

Communities and graph similarity in departmental structure of academic collaboration networks

Francisco Bauzá Mingueza, David Iñiguez Dieste, Alfonso Tarancón Lafita, and Jesús Gómez Gardeñes
 Institute for Biocomputation and Physics of Complex Systems, Universidad de Zaragoza, 50018 Zaragoza, Spain

Complex networks and graph theory have been widely applied in the study of scientific collaboration networks. In the recent years, many works have obtained results supporting this application, such as the formation of “small worlds” in collaboration networks [1], the correlation between the structure of collaboration networks and the research performance of scholars [2], or the influence of betweenness centrality in the attachment of new researchers to these systems [3].

In this work, we present a study about efficiency and optimization of researchers collaboration through the analysis of the community structure of collaboration networks. To this aim, we have used typical magnitudes and procedures of community detection in complex networks, such as Modularity and Girvan-Newman algorithm, and usual graph similarity indicators, such as Wallace [4] and Rand indexes. With these tools we make a comparison between the departmental and community structure of the scientific collaborations in the University of Zaragoza (Fig. 1).

The collaboration network has been modeled using the researchers co-authorship in published papers. In addition we have used the JCR impact of these papers to assign the weights of the links between two authors, so that those successful collaborations becomes highlighted in the network backbone. Based on this model, we assume that the higher is the modularity of the network the more efficient is the community structure improving the already existing profitable collaborations between researchers. Once the partition corresponding to the maximum modularity has been obtained we compare it with the existing departmental partition to assess their similarity. In addition, we calculate the modular partition that maximizes similarity with the departmental structure and the partition that, having the smallest number of clusters, display a large modularity value.

Our study points out that it is possible to minimize the number of departments in a university while keeping the per-

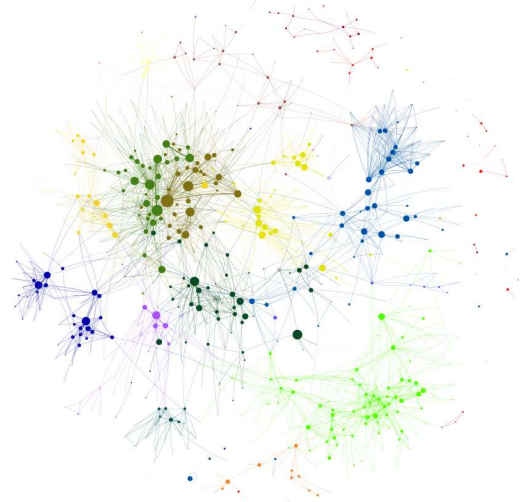


Fig. 1. Collaboration network within the Science area in the University of Zaragoza. Departmental structure appears represented by the colours of nodes.

formance of their researchers based on community detection methods.

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