Title: Arrhythmia Discrimination Using a Smartphone

Abstract: Atrial Fibrillation (AF) is the most common sustained arrhythmia. Over 5.2 million Americans have been diagnosed with AF, and the prevalence of AF is increasing concomitant with the aging of the U.S. population. AF exerts a significant negative impact on the longevity and quality of life of a growing number of Americans, predominantly through its association with an increased risk for heart failure and stroke. Effective AF treatments reduce a risk of complications from AF. A major challenge facing clinicians and researchers is the early detection of AF, because particularly in its early stages, AF can be intermittent and asymptomatic. While the population with undiagnosed AF is substantial, studies have shown that more intensive cardiac monitoring can improve AF detection and enable timelier institution of treatment. Automated AF detection algorithms offer real-time realizable AF detection but often suffer from the fact that common benign causes of rhythm irregularity, most notably premature atrial (PAC) and ventricular (PVC) contractions, can cause false positive AF detection. There is a pressing need to develop a continuous arrhythmia monitoring device that can accurately and reproducibly distinguish between AF, NSR, and premature beats (PACs and PVCs) in order to improve patients' cardiovascular health and reduce the costs associated with treating AF. To this end, we have recently developed a smartphone application for arrhythmia discrimination, which can identify NSR, AF, PACs and PVCs using pulsatile time series collected from a smartphone's camera. This application detects and removes motion and noise artifacts (MNAs). This talk discusses the development and clinical testing of arrhythmia discrimination. Given the ever-growing popularity of wearable devices and smartphones, our approach to arrhythmia discrimination will give the population as well as health care providers the opportunity to monitor arrhythmia under a wide variety of conditions outside of the physician's office.

Jo Woon Chong is an Assistant Professor in the Department of Electrical and Computer Engineering at Texas Tech University (TTU). He worked as Postdoctoral Fellow (2010-2012) in the Laboratory for Information and Decision Systems (LIDS) at Massachusetts Institute of Technology (MIT), Research Assistant Professor (2012-2016) in the Biomedical Engineering Department at Worcester Polytechnic Institute (WPI), and Visiting Scholar (2014-2016) in the Department of Biomedical Engineering at University of Connecticut (UConn). He holds a Ph.D. degree (2009) in Electrical Engineering from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea. Dr. Chong has conducted research in a variety of areas, including medical instrumentation, biosignal processing, identification and modeling of physiological systems, non-invasive physiological monitoring, home monitoring of health and disease, and wireless communication and networks. He is a co-author of 22 journal papers, 35 conference publications, and one book chapter. He has 22 patents and software registrations. He is currently working as Principal Investigator on the NIH project related to detecting arrhythmia using smartphones.