Advances in latent space representations of dynamic random graphs

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Random graphs are used to give a formal characterisation to the observed interactions within a set of entities. For example, these may be used to represent coauthorship relations between researchers, liabilities between financial institutions, or functional connectivity between different areas of the human brain. In recent years, a multitude of statistical models have been introduced to study the complex interdependencies that are exhibited by these objects. Most approaches consider static graphs, where the interactions are either aggregated over time or simply collected as they manifest in a snapshot. However, in the vast majority of cases, the interactions are inherently dynamic, as they evolve in a continuous fashion over time. Very limited research has been carried out on the analysis of the non-static structures so far. The main goal of this project is to develop new statistical methodologies to analyse dynamic networks. In particular, the research will focus on latent variable models that allow one to visualise the nodes in a latent Euclidean space. As a consequence, the proposed approaches will guarantee a simplified representation of the complex network structures, and they will permit the extraction of meaningful summaries that can be derived from the model. Due to the large size of the available datasets, one fundamental aspect of the project will be computation, and, in particular, the design of scalable inferential Bayesian procedures that can challenge the current computational barriers in the field.

References

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