ABSTRACT
Wireless networks have been traditionally used for communications. However, wireless signals also have the potential to extend our senses, enabling us to see moving objects through walls and behind closed doors. Specifically, as these signals travel in the medium, they traverse occlusions and bounce off different objects before arriving at a receiver; hence, they carry information about the environment. The key challenge in extracting this information is that we live in a sea of waves which interact with each other and with the environment in complex ways.

In this talk, I will demonstrate how we can build systems and design algorithms that can extract this information and enable wireless networks to deliver new sensing services. In particular, I will describe how we can use WiFi signals to sense motion through walls. I will also show how we design wireless systems that can accurately track the 3D motion of people from the wireless signals reflected off their bodies, even if they are behind a wall. Finally, I will touch on how these systems can also recover a coarse human silhouette behind a wall, trace hand gestures in mid-air, and monitor our breathing and heart rates remotely.

This research is being commercialized for elderly monitoring by a recent startup, Emerald, which is currently in the pilot stage. It is also being used in studies on sleep apnea at Massachusetts General Hospital. Looking forward, this approach to sensing through wireless signals promises to deliver new services in various settings including smart homes, communications, health-care, and human-machine interfaces.

BIOGRAPHY:
Fadel Adib is a Ph.D. candidate in Electrical Engineering and Computer Science at MIT. He works on wireless networks and sensing systems. His research has been identified as one of the 50 ways MIT has transformed Computer Science over the past 50 years. This work has also been featured in BBC, NBC, CBS, The Washington Post, The Boston Globe, and The Guardian. Adib was named to the Forbes’ list of 30 under 30 and Technology Review’s list of the world’s top 35 innovators under 35. He is also the recipient of the Microsoft Research PhD Fellowship, the Jacobs Presidential Fellowship from MIT, the MobiCom 2014 Best Demo Award, the CHI 2015 Honorable Mention Award, and the best Master’s thesis award in EECS at MIT. Before joining MIT, Adib received a bachelor's degree in Computer and Communications Engineering from the American University of Beirut, where he received the Distinguished Graduate Award for graduating with the university’s highest GPA on record. Most recently, he demoed his research to President Obama at the White House as part of the First-Ever White House Demo Day.

Hosted by Professor Xiaofan (Fred) Jiang