

Computational Complexity

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1 Max Flow

1. Applications and problem definition.
2. Improving an existing flow.
3. Augmenting path theorem.
4. The Ford-Fulkerson algorithm.

2 Flows, Cuts and Duality

1. The notion of cuts in a weighted, directed graph.
2. The Min-cut problem.
3. The Max-Flow - Min-cut theorem.
4. Saturating an edge.
5. Duality between the Max-Flow and Min-Cut problems.

3 Transformations and Reductions

1. Reducing the Find-min problem to the sorting problem.
2. Reducing the sorting problem to the Find-min problem.
3. The bipartite perfect matching problem with applications.
4. Reduction to Maximum flow.
5. The general notion of reduction with a brief introduction to **NP-completeness**.