University of California, Irvine
Statistics Seminar

Process-based Inference for Actigraph Data from Wearable Devices

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Rapid developments in streaming data technologies have enabled real-time monitoring of human activity. Wearable devices, such as wrist-worn sensors that monitor gross motor activity (actigraphy), have become prevalent. An actigraph unit continually records the activity level of an individual, producing large amounts of high-resolution measurements that can be immediately downloaded and analyzed. While this type of BIG DATA includes both spatial and temporal information, we argue that the underlying process is more appropriately modeled as a stochastic evolution through time, while accounting for spatial information separately. A key challenge is the construction of valid stochastic processes over paths. We devise a spatial-temporal modeling framework for massive amounts of actigraphy data, while delivering fully model-based inference and uncertainty quantification. Building upon recent developments we discuss traditional Bayesian inference using Markov chain Monte Carlo algorithms as well as faster alternatives such as Bayesian predictive stacking. We test and validate our methods on simulated data and subsequently evaluate their predictive ability on an original dataset from the Physical Activity through Sustainable Transport Approaches (PASTA-LA). *Study conducted by UCLA's Fielding School of Public Health.*