

COMMUNITY DETECTION IN COMPLEX NETWORKS WITH GENETIC ALGORITHMS

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In the last years, complex networks have been receiving a lot of interest by researchers because of their capability of representing the relationships among objects composing many real world systems. One of the main problems in the study of complex networks is the detection of community structure, i.e. the division of a network into groups of nodes having dense intra-connections, and sparse interconnections. In this context, Genetic Algorithms based approaches have been playing a central role because of their capability of exploring the search space and escaping from local minima during the optimization process. The objective of the tutorial is to introduce the evolutionary computation paradigm as a powerful technique for the community detection problem. The identification of a community structure in a network is formalized as an optimization problem that can be solved by using a population-based model, by applying genetic operators that allow the exploration of the search space to find a solution. Several types of networks are considered, such as undirected, directed, weighted, signed, multi-dimensional, time evolving, and the most recent proposals exploiting evolutionary techniques for finding communities in these types of networks, both non-overlapping and overlapping community structure, are described. Moreover, the differences between the different representations adopted by methods, along with single objective versus multi-objective approaches, are discussed.