

The Functional Graphical Lasso

Abstract:

The problem of recovering conditional independence relationships between jointly distributed Hilbertian random elements given multiple realizations thereof is studied from the perspective of functional data analysis. We operate in the sparse high-dimensional regime, where number of realizations is smaller than the number of elements, and each element is only related to a small number of other elements. In this context, we propose an infinite-dimensional generalization of the graphical lasso. We prove model selection consistency under natural assumptions and extend many classical results to infinite dimensions. In particular, we do not require finite basis expansion or any other structural restrictions on the data generating mechanism. The plug-in nature of our method makes it applicable to any observational regime, whether sparse or dense, and indifferent to serial dependence. Importantly, our method can be understood as naturally arising from a coherent maximum likelihood philosophy, which is itself an entirely novel viewpoint for infinite-dimensional data. In this talk, the basic notions of functional data analysis and Gaussian graphical modeling will be introduced, and focus will be placed on the methodological aspects.