What is Effective Resistance (ER)?

- Effective Resistance
- Problem Definition
- Effective Resistance
- Applications of ER
  - Electrical Circuit & Power Network Analysis
  - Graph Sparsifiers
  - Graph Clustering
  - Recommendation Systems
  - Image Segmentation
- Problem Definition

1. The ER of node pair \((s, t)\) is a sum of the random walk probabilities of all possible numbers of hops between \(s\) and \(t\). It describes the dissimilarity of nodes \(s\) and \(t\).
2. Applications of ER
   - Electrical Circuit & Power Network Analysis
   - Graph Sparsifiers
   - Graph Clustering
   - Recommendation Systems
   - Image Segmentation

Efficient Estimation of Pairwise Effective Resistance
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Reducing Random Walk Length
- Finding a Maximum Random Walk Length
- Utilizing Node Degrees
- On Facebook graph (#nodes=4k, #edges=88k)

Pruning Random Walks
- An Observation
- #Path & #Random Walks from Node \(s\) to Node \(t\)
- Combining Deterministic Graph Traversal and Random Walks in an Adaptive Manner

Limitations of Existing Work
- Existing works need either expensive matrix operations or a huge number of long random walks.
- The SOTA is a Monte-Carlo Approach
- Maximum Random Walk Length

Experimental Setup
- Dataset
- Experimental Results
- Our Maximum Random Walk Length
- Finding a Maximum Random Walk Length
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- Error threshold \(\epsilon\)
- Maximum Random Walk Length
- Approximate Pairwise ER Query

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