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An Empirical Bayes Solution for Selection Bias in Functional Data

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3:20 – 4:20pm
Light refreshments will be served
110 Frelinghuysen Road

Abstract: Selection bias results from the selection of extreme observations and is a well-recognized issue for standard scalar or multivariate data. Numerous approaches have been proposed to address the issue, dating back at least as far as the James-Stein shrinkage estimator. However, the same potential issue arises, albeit with additional complications, for functional data. Given a set of observed functions, one may wish to select for further analysis those which are most extreme according to some metric such as the average, maximum, or minimum value of the function. However, given the functions are often noisy realizations of some underlying mean process, these outliers are likely to generate biased estimates of the quantity of interest. In this talk I propose an Empirical Bayes approach, using Tweedie's formula, to adjust such functional data to generate approximately unbiased estimates of the true mean functions. The approach has several advantages. It is non-parametric in nature but is capable of automatically shrinking back towards a James-Stein type estimator in low signal situations. It is also computationally efficient and possesses desirable theoretical properties. Furthermore, I demonstrate through extensive simulations that the approach can produce significant improvements in prediction accuracy relative to possible competitors.

Bio: Gareth M. James, Ph.D., is the E. Morgan Stanley Chair in Business Administration and Professor of Data Sciences and Operations in the Marshall School of Business at the University of Southern California. He has been on the faculty since 1998. He is currently serving as the Director of the Institute for Outlier Research in Business. Dr. James has authored numerous journal articles, discussion articles, books, conference proceedings and book chapters. In particular he has published extensively in the areas of functional data analysis and high dimensional statistics. His work has been extensively cited. Dr. James has also served as the PI or Co-PI on several NSF research grants. He is currently an Associate Editor for JRSSB and Operations Research and served in the past in this capacity for JASA Theory and Methods, JASA Case Studies and Applications, and Statistica Sinca. He is an elected Fellow of the American Statistical Association and a life member of the Institute of Mathematical Statistics.