Contribution ID: **23** Type: **Presentation (15' + 5' for questions)**

Targeted Community Merging provides an efficient comparison between collaboration clusters and departmental partitions

Monday 25 September 2023 14:30 (20 minutes)

The field of Complex Systems has rapidly gained prominence over recent decades as a result of its capacity to explore the intricate and interdependent behaviors exhibited by a wide range of natural, social, and technological systems. Driven by advances in data availability, computational methods, and interdisciplinary collaboration, Complex Systems research has become a burgeoning field of study with broad cross-disciplinary appeal.

Community detection theory is vital for the structural analysis of many types of complex collaboration systems, especially for human-like collaboration networks. Within a network, a community is understood as a group of nodes among which interactions are more frequent (or of greater weight) than would be expected if interactions were completely random. The detection and analysis of this type of groups give us relevant information on the characteristics of the structure of interactions at a mesoscopic scale, halfway between the global and local scale.

Usually, complex systems are formed by a great number of interacting agents which implies huge quantities of data when modelling these systems. Because of this, the problem of community detection requires the development of powerful and optimized algorithms that fit the requirements of each problem. In this work, we present a new community detection algorithm, the Targeted Community Merging (TCM) algorithm, based on a well-known and widely used algorithm in the literature, which allows obtaining proper community partitions with a small number of communities.

We then perform an analysis and comparison between the departmental and community structure of scientific collaboration networks within the University of Zaragoza. To construct the scientific collaboration networks and perform this analysis, we use data from the University of Zaragoza. This data consists of published articles and researchers affiliation database, covering a period of time ranging from January 2002 to January 2021. Our analysis is focused on three macro-areas of knowledge of the University of Zaragoza: Science, Health Science and Engineering and Architecture.

Thus, we draw valuable conclusions from the inter- and intra-departmental collaboration structure that could be useful to take decisions on an eventual departmental restructuring. This algorithm and methods can be easily generalized to be applied to other collaboration systems where data of similar features and a native partition of the agents that conform the system are available.

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Session Classification: IBERGRID

Track Classification: R&D for computing services, networking, and data-driven science