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.