Statistics Seminar

Department of Mathematical Sciences

DATE:	Thursday, April 7, 2022
TIME:	1:15pm – 2:15pm
LOCATION:	Zoom meeting
SPEAKER:	Yangsheng Wang, Binghamton University
TITLE:	Recovering the Underlying Trajectory from Sparse and Irregular Longitudinal Data

Abstract

In this article, we consider the problem of recovering the underlying trajectory when the longitudinal data are sparsely and irregularly observed and noise-contaminated. Such data are popularly analyzed with functional principal component analysis via the principal analysis by conditional estimation (PACE) method. The PACE method may sometimes be numerically unstable because it involves the inverse of the covariance matrix. We propose a sparse orthonormal approximation (SOAP) method as an alternative. It estimates the optimal empirical basis functions in the best approximation framework rather than eigen-decomposing the covariance function. The SOAP method avoids estimating the mean and covariance function, which is challenging when the assembled time points with observations for all subjects are not sufficiently dense. The method also avoids the inverse of the covariance matrix, hence the computation is more stable. It does not require the functional principal component scores to follow the Gaussian distribution. We show that the SOAP estimate for the optimal empirical basis function is asymptotically consistent. The finite-sample performance of the SOAP method is investigated in simulation studies in comparison with the PACE method. Our method is demonstrated by recovering the CD4 percentage curves from sparse and irregular data in a multi-centre AIDS cohort study.