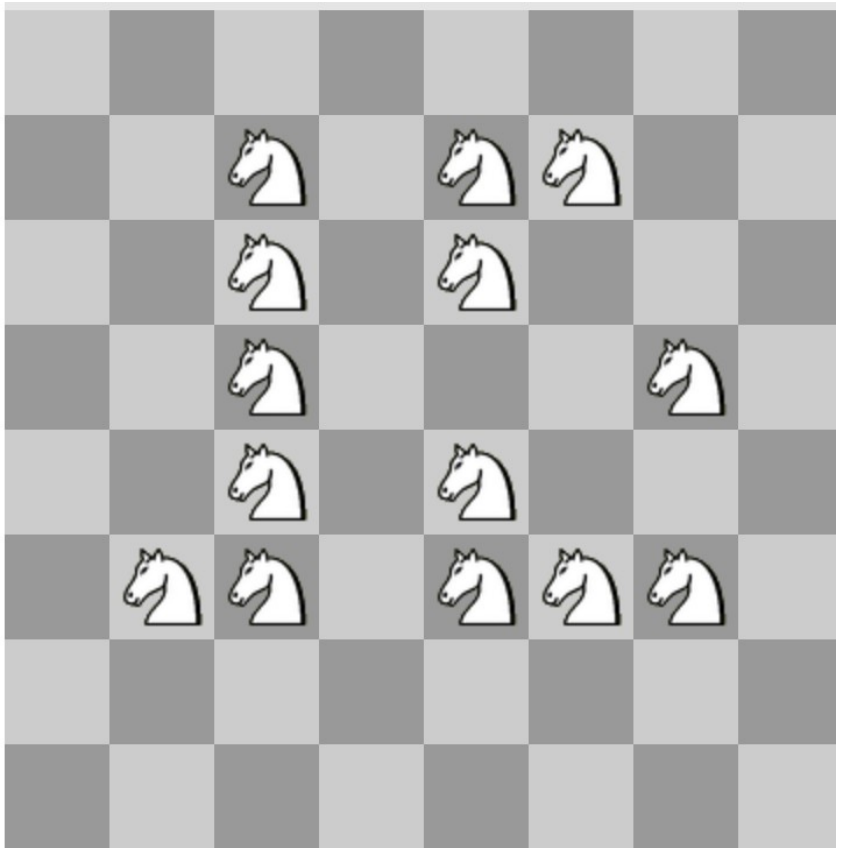
Artificial Intelligence
CSC 361

Tutorial#4

Question 1

- Give a local search formulation to the problem of finding the minimal number of knights needed to occupy or attack every square of an n × n chessboard.
  - State.
  - Initial state(s).
  - Actions.
  - Objective function (no goal test: the algorithms search for a minimum of the function).

Question 1

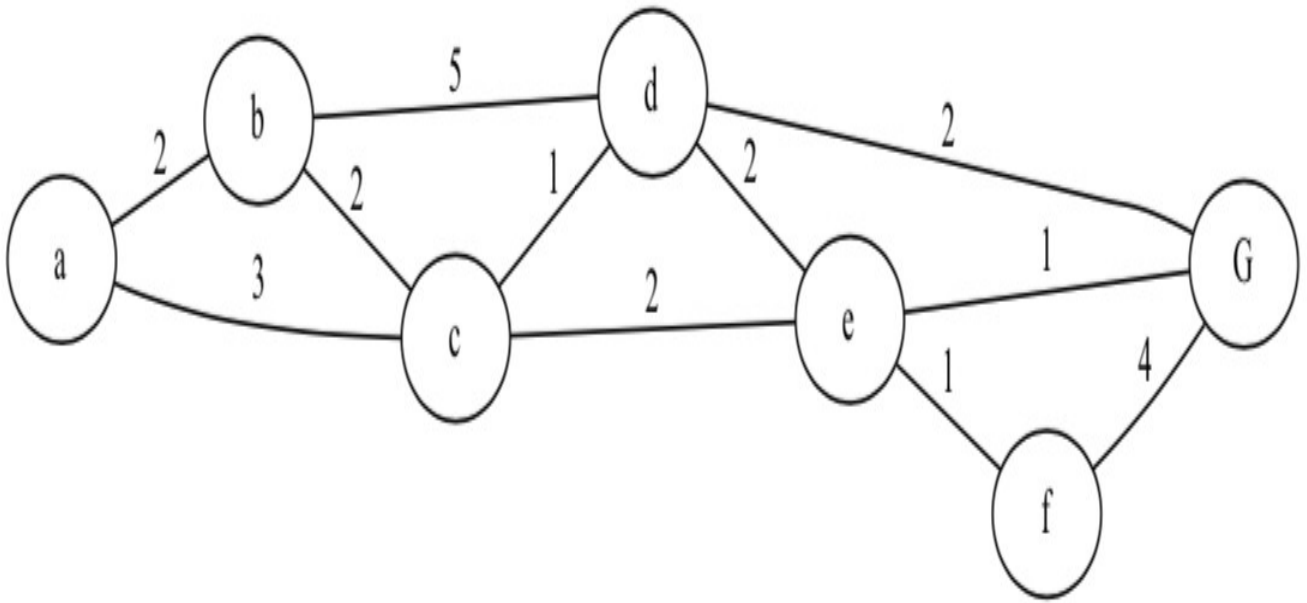


Answer

- State: **positions of all knights on the board.**
  - **For each knight K on the board K_x->(i,j)**
- Initial state:
  - **board full of knights.**
- Actions:
  - **remove one knight if this does not result in a square not being attacked**
- Objective function
  - **number of knights (to be minimized).**

Question 2

Consider the search space of Figure 1, where state a is the initial state and G is the goal state. **Give the sequence of nodes visited** by hill-climbing when using each of the objective functions of Table 1. The objective is to minimize the objective function. Ties are broken according to alphabetical order



States	h1	h2	h3
a	6	6	7
b	3	5	3
c	2	3	2
d	0	2	1
e	1	0	1
f	1	2	1
g	0	-1	0

Answer

1. h1: a,c,d,g.
2. h2: a,c,e,g.
3. h3: a,c,d,g.

Question 3

Give the name of the algorithm that results from each of the following special cases:

1. Local beam search with k = 1.
2. Local beam search with one initial state and no limit on the number of states retained.
3. Simulated annealing with T = 0 at all times (and omitting the termination test).

Question 3

1. Local beam search with k = 1.
   - **hill-climbing.**
2. Local beam search with one initial state and no limit on the number of states retained.
   - **BFS**
3. Simulated annealing with T = 0 at all times (and omitting the termination test).
   - **hill-climbing.**