SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107
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Department of AI &DS

Course Name – 23ADT201 ARTIFICIAL INTELLIGENCE

II Year / III Semester

UNIT 2

PROBLEM SOLVING

Topic: LOCAL SEARCH AND OPTIMIZATION PROBLEMS

LOCAL SEARCH AND OPTIMIZATION PROBLEMS

Case Study: A local bakery improved their foot traffic by 30% within six months by implementing a localized SEO strategy and optimizing their Google My Business listing.

LOCAL SEARCH AND OPTIMIZATION PROBLEMS

Local Search Algorithm

- The Local search algorithm searches only the final state, not the path to get there.
- For example, in the 8-queens problem,
- we care only about finding a valid final configuration of 8 queens (8 queens arranged on chess board, and no queen can attack other queens) and not the path from initial state to final state.
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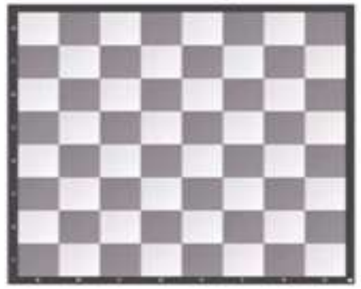
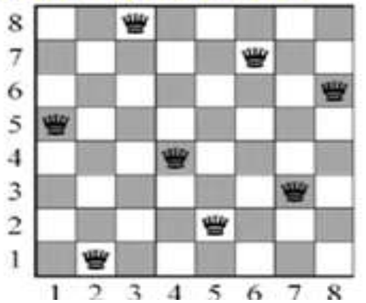




LOCAL SEARCH AND OPTIMIZATION PROBLEMS

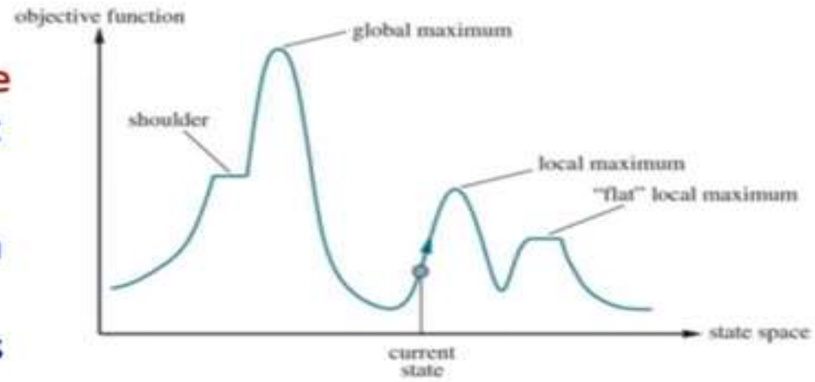
Local Search Algorithms

- **Local search** algorithms operate by searching from a start state to neighboring states,
- without keeping track of the paths, nor the set of states that have been reached.
- They are not systematic—
- they might never explore a portion of the search space where a solution actually resides.
- They searches only **the final state**

LOCAL SEARCH AND OPTIMIZATION PROBLEMS

Hill-climbing Search Algorithm

- Hill climbing algorithm is a Heuristic search algorithm which continuously moves in the direction of increasing value to **find the peak of the mountain or best solution to the problem**.
- It keeps track of one current state and on each iteration moves to the neighboring state with highest value—that is, it heads in the direction that provides the **steepest ascent**.



