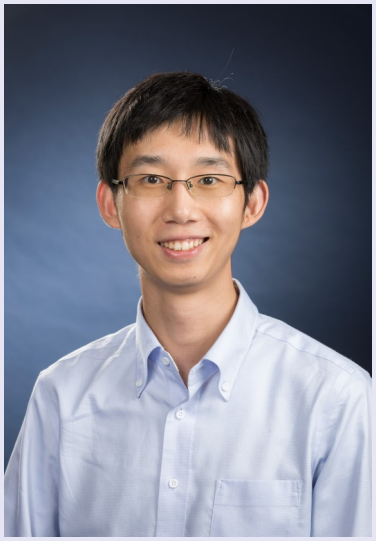
BIOENGINEERING FALL 2020 SEMINAR

Date: **Thursday, October 8**
Time: **12:00 pm - 1:00pm**
Location: **Virtual**
Join Zoom Meeting—https://gmu.zoom.us/j/92554249038?pwd=V2p1ZUdqM1Y2RnBCcWhDU0V0T2FZZz09

Meeting ID: 925 5424 9038 Passcode: 640851



Haichong Kai Zhang, Ph.D.

Biography: Dr. Haichong (Kai) Zhang is an Assistant Professor in Biomedical Engineering and Robotics Engineering with an appointment in Computer Science at Worcester Polytechnic Institute (WPI). He is the founding director of the Medical Frontier Ultrasound Imaging and Robotic Instrumentation (Medical FUSION) Laboratory. His research interests include advanced imaging and robotic instrumentation with emphasis on ultrasound and photoacoustics for medical applications. Dr. Zhang received his B.S. and M.S. in Human Health Sciences from the Kyoto University, Japan, and subsequently earned his M.S. and Ph.D. in Computer Science from the Johns Hopkins University. He is the recipient of the NIH Director's Early Independence Award (DP5) in 2019 and the Early Investigator Research Award from the Department of Defense Prostate Cancer Research Program in 2018.

Title: **Listening to the Sound of Light with a Robot: Molecular Photoacoustic Imaging and Robotic Instrumentation**

Abstract: The research program of the Medical FUSION lab focuses on the interface of medical robotics, sensing, and imaging, developing robotic interventional platforms under image guidance as well as imaging systems assisted by robot. In this talk, I will present two case studies. First, I will introduce a molecular photoacoustic imaging approach to detect prostate tissue abnormality and its robotic instrumentation for enhanced performance and clinical translation. Prostate cancer is the second leading cause of cancer-related death among men in the United States. Screening and monitoring are critical to both finding prostate cancer in its early stage, when they are easier to treat, and managing cancer treatment. The photoacoustic-based imaging approach can be real-time, non-invasive, non-ionizing, and highly selective and specific to depict cancer-specific targeted antigen. I will discuss the strategy of integrating imaging and robotic platform such as a robot-assisted ultrasound imaging system to translate this concept into a clinically practical environment. Second, I will introduce the paradigm of robot assisted ultrasound imaging enabling a reproducible follow-up assessment and improving the identification efficacy of thyroid diseases. Conventional ultrasound procedures require high physical and cognitive burden and yield clinical results that are highly operator-dependent, therefore, frequently diminishing diagnostic confidence in repetitive assessment. The robotic ultrasound platform comprises a robot arm attached to an ultrasound probe that guides the operator following the scanning path computed based on previous scans performed on the same patient. Through the integration of computer vision, haptic sensing, robotic control, and image analysis, the proposed system identifies the location and orientation of an ultrasound probe to be placed and maintains the optimal tissue-contact pressure to acquire ultrasound images comparable to that of previous exams.