



# **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107

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## **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**COURSE NAME : 19PE003- Artificial Intelligence**

**III YEAR /V SEMESTER**

**Unit 1- INTRODUCTION**

**Topic 5 : ISSUES IN THE DESIGN OF SEARCH PROGRAMS**



# Recall previous topic





# Issues in the design of search programs

- The direction in which to conduct the search ( forward versus backward reasoning).
- How to select applicable rules ( Matching)
- How to represent each node of the search process ( knowledge representation problem)



# Uninformed vs. informed search

- **Uninformed search strategies**

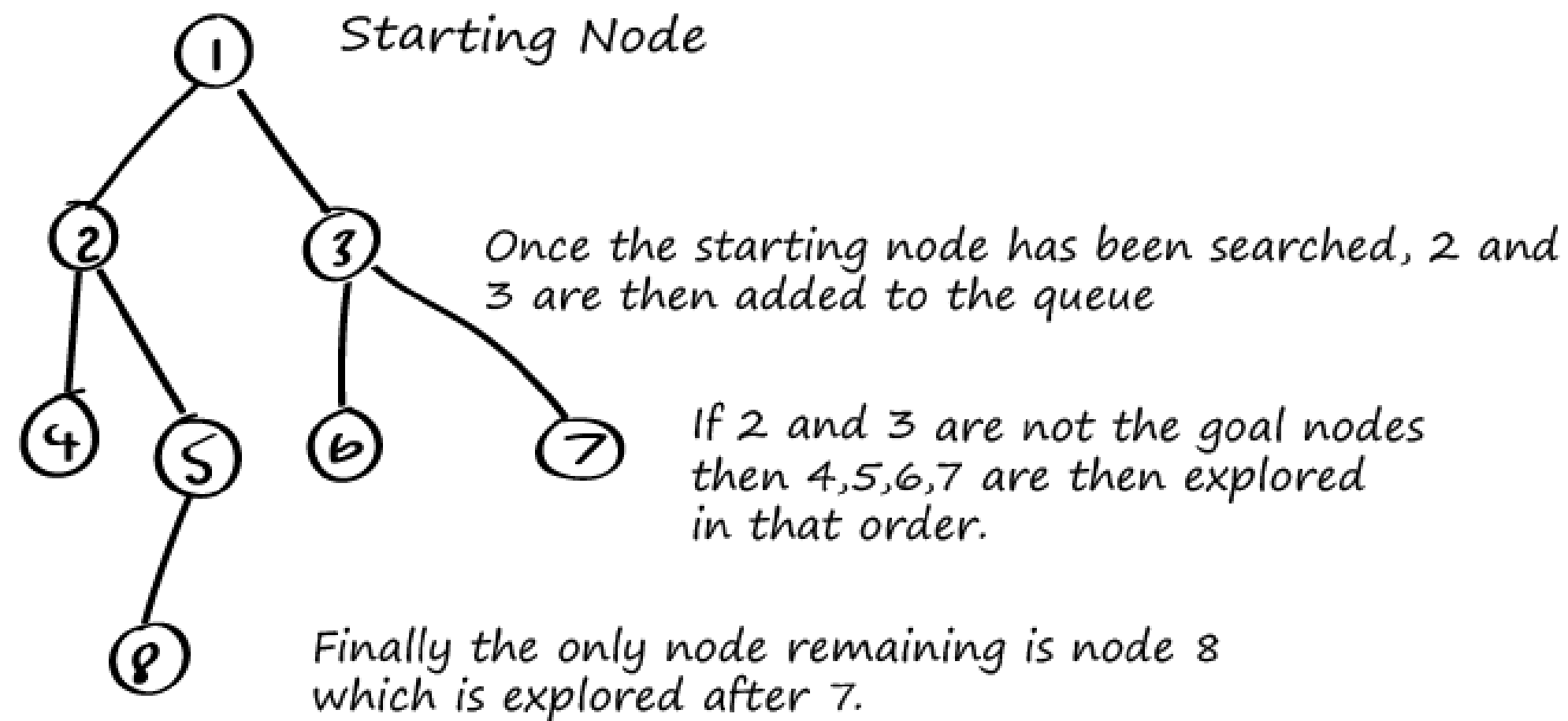
- Aka “blind search,”
- use no information about the likely “direction” of the goal node(s)
- Example methods: Breadth-first, depth-first, depth-limited, uniform-cost, depth-first iterative deepening, bidirectional

