On Core Structures of Social Graphs

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Abstract

Given graph G, the k-core is a maximal subgraph such that the minimum degree in the induced subgraph is k. It finds many applications in social graph analysis.

1. We present a \(O(n \log d)\) space algorithm to estimate k-cores in large graphs, where \(n\) is the number of nodes, and \(d\) is the maximum degree. Our experimental study shows space savings up to 60X with average relative error less than 2.3%.

2. We propose 'k-peak' decomposition to understand different k-core density at different regions of graphs. We demonstrate that k-peak decomposition presents a global mapping of a graph.

3. K-core computing is related to h-index. We present algorithms to compute h-index in various streaming settings and get a \((1 \pm \epsilon)\) estimate of the h-index with sublinear, ie, polylog or even \(O(1)\) space.

Our work contributes to the understanding of the k-core structure of social graphs.

Defense Committee: Prof. S. Muthukrishnan (Chair), Prof. Badri Nath, Prof. William Steiger, Prof. Laks V.S. Lakshmanan (University of British Columbia)