

## Generalized Louvain Method for Community Detection in Large Networks

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### Abstract

In this paper we present a novel strategy to discover the community structure of (possibly, large) networks. This approach is based on the well-know concept of network modularity optimization. To do so, our algorithm exploits a novel measure of edge centrality, based on the k-paths. This technique allows to efficiently compute a edge ranking in large networks in near linear time. Once the centrality ranking is calculated, the algorithm computes the pairwise proximity between nodes of the network. Finally, it discovers the community structure adopting a strategy inspired by the well-known state-of-the-art Louvain method (henceforth, LM), efficiently maximizing the network modularity. The experiments we carried out show that our algorithm outperforms other techniques and slightly improves results of the original LM, providing reliable results. Another advantage is that its adoption is naturally extended even to unweighted networks, differently with respect to the LM.

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