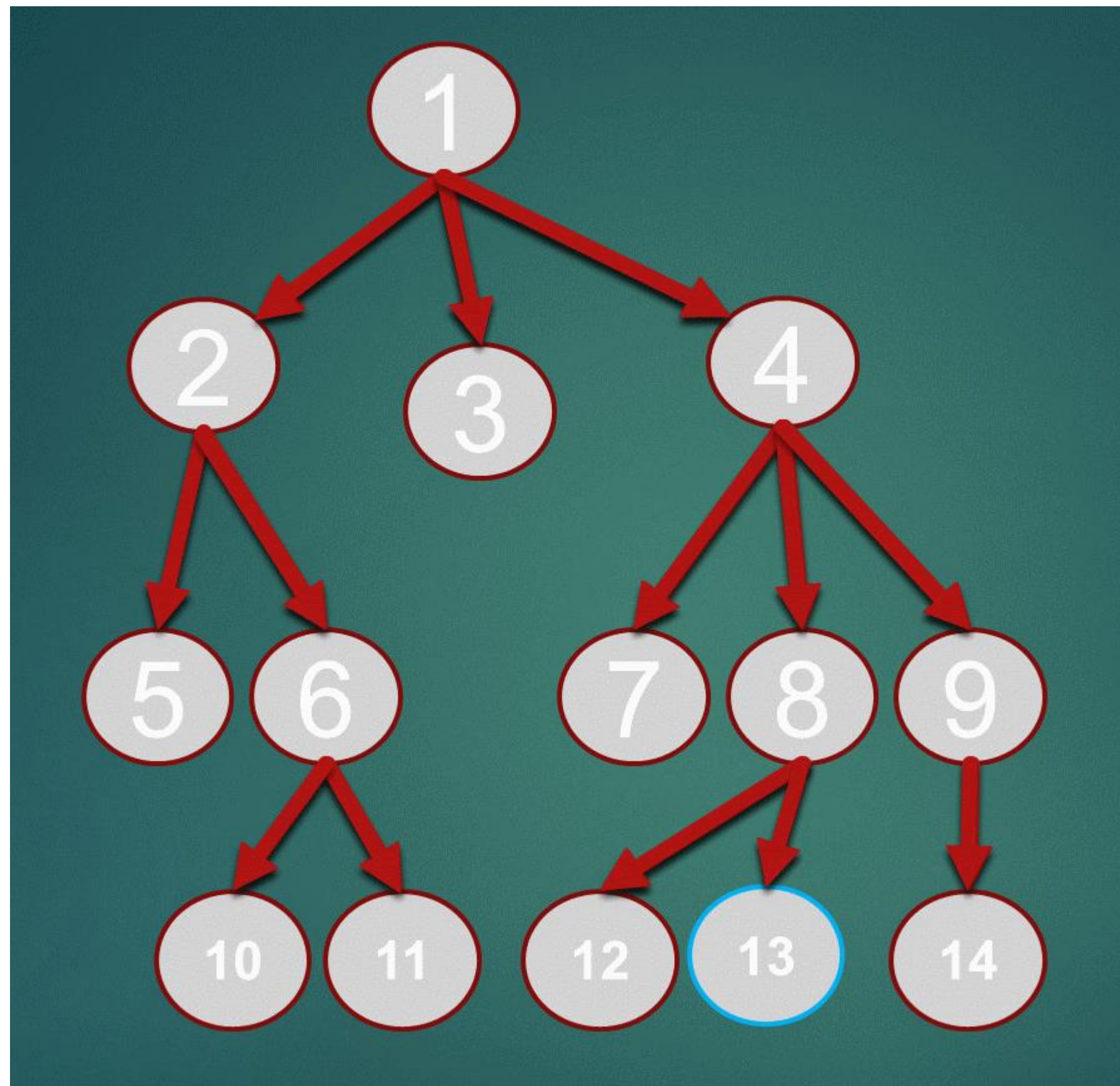
- **Informed search strategies**

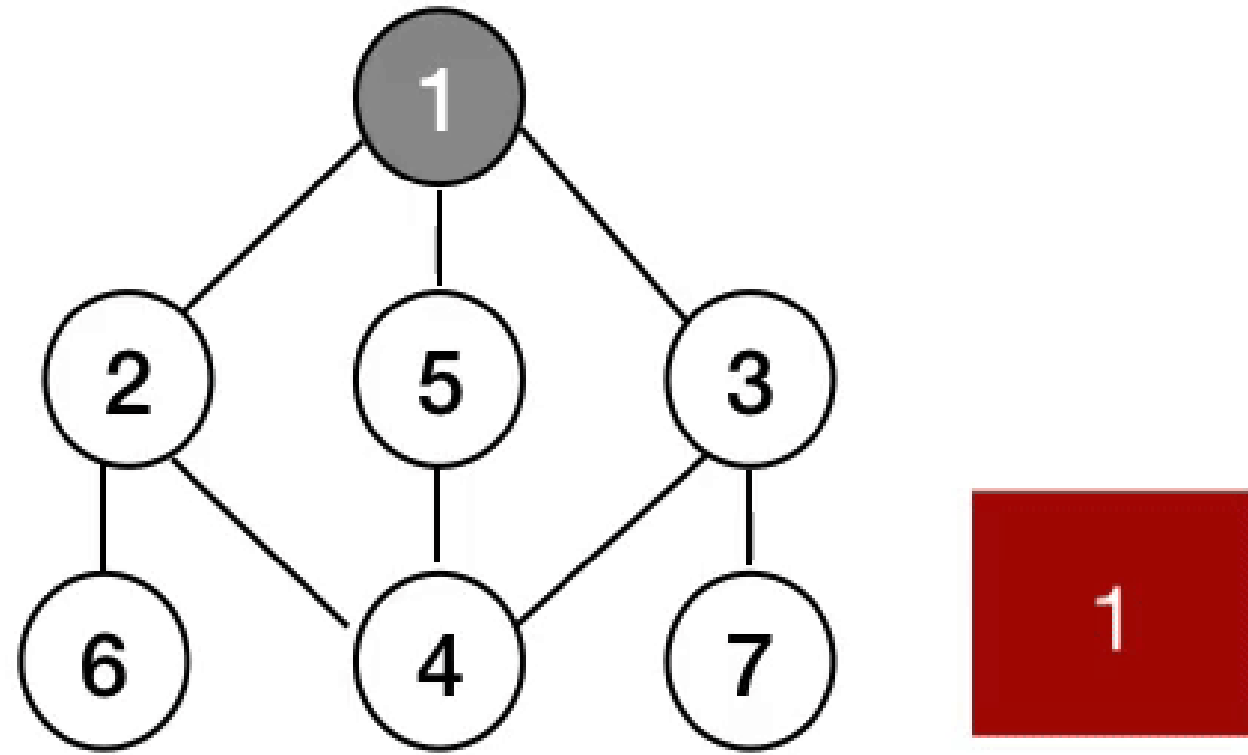
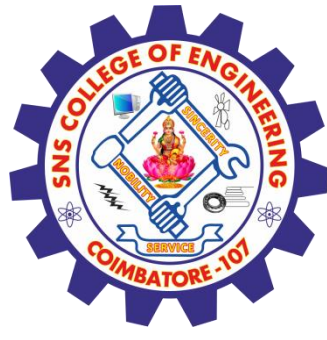
- aka “heuristic search”
- use information about the domain to (try to) (usually) head in the general direction of the goal node(s)
- Example methods: hill climbing, best-first, greedy search, beam search, A, A\*

Breadth-first search is an algorithm for searching a tree data structure for a node that satisfies a given property. It starts at the tree root and explores all nodes at the present depth prior to moving on to the nodes at the next depth level.

