Presentation 1
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Topic Area

• NP-hard problems in graph theory.
Problem: Maximum Independent Set

- The maximal independent set problem is a NP-hard problem in graph theory.
- The goal is to find an independent set of vertices and edges that is not a subset of any other independent set in a graph.
- The graphs can be generated randomly of different sizes to test the performance of the parallel program.
Problem: Maximum Independent Set

• Input: a graph $G=(V,E)$ represented by an array of vertices (V) and an adjacent matrix of edges (E)
• Output: an array of vertices that satisfies the requirement of maximum independent set (R)
Example
Solution 1: Brute-force

- Sequential Implementation:
  - Exhaust all subsets of vertices in the graph
  - For each subset, check if every two vertices are independent
  - $O(2^v \times v^2)$
Solution 1: Brute-force

- Parallel Implementation:
  - Exhaust all subsets of vertices in the graph
  - Parallel for each subset, check if every two vertices are independent
Solution 2: Greedy

• Recursive Implementation:

• FindMIS (G){
  • Vmindeg = vertices with minimal degree
  • Vmindeg_maxsup = vertices with maximal support in vmin
  • v = select a vertex from Vmindeg_maxsup based on priority
  • G* = graph G with vertex v and all its neighbor removed
  • FindMIS (G*)
  • }