology Review 35 Under 35 lists. Ritu’s efforts to add hands-on experiences to classes at the intersection of mechanical engineering and biology were recently recognized by an MIT Spira Award for Excellence in Teaching. Beyond the classroom, Ritu is passionate about broadening access to scientific literacy in tissue engineering, and is the author of the MIT Press book Biofabrication.

Discussion leader: **Taher Saif**, University of Illinois Urbana-Champaign

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