



The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on Statistics and Data Science

**Statistical Methods for Wearable Device Data
with Applications in Clinical Studies**

By

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Abstract

With the recent development and popularity of wearable devices, actigraphy has been widely used in clinical studies to provide continuous and objective activity measures and monitor daily sleep-activity patterns. While actigraphy contains rich information, statistical methods to effectively extract the information are still lacking. In this talk, I will discuss our proposed methods to analyze accelerometer data, from pattern recognition to circadian rhythm analysis. First, current sleep/wake identification algorithms are often labor-intensive in model training steps, subjective in variable selection, and ad-hoc in the limited use of each trained algorithm in one dataset. We proposed a universal unsupervised algorithm based on Hidden Markov Model, which is applicable to actigraph data collected from different populations, wearable devices, and wearing methods. Second, current methods for circadian rhythm analysis cannot effectively analyze the periodic information in sleep-wake circadian rhythms. We proposed a penalized multi-band learning algorithm that can analyze actigraphy to select dominant periodicities sequentially and characterize the sleep-wake circadian rhythm of the study population. Applying our methods to a toddler Actiwatch dataset from Shanghai Children's Medical Center provides new insights into early childhood development, as we are able to characterize individual heterogeneities in activity patterns as well as identify the association between circadian rhythm formation and early childhood physical development. Implementation of our methods using UK Biobank data also identified novel genetic loci associated with sleep and circadian rhythms.

Date: Thursday, 29 November 2018
Time: 10:00a.m.-11:00a.m.
Venue: Room 2303 (lifts 17 & 18),
Academic Building, HKUST

All are welcome!