Densest subgraph discovery references

The linear program for densest subgraph that we covered in class, and the ½-approximation for the greedy algorithm were first shown by Charikar [1]. In class, we covered the ½-approximation proof for the greedy algorithm due to Khuller and Saha [3]. A min s-t cut formulation for the densest subgraph problem was first given by Goldberg [2]. The technique covered in class is based on the same fundamental idea though the presentation is different.

Other related work. The above references are foundational results on densest subgraphs that have been used extensively, even in very recent papers. In [4], the authors showed how to use the dual of the densest subgraph LP to find near-optimal solutions to the problem in changing *dynamic* graphs [4]. Improved greedy algorithms were studied in [5,6]. A generalized objective that captures both densest subgraphs and the k-core problem was presented in [7], with generalized greedy peeling algorithms.

[1] Moses Charikar. Greedy approximation algorithms for finding dense components in a graph. In International Workshop on Approximation Algorithms for Combinatorial Optimization, pages 84–95. Springer, 2000.

[2] Andrew V Goldberg. Finding a maximum density subgraph. Tech Report, UC Berkeley, 1984.

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[4] Sawlani, Saurabh, and Junxing Wang. "Near-optimal fully dynamic densest subgraph." *Proceedings of the 52nd Annual ACM SIGACT Symposium on Theory of Computing*. 2020.

[5] Chekuri, C., Quanrud, K., & Torres, M. R. (2022). Densest Subgraph: Supermodularity, Iterative Peeling, and Flow. In *Proceedings of the 2022 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)* (pp. 1531-1555). Society for Industrial and Applied Mathematics.

[6] Boob, D., Gao, Y., Peng, R., Sawlani, S., Tsourakakis, C., Wang, D., & Wang, J. (2020, April). Flowless: Extracting densest subgraphs without flow computations. In *Proceedings of The Web Conference 2020* (pp. 573-583).

[7] Veldt, N., Benson, A. R., & Kleinberg, J. (2021, August). The generalized mean densest subgraph problem. In *Proceedings of the 27th ACM SIGKDD Conference on Knowledge Discovery & Data Mining* (pp. 1604-1614).