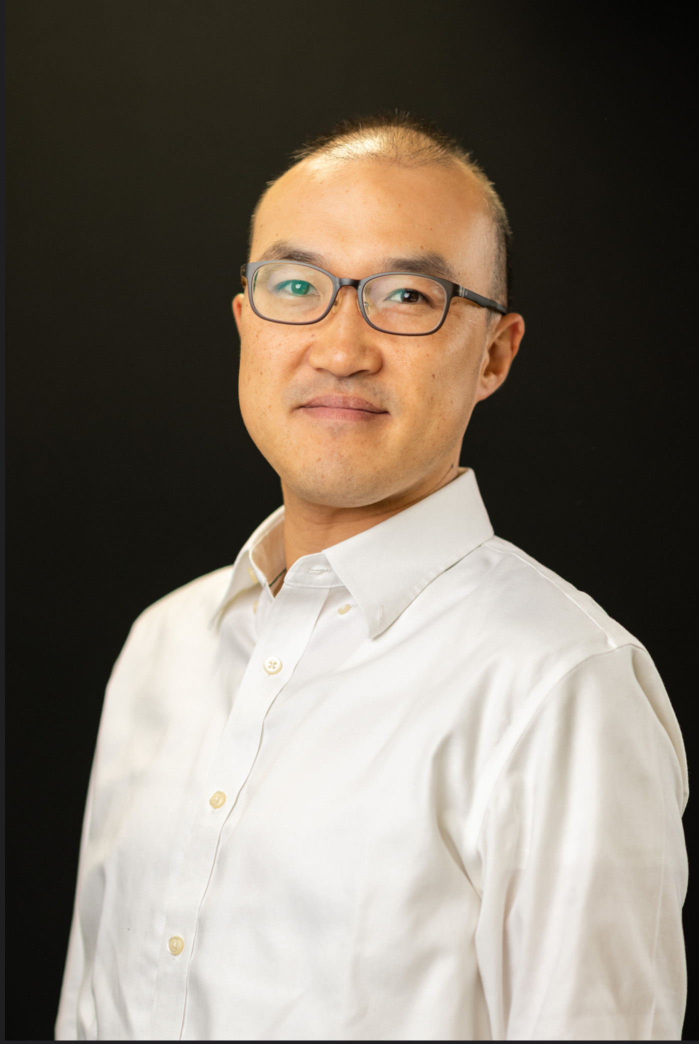
Sangyoon Han

Assistant Professor, Biomedical Engineering
Affiliated Assistant Professor, Mechanical Engineering-Engineering Mechanics

