

1135-90-2390

Kimon Fountoulakis*, 1947 Center Street, Ste. 600, Berkeley, CA 94704, and **Farbod Roosta-Khorasani, Julian Shun, Xiang Cheng** and **Michael Mahoney**. *Variational Perspective on Local Graph Clustering*.

Modern graph clustering applications require the analysis of large graphs and this can be computationally expensive. In this regard, local spectral graph clustering methods aim to identify well-connected clusters around a given "seed set" of reference nodes without accessing the entire graph. The celebrated Approximate Personalized PageRank (APPR) algorithm in the seminal paper by Andersen et al. is one such method. APPR was introduced and motivated purely from an algorithmic perspective. In other words, there is no a priori notion of objective function/optimality conditions that characterizes the steps taken by APPR. Here, we derive a novel variational formulation which makes explicit the actual optimization problem solved by APPR. We show that an optimization algorithm which apparently requires accessing the entire graph, can be made to behave in a completely local manner by accessing only a small number of nodes. This viewpoint builds a bridge across two seemingly disjoint fields of graph processing and numerical optimization, and it allows one to leverage well-studied, numerically robust, and efficient optimization algorithms for processing today's large graphs. (Received September 26, 2017)