Wisconsin Institute for
Healthcare Systems Engineering
UNIVERSITY OF WISCONSIN-MADISON

WIHSE Webinar

Micro-Sensors and Micro-Optics for Biomedical Applications

Monday, October 25, 2021
12:00pm

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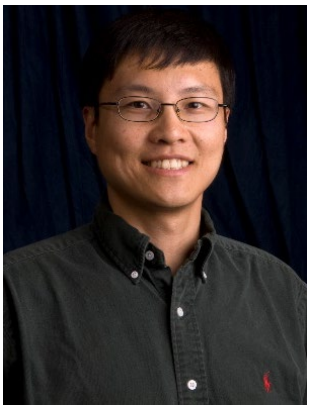
Presented by



Hongrui Jiang is a Vilas Distinguished Achievement Professor and Lynn. H. Matthias Professor in Engineering at the University of Wisconsin – Madison. He received a B.S. degree in physics from Peking University, Beijing, China, and the M.S. and Ph.D. degrees in electrical engineering from Cornell University, Ithaca, NY, in 1999 and 2001, respectively. He was a Postdoctoral Researcher at the Berkeley Sensor and Actuator Center, University of California-Berkeley, Berkeley, from 2001 to 2002.

He is currently the Lynn H. Matthias Professor in Engineering and the Vilas Distinguished Achievement Professor at the University of Wisconsin – Madison. He is with the Department of Electrical and Computer Engineering and is also a Faculty Affiliate with the Departments of Biomedical Engineering and Ophthalmology and Visual Sciences, a faculty member of the Materials Science and Engineering, and the McPherson Eye Research Institute. He is a member of the Editorial Board of the Journal of Microelectromechannical Systems and Micromachines.

Professor Jiang is a Fellow of the Institute of Physics, the Royal Society of Chemistry, the American Institute for Medical and Biological Engineering, and Institute of Electrical and Electronics Engineers. He received numerous awards, including the National Science Foundation CAREER Award and the DARPA Young Faculty Award in 2008, the University of Wisconsin H.I. Romnes Faculty Fellowship in 2011, the National Institute of Health Director's New Innovator Award in 2011, the University of Wisconsin Vilas Associates Award in 2013, and the Research to Prevent Blindness Stein Innovation Award in 2016.

Abstract

Title: Micro-Sensors and Macro-Optics for Biomedical Applications

Hongrui Jiang

Microsensors and micro-scale optical detection and imaging have wide applications. With continuing miniaturization effort to realize integrated microsystems, the importance of micro-scale sensing components become more and more prominent. In this talk, I will present some of our works on micro-scale sensors and optical components and their resultant imaging systems. I will introduce a few types of microlenses and microlens arrays, including tunable liquid microlenses actuated by hydrogels, and through electrowetting and dielectric force. I will show a few examples of microcameras integrating these optical devices. I will also discuss about our work on mechanical microsensors, including flexible force and shear sensors based on capacitive sensing and implantable pressure and strain sensors based on high contrast gratings. My talk will also include a few examples of biomedical applications of these technologies, including endoscopes, laparoscopes, and remote axial focusing for 3D microscopy. Natural visualization systems often provide intriguing optical designs and unique properties, which serve as a great source of inspiration for micro-optical devices and systems. Therefore, I will also briefly discuss about artificial compound eyes mimicking reflecting superposition compound eyes found in some decapods, as well as all-optical photosensitivity enhancer inspired by the retina of elephant nose fish.