sjhan@mtu.edu

+1-906-487-2897



Research Interests

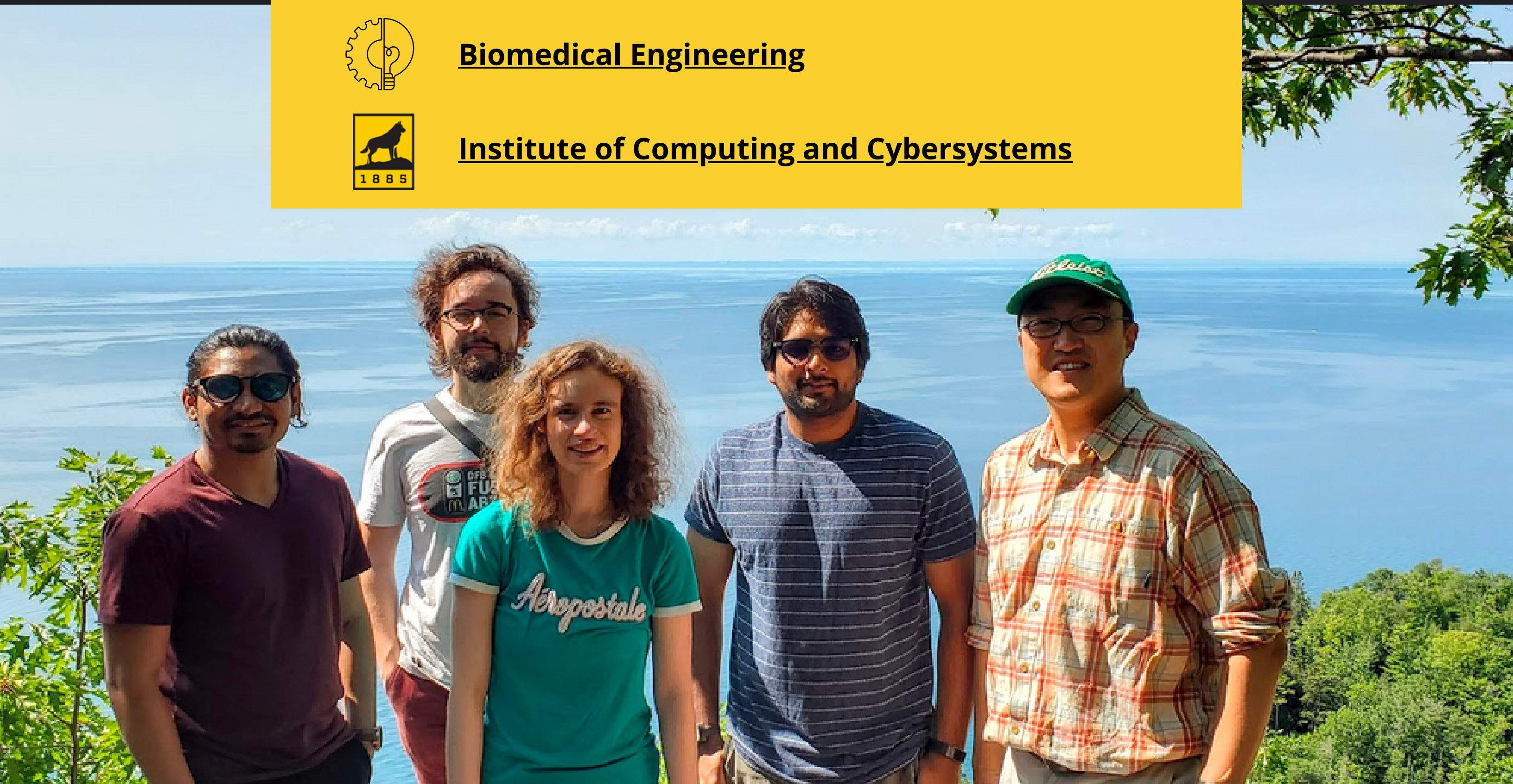
- Mechanobiology
- Tradition force by a living cell
- Cell adhesion and migration
- Image data modeling
- Machine learning
- BioMEMS

