سمینار هفتگي ماده چگال نرم

Collective Nonparametric Density and Spectral Density Estimation with Applications in Bioinformatics

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چکیده

In this talk, I review a nonparametric method for the collective estimation of multiple bivariate density functions for a collection of populations of protein backbone angles. This collective density estimation approach is widely applicable when there is a need to estimate multiple density functions from different populations with common features. In the second part of the talk, I present an extension of this approach for the simultaneous estimation of spectral density functions (SDFs) for a collection of stationary time series that share some common features. A collective estimation approach pools information and borrows strength across the SDFs to achieve better estimation efficiency. Also, each estimated spectral density has a concise representation using the coefficients of the basis expansion, and these coefficients can be used for visualization, clustering, and classification purposes. The Whittle pseudo-maximum likelihood approach is used to fit the model, and an alternating blockwise Newton-type algorithm is developed for the computation. A web-based shiny App found at "https://ncsde.shinyapps.io/NCSDE" is developed for visualization, training and learning the SDFs collectively using the proposed technique. Finally, we apply our method to cluster similar brain signals recorded by the electroencephalogram for identifying synchronized brain regions according to their spectral densities.

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