### Breadth First Search



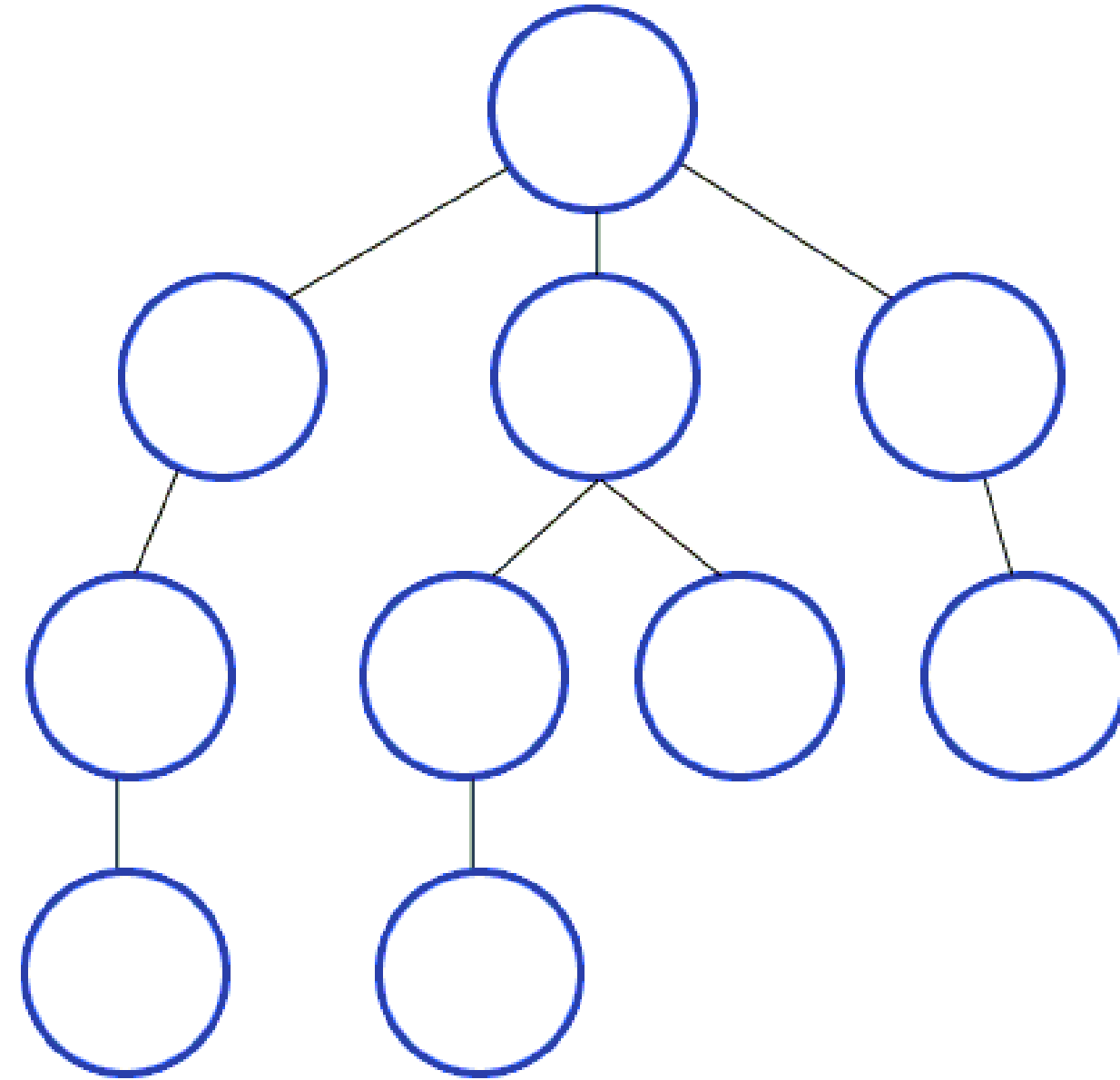




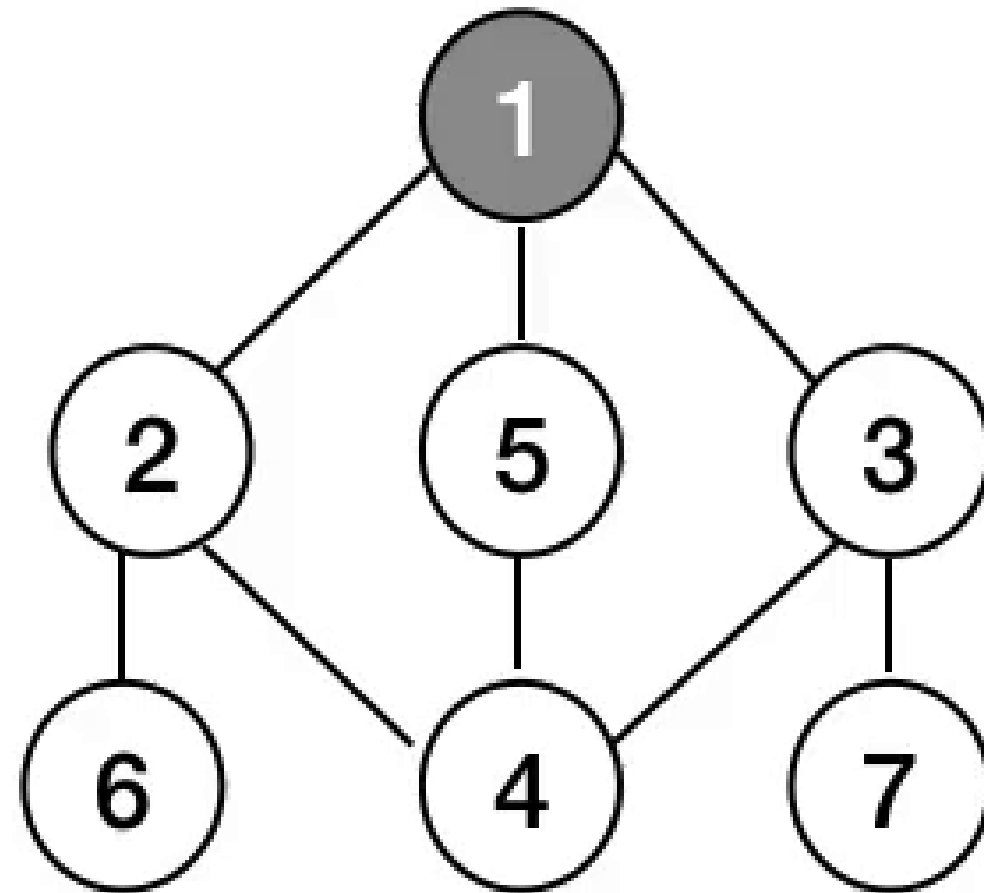


**Depth-first search** (DFS) is an algorithm for traversing or searching tree or graph data structures. The algorithm starts at the root node (selecting some arbitrary node as the root node in the case of a graph) and explores as far as possible along each branch before backtracking