Links of Interest

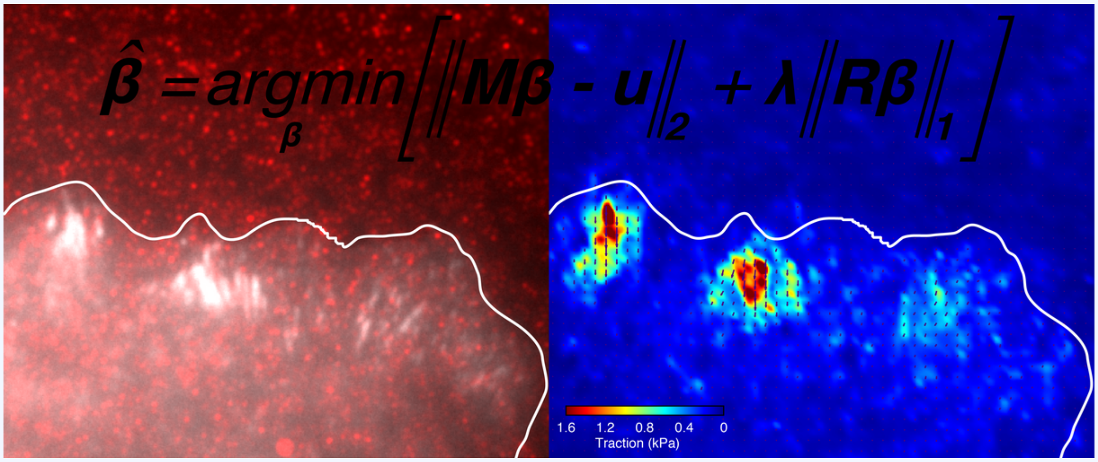
Dr. Han's Lab Webpage

Biomedical Engineering

Institute of Computing and Cybersystems



Research Synopsis

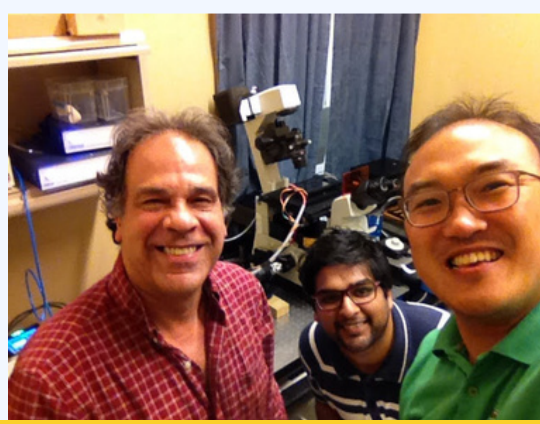


Developing Traction-Measuring Experimental Platform and Software
This research initiative aims to design and implement an innovative experimental platform coupled with sophisticated software for measuring cellular traction forces. Cellular traction forces play a pivotal role in various physiological and pathological processes, including cell migration, tissue development, and disease progression. By integrating advanced microfabrication techniques and high-resolution imaging, this platform enables real-time tracking and quantification of cellular forces exerted on their surrounding substrate. The accompanying software facilitates the automated analysis of these forces, offering insights into cellular mechanosensing and response to their microenvironment. The developed platform and software hold the potential to revolutionize our understanding of cellular biomechanics and contribute to advancements in tissue engineering and disease treatment.

Uncovering Cells' Ability to Sense the Stiffness of the Physical Environment
This research focus delves into the remarkable capability of cells to sense and respond to the mechanical properties of their surrounding matrix, particularly its stiffness. Investigating this phenomenon involves a multidisciplinary approach, encompassing cell biology, materials science, and biophysics. Through a series of experiments utilizing silicone with tunable stiffness gradients, the research seeks to elucidate the molecular mechanisms underlying how cells transduce mechanical cues into biochemical signals. By deciphering the intricate pathways involved in mechanotransduction, this work holds potential for applications in tissue engineering, regenerative medicine, and the development of therapies for diseases influenced by altered tissue stiffness perception.

Discovering Endothelial Cells' Ability to Sense Fluid Shear Stress
In this research domain, the focus is on unraveling the intricate interplay between endothelial cells and fluid shear stress, a mechanical force exerted by flowing blood on vessel walls. This force is a critical regulator of vascular health and disease, influencing endothelial cell behavior and function. By employing cutting-edge microfluidic systems that mimic physiological flow conditions, the study investigates how endothelial cells sense and respond to different levels of shear stress. Through a combination of live-cell imaging, genetic manipulation, and biomechanical analysis, the research aims to identify the molecular sensors and signaling pathways that mediate endothelial cell responses to shear stress. The outcomes of this investigation could hold therapeutic implications for cardiovascular diseases and inform the design of vascular implants that promote healthy endothelial function.

In summary, this research synopsis outlines a comprehensive endeavor to advance our understanding of cellular mechanosensation in complex tissue microenvironments. By focusing on developing novel experimental platforms, uncovering the sensing of matrix stiffness, and discovering how endothelial cells respond to fluid shear stress, this research aims to shed light on fundamental cellular processes with broad implications for tissue engineering, regenerative medicine, and cardiovascular health.:



[ICC]

For more information

Publications

Get to Know Dr. Sangyoon Han