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Covariate Adjusted Functional Principal Components Analysis for Longitudinal Data

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Abstract

Classical multivariate principal component analysis has been extended to functional data and termed Functional principal component analysis (FPCA). Much progress has been made but most existing FPCA approaches do not accommodate covariate information, and it is the goal of this talk to develop alternative approaches to incorporate covariate information in FPCA, especially for irregular or sparse functional data. Two approaches are studied: the first incorporates covariate effects only through the mean response function, but the second approach adjusts the covariate effects for both the mean and covariance functions of the response. Both new approaches can accommodate measurement errors and allow data to be sampled at regular or irregular time grids. Asymptotic results are developed and numerical support provided through simulations and a data example. A comparison of the two approaches will also be discussed.