San Diego State University

SDSU Mathematics Colloquium Distinguished Lecture Series

Statistical and Ethical Considerations in the Analysis of Human Activity Pattern Data

Monday, April 17, 2023 4pm–5pm, GMCS 405

Departmental Tea at 3:30pm

SPEAKER: Dr. Catherin (Kate) Calder

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ABSTRACT: In the biomedical and social sciences, mobile phone tracking (MPT) data — collected using location sensing technologies readily available on smartphones — has become an increasingly common component of cohort studies, where it has been employed for purposes of digital phenotyping or estimating personal exposure to the ambient environment or particular social contexts. Notwithstanding meaningful progress for interpolating movement and summarizing activity, there are numerous statistical challenges associated with using it for research purposes. For example, there is not a formal statistical infrastructure for parameter inference and trajectory imputation under various forms of missing data that are ubiquitous in practice. In this talk, I will introduce a foundational statistical model for studying individual human mobility using MPT data by formalizing the so-called flight-pause paradigm for human movement as a likelihood for a random object, called a motion, made up of increments of changes in space and time. Under this model, it is possible to illuminate the consequences of different MPT data collection mechanisms, including the surprising result that common assumptions about the missing data mechanism for MPT are not valid for the mechanism governing the random motions of the flight-pause model. The consequences of missing data and proposed adjustments will be illustrated using both simulations and real data, illustrating how the statistical formulation pursued here can serve as a foundation for continued statistical research on MPT data collection, design, and analysis. Finally, I will briefly discuss some ethical considerations related to the use of MPT data for research purposes. This is joint work with Marcin Jurek, Cory Zigler, and Chris Browning.

BIO: Catherine (Kate) Calder currently serves as the chair in the Department of Statistics and Data Sciences (SDS) at UT Austin. Previously, she spent 16 years on the faculty of The Ohio State University. Dr. Calder's methodological research interests are in spatio-temporal statistics, Bayesian methods, and network analysis. Most of her applied work focuses on problems that fall under the umbrella of exposure/contextual effects analysis. She has developed statistical methods for quantifying individual- and population- level exposures that account for human mobility and network dependence and for examining both the causes and consequences of social and environmental exposures. She currently leads an NIH NICHD-funded project that uses Adolescent Health and Development in Context data to construct bipartite networks of youth and the places they spend time to understand their implications for health and developmental outcomes.