

Algorithmic Problem Solving

17ECSE309

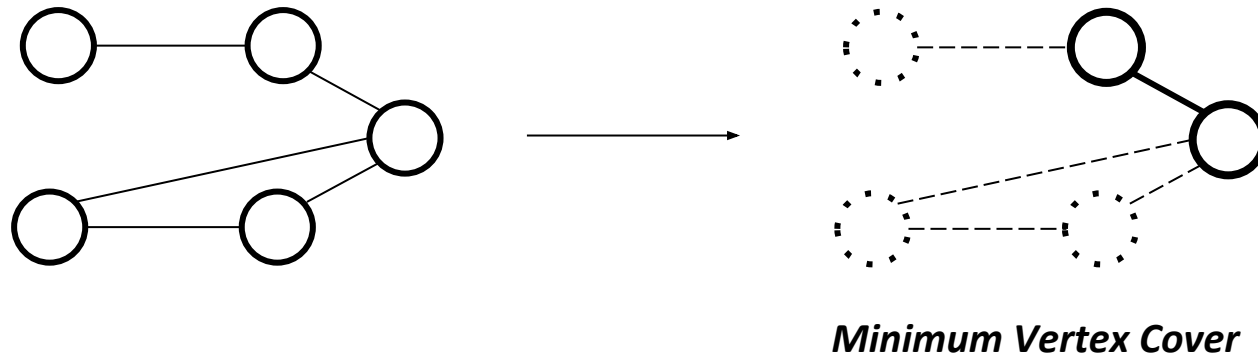
Vertex Cover Problem

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The Problem

- A **vertex cover** of a graph is a set of vertices such that each edge of the graph is incident to at least one vertex of the set
- A ***minimum vertex cover*** is a **vertex cover** of smallest possible size.



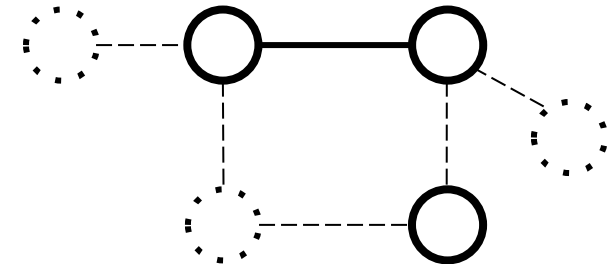
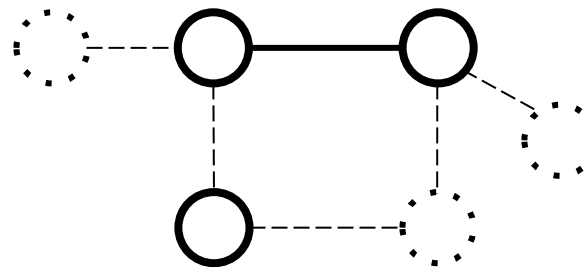
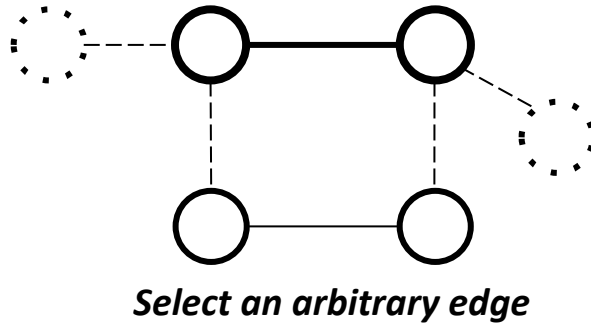
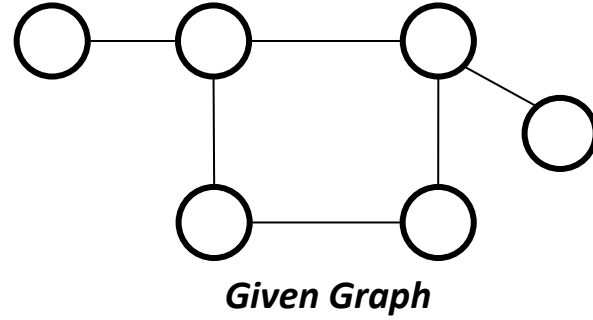
The Solution

- Finding a *vertex cover* for a given undirected graph is a menial job.
- Finding the *minimum vertex cover*, on the other hand, is a near improbable task when computed using a computer.
- Vertex Cover Problem is a known NP Complete problem, i.e., there is no polynomial time solution. There are approximate polynomial time algorithms to solve the problem though. But none guarantee the correct output.

Algorithm

- Initialize the result as $\{\}$
- Consider a set of all edges in given graph. Let the set be E .
- Do following while E is not empty
 - Pick an arbitrary edge (u, v) from set E and add ' u ' and ' v ' to result
 - Remove all edges from E which are either incident on u or v .
- Return result

Example



Minimum Vertex Cover

Applications

- Efficient dynamic detection of race conditions
- Resource optimization
- Matching problems

References

- https://en.wikipedia.org/wiki/Vertex_cover
- <https://www.geeksforgeeks.org/vertex-cover-problem-set-1-introduction-approximate-algorithm-2/>