Searching border communities' in badly conditioned graphs: some ideas about that.

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Abstract

Many complex systems can be modeled by graphs and networks, [4]. Many factors must be considered when studying the properties of graphs: the number of edges in the graph represents an important factor to consider, as it indicates whether the network is dispersed or highly connected; moreover, the weight of their edges is important as it provides us an idea about whether the graph its bad-conditioned or not.

The study of those subgraphs whose vertices have relatively many connections between/in themselves with respect to the graph structure, the so-called communities, is primarily interesting. In some problems, the study of communities allows quantitative and qualitative approaches and obtaining some knowledge about the structure of the graph and what it represents [1,2,3,5].

There is an extensive literature on the study of communities, mostly focused on non-directed graphs [2, 3, 5]. In our case, we focus our work on the study of communities in directed graphs, weakly connected, with weights on the edges.

In 2016, in this conference was presented an algorithm for the detection of directional communities in a directed graph [1], with a special interest in the graph representing the process of access to the Spanish Public University System, (SUPE). The proposed algorithm allowed to obtain communities that provided an approximation to the problem. In 2020 we propose a new algorithm based on obtaining the centers of the graph and pruning non-significant edges [6]. Recently a method for obtaining communities using convolution techniques was presented in [5] based on convolution techniques.

In this paper, we present several alternatives to obtain the communities in a directed graph using convolution techniques applied on linearized graphs that allow us to prune non-significant edges and study the behavior for the different procedures presented.

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