Multitype modular networks as a model of clustered social networks

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Tackling the structural complexity of social networks in an analytical framework is not an easy task and many existing models must rely on simplifying assumptions although realistic in some context in order to be solvable. We present a multitype generalization of the configuration model that can take into account realistic social structures such as households, schools, workplaces, etc.

In the model we differentiate nodes into categories (e.g. gender, age) by assigning each to a specific type, and edges between nodes can be due either to a direct connexion (e.g. friendship) or to membership in a common group (e.g. workplace, family). The multitype approach is also applied to groups such that nodes can belong to groups of different types, each type of groups having a distinct size distribution and edge density within its members.

Using a probability generating function formalism, we obtain typical percolation properties of our model, such as the size of the giant component and the percolation threshold, and compare those predictions with numerical simulations.