Recent advances in information science have shown that linked data pervade our society and the natural world around us. Graphs have become increasingly important for representing complicated structures such as Wikipedia, Freebase, and various social networks. However, existing algorithms cannot handle large graphs efficiently, so fast algorithms are needed. We introduce two fast algorithms. They outperform previous algorithms in terms of both speed and quality. Our algorithms are fundamental to many applications. Our algorithms allow many applications to be processed more efficiently and will help to improve the effectiveness of future applications.

**Efficient graph based labeling algorithm [1]**

**Overview**
Find high PageRank nodes from large-scale graphs efficiently and exactly

- Compute lower/upper labeling scores from the definition:
  \[
  F = \alpha SF + (1 - \alpha)Y \\
  = (1 - \alpha)(Y + \alpha SY + \alpha^2 S^2 Y + \cdots)
  \]

  \(F\): nodes \times scores matrix  \(\alpha\): constant parameter
  \(S\): adjacency matrix  \(Y\): given score distribution

**Fast algorithm for graph clustering [2]**

**Overview**
Efficiently detect communities, hubs and outliers from large-scale graph data

- Find coarse communities by computing 2-hop away nodes
- Refine communities by finding nodes that are belong to multi-communities

**Related works**


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