Approximate Algorithms

Minimum VERTEX COVER

Given an undirected graph $G = (V, E)$ find the smallest set of vertices $S \in V$ such that all edges in G have at least one of their endpoints in S.

This is an NP-hard problem.

Claim

MVC is a 2-approximation for VERTEX COVER.

We don't know how big OPTVC(G) is, but we can lower bound its size.

$|MVC(G)| \leq 2|OPTVC(G)|$

Because edges selected by MVC form a matching, no vertex covers more than one edge in a matching.

Matching Vertex Cover

Pick edge (u,v), remove the edge and all edges adjacent to u or v. Add u, v to vertex cover. Repeat

List Scheduling Approximation 1966 Graham

Given n jobs, job i must execute uninterruptedly for Pi time units.

m machines (identical) each machine can work on one job at a time

Find a schedule of jobs that minimizes completion time (time when last machine finishes).