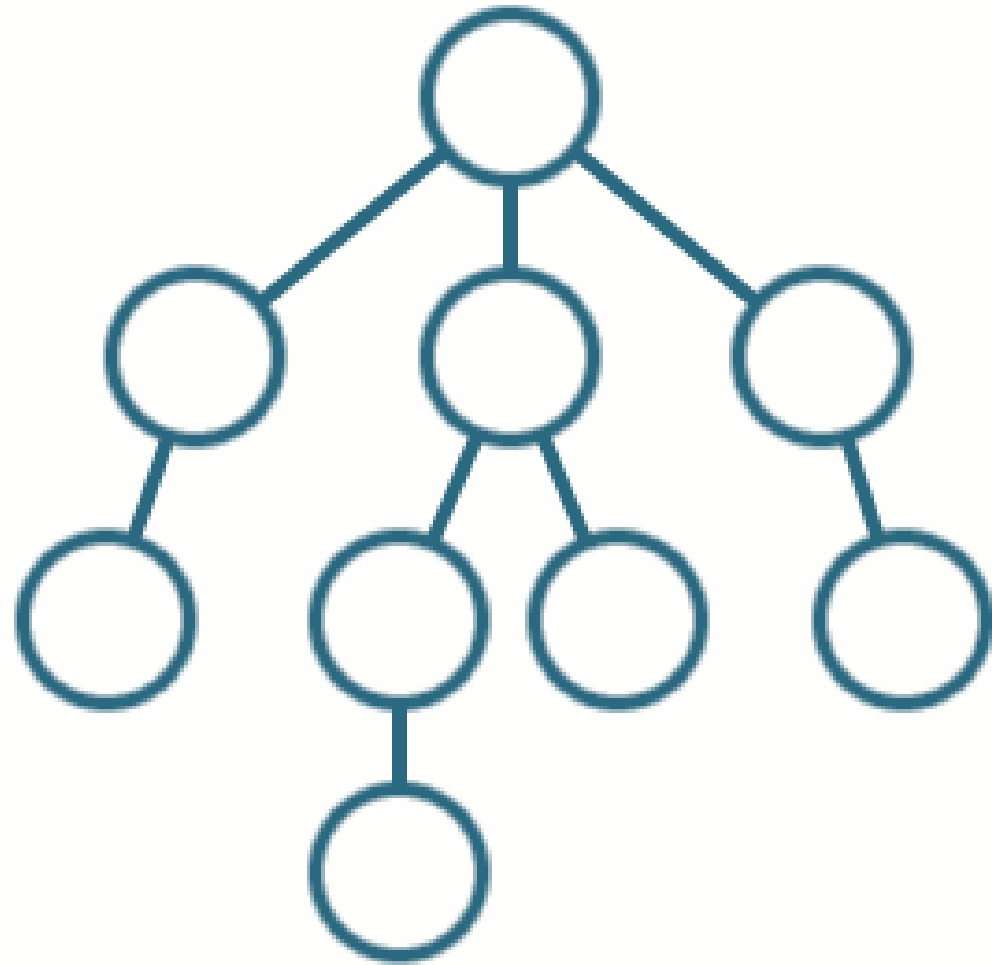




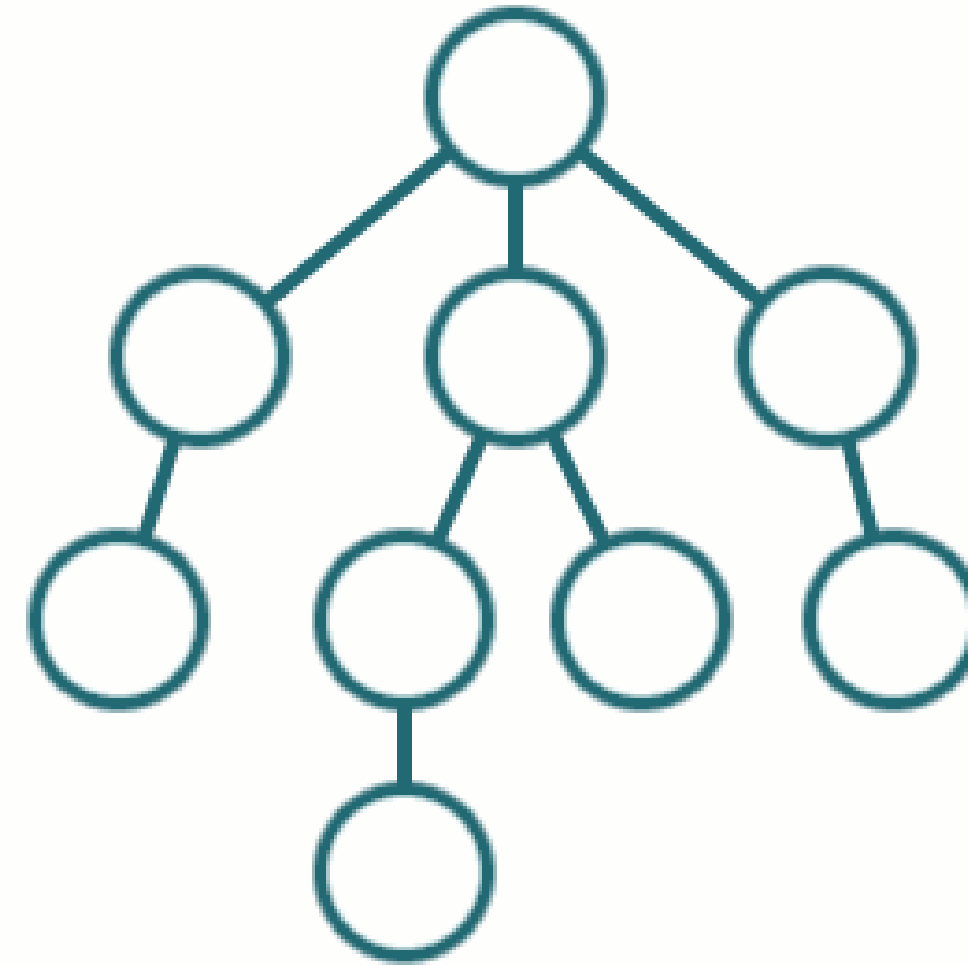




DFS



BFS





# | Heuristic Search

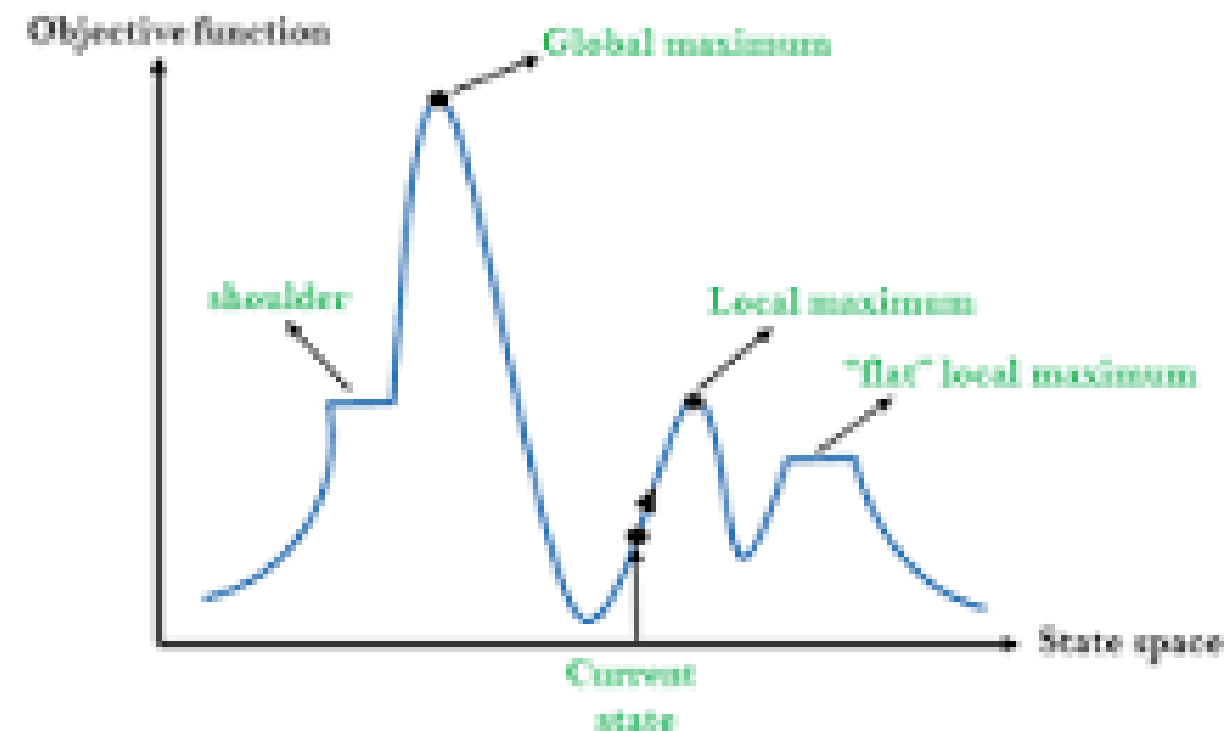
- ◆ We address the problem by using heuristic search
- ◆ Define a search space:
  - nodes are possible structures
  - edges denote adjacency of structures
- ◆ Traverse this space looking for high-scoring structures

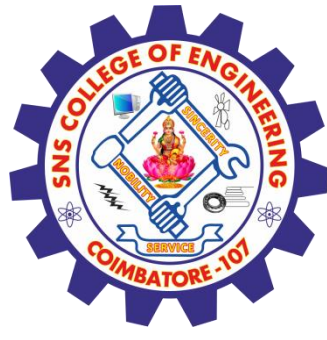
## Search techniques:

- Greedy hill-climbing
- Best first search
- Simulated Annealing



A hill-climbing algorithm is an **Artificial Intelligence (AI) algorithm that increases in value continuously until it achieves a peak solution.** This algorithm is used to optimize mathematical problems and in other real-life applications like marketing and job scheduling





