

# **Microwave-Ultrasound Hybrid Systems in Imaging and Implantable Medical Devices**

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Professor, Stanford University

**Date: Friday, October 28, 2016**

**Time: 1:30pm Location: EEB 132**

**Abstract:** Our group investigates new medical devices and concepts that combine advanced electronics with new physical interactions to address challenges in imaging, sensing, and implantable devices. This talk will focus on two of the active areas: i) low-cost portable medical imaging systems to bring screening and diagnostics closer to patients, and ii) minimally-invasive implantable medical devices (IMDs) for monitoring and modulating local physiology through neuromodulation.

The first part of the talk focuses on medical imaging. Conventional imaging modalities (MRI, PET, CT) rely on expensive and bulky hardware that limit usage to hospitals and clinics. In addition to access, safety is a major concern for frequent screening application (e.g., breast cancer screening). This talk will cover hybrid imaging techniques that combine RF/Microwave with ultrasound to provide high-resolution imaging of dielectric contrasts created by hemorrhages or by tumor angiogenesis and necrotic cores. Additionally, a new paradigm in thermoacoustics, namely standoff non-contact imaging for remote interrogation of hidden/embedded objects in highly dispersive media, with broad applications in security and medical screening, will be presented.

The second part of the talk focuses on implantable medical devices (IMDs), and the fundamental challenges related to the miniaturization of smart and minimally invasive IMDs. I will briefly discuss the design of a system that pushes dimensions down to the mm and sub-mm regime while maintaining the capacity to perform advanced and multi-modal closed-loop monitoring and stimulation.

**Biography:** Amin Arbabian received his Ph.D. degree in EECS from UC Berkeley in 2011. In 2012 he joined Stanford University, as an Assistant Professor of Electrical Engineering, where he is also a School of Engineering Frederick E. Terman Fellow. Amin's research interests are in high-frequency circuits, systems, and antennas, medical imaging, and ultra-low power sensors and implantable devices.

Prof. Arbabian is the recipient/co-recipient of the 2016 Stanford University Tau Beta Pi Award for Excellence in Undergraduate Teaching, 2015 NSF CAREER award, 2014 DARPA Young Faculty Award, 2013 Hellman Faculty Scholarship, the 2010-11, 2014-15, and 2016-17 Qualcomm Innovation fellowships, and best paper awards at the 2016 IEEE Conference on Biomedical Wireless Technologies, Networks, and Sensing Systems, 2014 IEEE VLSI Circuits symposium, 2013 IEEE International Conference on Ultra-Wideband (ICUWB), the 2010 IEEE Jack Kilby Award for Outstanding Student Paper at the International Solid-State Circuits Conference, and two time second place Best Student Paper Awards at 2008 and 2011 RFIC symposiums.

*Hosted by Prof. Hossein Hashemi, Prof. Mike Chen, and Prof. Mahta Moghaddam. Organized and hosted by Tzu-Fan Wu.*