Baylor University
COLLEGE OF ARTS & SCIENCES
Statistical Science

Principal Component Analysis using Frequency Components of Multivariate Time Series

Raanju Sundararajan
Assistant Professor
Department of Statistical Science

Southern Methodist University

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Marrs McLean Science Building 301

Abstract: Dimension reduction techniques for multivariate time series decompose the observed series into a few useful independent/orthogonal univariate components. This talk introduces principal component analysis (PCA) in the multivariate time series context. After reviewing existing PCA methods, a new spectral domain method for multivariate second-order stationary time series that linearly transforms the observed series into several groups of lower-dimensional multivariate subseries is discussed. These multivariate subseries have non-zero spectral coherence among components within a group but have zero spectral coherence among components across groups. The observed series is expressed as a sum of frequency components whose variances are proportional to the spectral matrices at the respective frequencies. The demixing matrix is then estimated using an eigendecomposition on the sum of the variance matrices of these frequency components and its asymptotic properties are derived. Finally, a consistent test on the cross-spectrum of pairs of components is used to find the desired segmentation into the lower-dimensional subseries. The numerical performance of the proposed method is illustrated through simulation examples and an application to modeling and forecasting wind data is presented.

Bio: Raanju Sundararajan, Ph.D., is an Assistant Professor in the Department of Statistical Science at Southern Methodist University since August 2019. Raanju received his PhD in Statistics from Texas A&M University in 2018. His research focuses on theoretical and methodological problems in time series analysis. He also works on applications of time series analysis in disciplines such as neuroscience, economics, finance and geoscience.

Please join us in the foyer of the department for refreshments at 3:00 pm