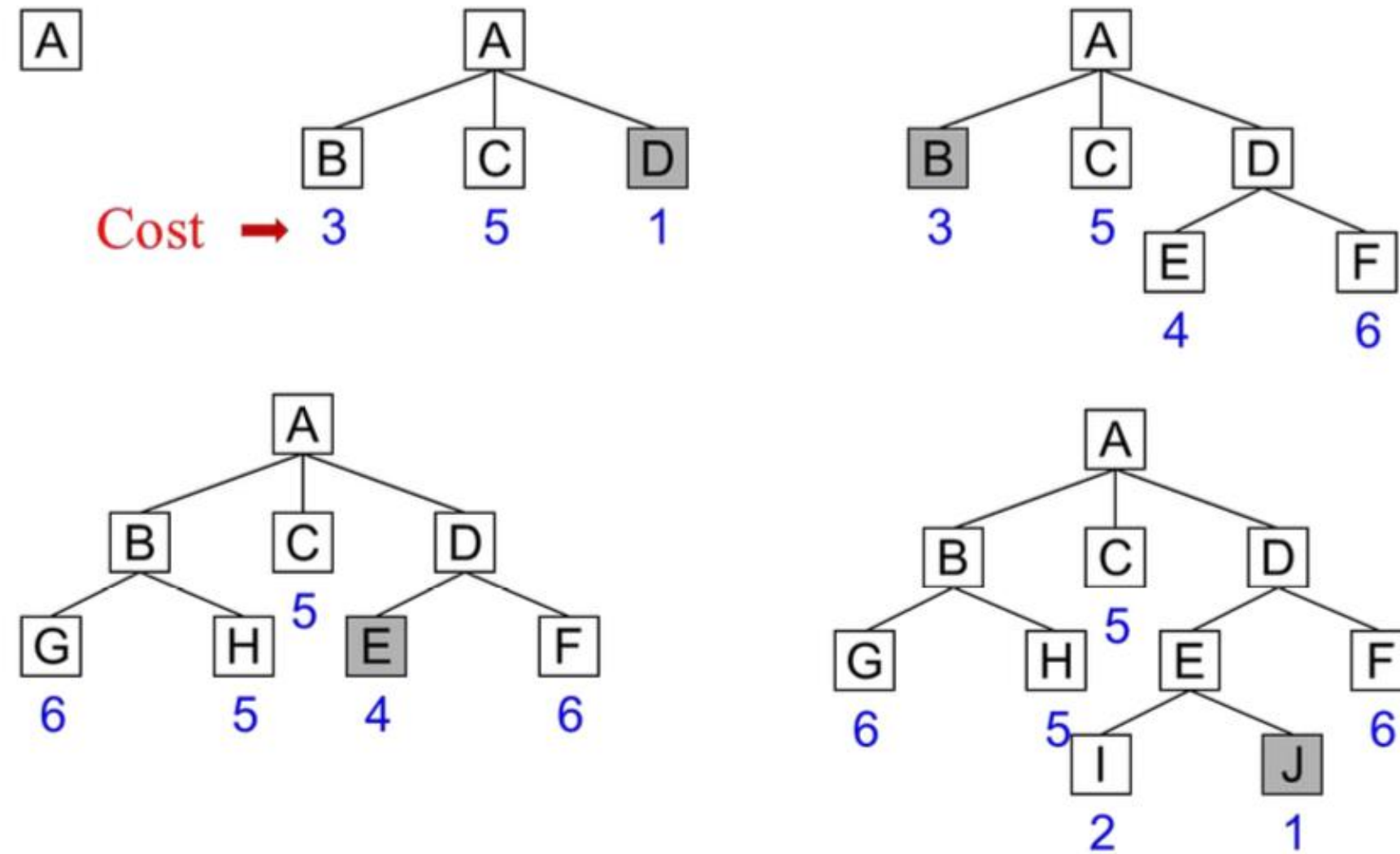
## Hill Climbing Algorithm

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- A **search method** of selecting the best local choice at each step in hopes of finding an optimal solution.
- Does not consider how optimal the current solution is.
- Does not consider steps past the next immediate choice.
- **Steps:**
  1. Define an evaluation function  $f(x)$  to determine the value of a state.
  2. From the current state, determine the search space (actions) for one step ahead.
  3. Select the action from the search space that returns the highest value.



