

Seminario Aleatorio

Sesión 421

Job Market Seminar

Bayesian model-based clustering for populations of network data

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Abstract

There is increasing appetite for analysing populations of network data due to the fast-growing body of applications demanding such methods. While methods exist to provide readily interpretable summaries of heterogeneous network populations, these are often descriptive or ad hoc, lacking any formal justification. In contrast, principled analysis methods often provide results difficult to relate back to the applied problem of interest. Motivated by two complementary applied examples, we develop a Bayesian framework to appropriately model complex heterogeneous network populations, whilst also allowing analysts to gain insights from the data, and make inferences most relevant to their needs. The first application involves a study in Computer Science measuring human movements across a University. The second analyses data from Neuroscience investigating relationships between different regions of the brain. While both applications entail analysis of a heterogeneous population of networks, network sizes vary considerably. We focus on the problem of clustering the elements of a network population, where each cluster is characterised by a network representative. We take advantage of the Bayesian machinery to simultaneously infer the cluster membership, the representatives, and the community structure of the representatives, thus allowing intuitive inferences to be made. The implementation of our method on the human movement study reveals interesting movement patterns of individuals in clusters, readily characterised by their network representative. For the brain networks application, our model reveals a cluster of individuals with different network properties of particular interest in Neuroscience. The performance of our method is additionally validated in extensive simulation studies

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