SCHOOL OF DATA SCIENCE

SEMINAR SERIES

Statistical Methods for Wearable Device Data with Applications in Clinical Studies

Date: 26 November 2018 (Monday)
Time: 10:00am to 11:00am
Venue: G4302, Green Zone, 4/F, Yeung Kin Man Academic Building (YEUNG), City University of Hong Kong

Ms. Li, Xinyue
PhD Candidate in Biostatistics
Yale University

Guest Speaker's profile

Xinyue Li is a fifth-year Biostatistics PhD candidate at Yale University. She received her B.A. and M.S. in Statistics from the University of Chicago in 2014. Her research interests are statistical methods for time-series wearable device data, including activity type identification, circadian rhythm characterization, and pattern clustering. She is also interested in scalable statistical learning and machine learning methods for large datasets.

She has several collaborative projects with Yale Center for Outcomes Research & Evaluation, Shanghai Jiao Tong University-Yale Joint Center for Biostatistics, and Shanghai Children′s Medical Center, and the topics include chronic disease epidemiological studies, electronic health records studies, and physical activity research.

She was the teaching assistant for multiple graduate-level courses, including Theory of Survival Analysis, Generalized Linear Models, Applied Regression Analysis, and Categorical Data Analysis, in which she gave guest lectures, led discussion sessions, and gave weekly presentations.

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.

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All are welcome