

Proposition de stage de M2
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Representation of social temporal networks

Abstract:

Data concerning social interactions of individuals is becoming increasingly available, including data with temporal resolution. These data are typically represented as temporal networks, whose analysis and interpretation can be complex. In particular, the temporal network at a certain time t includes only the interactions taking place at t , so does not inform us on the global status of the social system at this time, which depends on all the previous interactions. On the other hand, integrating interactions on long time scales leads to a blurred image in which potential important temporal patterns are flattened.

Recently, some works have explored the possibility to represent differently temporal networks, in order to tackle this problem [1,2]. In our group, we have also recently put forward a new representation of temporal social networks based on the idea that each individual has a finite interaction capital that s/he needs to divide between contacts [3]: if A has a contact with B, it means the tie between A and B is reinforced but other ties of A loose strength.

The internship will consist in an in-depth analysis of this representation for various data sets and model temporal networks, in which structure and temporal patterns can be tuned to represent various social situations (separated communities, groups merging or splitting, etc). We will investigate how well the new representation allows to characterize the social system at each time and to detect periods of stability and moments of change in the social structure.

The internship could lead to a PhD on theoretical aspects of temporal networks.

Required profile: physicist trained in complex systems with good numerical (coding) skills, preferentially in python.

References

- [1] Epidemiologically Optimal Static Networks from Temporal Network Data
<https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003142>
- [2] Tie-decay temporal networks in continuous time and eigenvector-based centralities,
<https://arxiv.org/abs/1805.00193>
- [3] Limited communication capacity unveils strategies for human interaction
<https://www.nature.com/articles/srep01950/>