Wearable devices: statistical methods and applications

Abstract: Wearable devices, such as accelerometers and heart rate monitors, can now provide objective and continuous measurements of human activity. Such devices have been widely deployed in large observational and clinical studies because they are expected to produce objective measurements that could improve or replace current self-reported activity measuring practices. In this talk I will present an overall picture for accelerometry research, describe the multi-layered structure of the signal from micro- to macro-level, and introduce methods for the study of the association between activity measurements and health. First, I will describe a new movement recognition method based on “movelets”, which predicts the type of physical activity at the sub-second level using the micro-structure of the accelerometry data. Then I will briefly describe several ways of transforming the micro-structure of the data into its macro-structure form. Finally, I will discuss a two-stage model for the macro-structure of the data to describe the inactive/active and activity intensity dynamics of the circadian rhythm of physical activity.