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p-Norm Flow Diffusion for Local Graph Clustering

Local graph clustering and the closely related seed set expansion problem are primitives on graphs that are central to a wide range of analytic and learning tasks such as local clustering, community detection, semi-supervised learning, nodes ranking and feature inference. In this talk we will present a family of convex optimization formulations based on the idea of diffusion with p-norm network flow. In the context of local clustering, we will present a characterization of the optimal solutions for these optimization problems and we will show their usefulness in finding low conductance cuts around input seed set. In particular, we achieve quadratic approximation of conductance in the case of $p = 2$ similar to the Cheeger-type bounds of spectral methods, constant factor approximation when p goes to infinity, and a smooth transition for general p values in between. Moreover, in this talk we will show that the proposed problem can be solved in strongly local running time for p is larger or equal to 2. Finally, we will present empirical evaluations on both synthetic and real-world graphs to illustrate our approach compares favorably with existing methods.