Best First Search is to use an **evaluation function to decide which adjacent is most promising and then explore**. Best First Search falls under the category of Heuristic Search or Informed Search





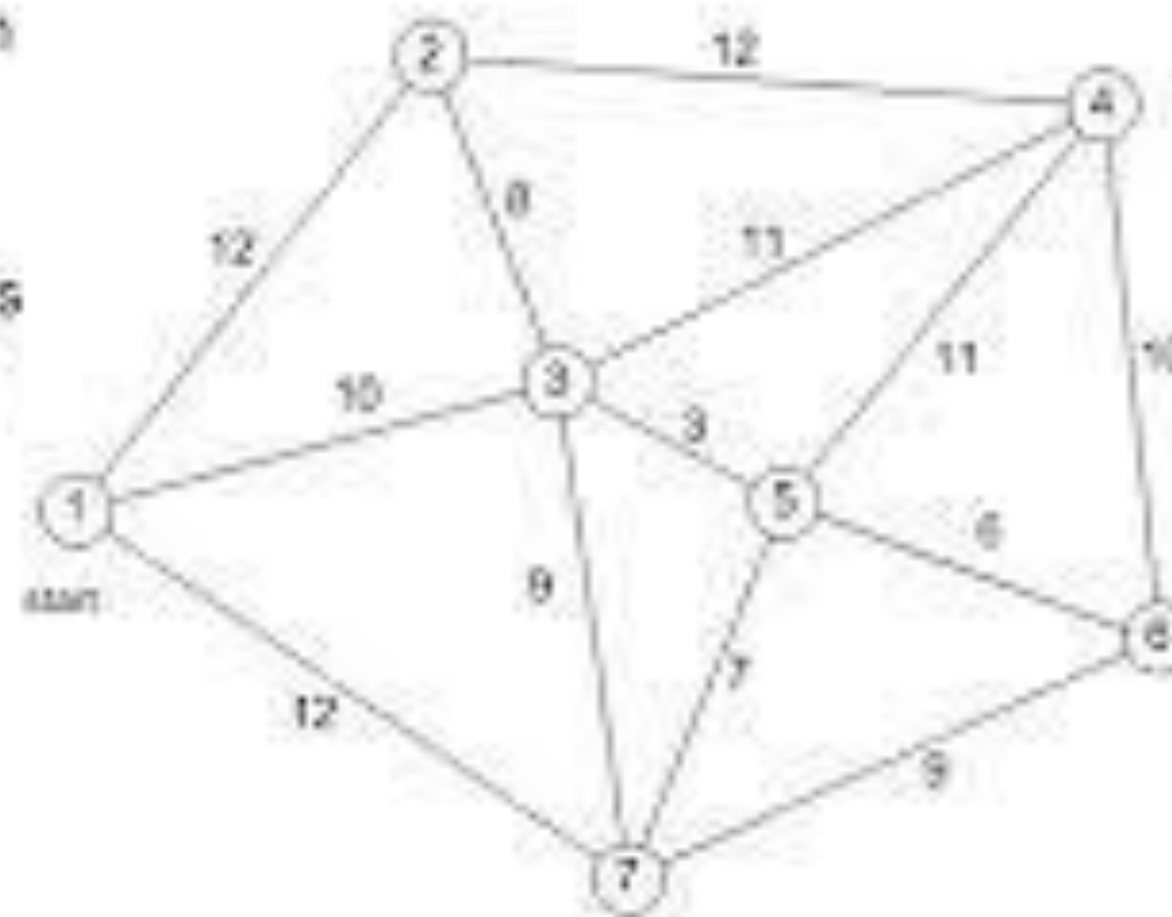


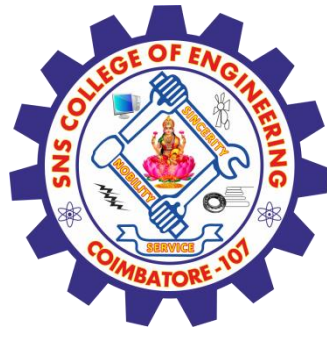
Simulated Annealing is a **stochastic global search optimization algorithm**. The algorithm is inspired by annealing in metallurgy where metal is heated to a high temperature quickly, then cooled slowly, which increases its strength and makes it easier to work with

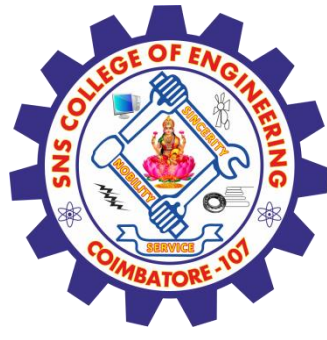
A typical example is the **traveling salesman problem**

# The Traveling Salesman Problem

- The salesman must travel to all cities once before returning home
- The distance between each city is given, and is assumed to be the same in both directions
- Objective - Minimize the total distance to be travelled



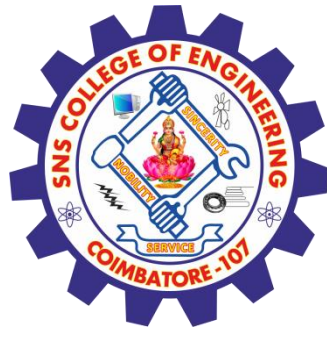




# Evaluation



- What is AI?
- Name the application related to AI
- What programming language used in AI?
- What s advantages of AI?



# REFERENCES



1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.

# THANK YOU