- Dynamic Programming Two Properties

  Overlapping Subproblems A recursive solution contains a small number of distinct subproblems repeated many times

  Expressed Recursively An optimal solution to a problem contains optimal solution to subproblems

- Subsequence: A sequence aIer deleting some elements
- A algorithm always makes the choice that looks best at the moment
  - Used for optimization
  - Make local optimal choices and hope to achieve global optimality (Greedy-choice property)
  - An optimal solution to the problem contains an optimal solution to subproblems (opCmal substructure)
- Graph
  - a symbolic representaBon of a network and of its connectivity
- There are two ways to represent graphs
  - Adjacency list
  - Adjacency matrix
- Cut edge: Edge whose deletion will increase the number of connected components (Disconnect the graph)

1 Complexities

1.1 Space Requirements

Adjacency Lists For directed and directed $\Theta(V + E)$

Adjacency Matrix For directed and undirected $\Theta(V^2)$

1.2 Search Complexities

Breadth-First $\mathcal{O}(V + E)$

Depth-First $\mathcal{O}(V + E)$

2 Coloring Depth First Search

White undiscovered

Gray discovered but not finished

Black finished (found every reachable vertex from it)