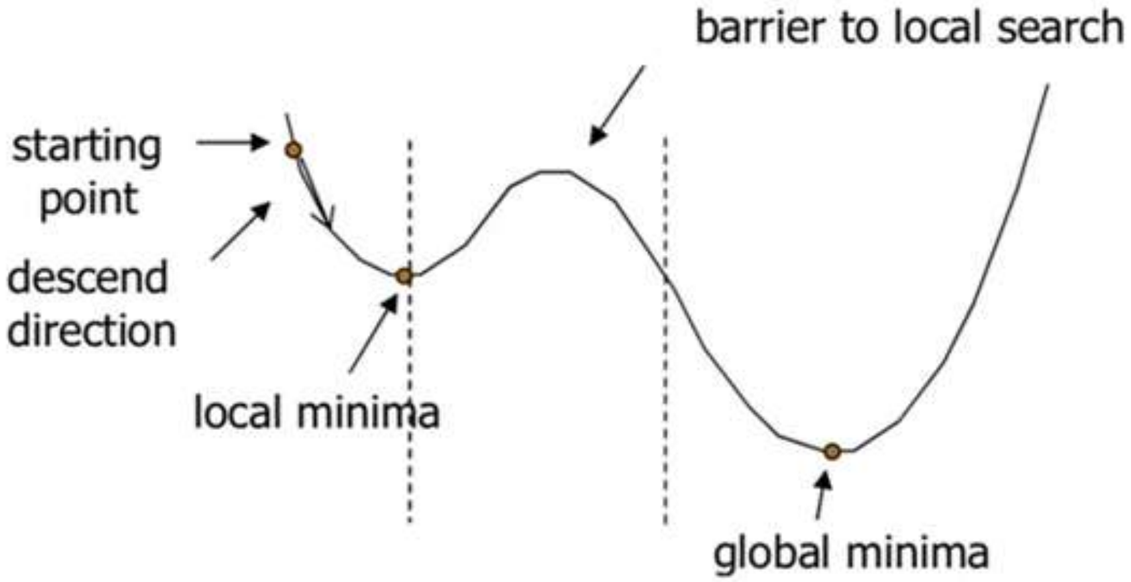
LOCAL SEARCH AND OPTIMIZATION PROBLEMS

Simulated Annealing

- **Simulated Annealing** is a stochastic global search optimization algorithm and it is modified version of stochastic hill climbing.
- This algorithm appropriate for nonlinear objective functions where other local search algorithms do not operate well.
- **The simulated-annealing solution is to start by shaking hard (i.e., at a high temperature) and**
- **then gradually reduce the intensity of the shaking (i.e., lower the temperature).**
- Simulated Annealing (SA) is very useful for situations where there are a lot of local minima.

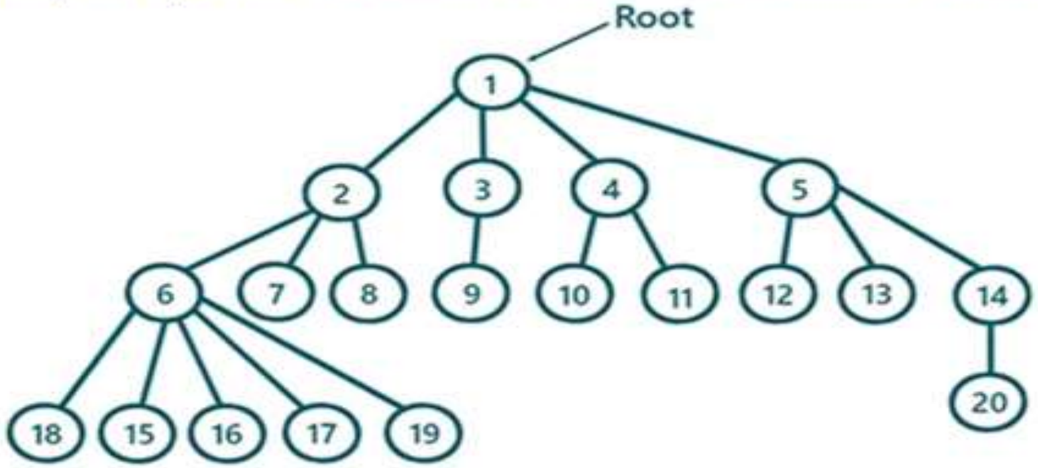
LOCAL SEARCH AND OPTIMIZATION PROBLEMS

Simulated Annealing - State Space Diagram



Beam Search Algorithm

- A heuristic search algorithm that examines a graph by extending the most promising node in a limited set is known as **beam search algorithm.**
- The number of nodes n represents the **beam width.**
- This algorithm only keeps the lowest number of nodes on open list,



Components of Beam Search

- A beam search takes three components as its input:
- 1. The problem usually represented as graph and contains a set of nodes in which one or more of the nodes represents a goal.
- 2. The set of heuristic rules for pruning: are rules specific to the problem domain and prune unfavorable nodes from memory regarding the problem domain.
- 3. A memory with a limited available capacity
- The memory is where the ***"beam"*** is stored, memory is full, and a node is to be added to the beam, the most costly node will be deleted, such that the memory limit is not exceeded.

Genetic Algorithm

- A **genetic algorithm** (or **GA**) is a search technique used to find true or approximate solutions.
- Genetic algorithms are categorized as global search heuristics.
- GAs are particular class of evolutionary algorithms that use techniques inspired by evolutionary biology such as inheritance, mutation, selection, and crossover (also called recombination).

LOCAL SEARCH AND OPTIMIZATION PROBLEMS

Applications of Local Search Algorithms

- Integrated-circuit design,
- Factory floor layout,
- Job shop scheduling,
- Automatic programming,
- Telecommunications network optimization,
- Crop planning, and
- Portfolio management.

THANK YOU