

Functional Mixed Effects Spectral Analysis for Analyzing Heart Rate Variability during Sleep

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3:30-4:30pm, New PI 6th Floor Multipurpose Room (6602)
Light refreshments provided

Abstract

In many studies, interest lies in understanding how frequency domain patterns of time series are associated with covariates when time series are collected from multiple participants and multiple time series are collected from the same participant. The motivation for this talk is a study that seeks to quantify how nervous system modulation and stress are associated with poor sleep in older adults through an analysis of heart rate variability epochs collected during different periods of sleep. Despite the wealth of methods developed to address such questions when interest lies in time domain parameters, primarily under the banners of longitudinal and functional data analysis, comparatively little attention has been directed towards such questions when scientific interest lies in frequency domain parameters. This talk discusses a mixed effects Cramér spectral representation that can be used to model the effects of covariates on second-order power spectra while accounting for correlations among the time series collected from the same participant. The transfer function is composed of a deterministic component to account for the population-average effects and a random component to account for participant-specific deviations. The resulting log-spectrum has a functional mixed effects representation where both the fixed effects and random effects are functions in the frequency domain. A data-driven iterative estimation procedure is offered for efficient periodic smoothing spline estimation and inference.

Biographical Note

Robert Krafty is an Assistant Professor of Statistics at Temple University and was previously on faculty at the University of Pittsburgh. His research centers around developing methods for analyzing time series and functional data and in using these methods to solve questions that arise from complicated data structures. He is particularly interested in problems in sleep research, chronobiology, biopsychology, and epidemiology. Dr. Krafty received his PhD in Biostatistics and Master's degree in Mathematics from the University of Pennsylvania and his Bachelor's degree in Mathematics and Dance from SUNY Stony Brook.

¹ The PI Biostatistics Seminar Series is held on Tuesdays at New York State Psychiatric Institute. If you are interested in receiving regular announcements for our seminars in the future, or if you need further information, please contact Jina James (jamesji@nyspi.columbia.edu, (212) 543-5589).