ARTIFICIAL INTELLIGENCE

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N-QUEENS PROBLEM

GIVEN BY : DR. JAYLAKSHMI BANDA

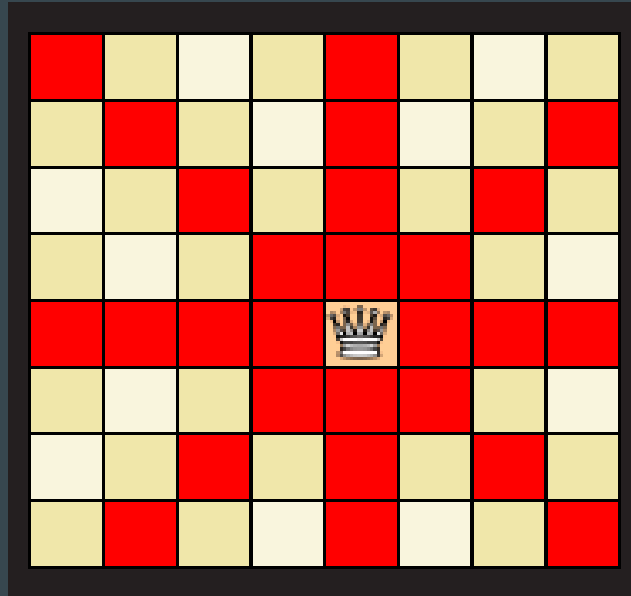PRESENTED BY:
DHEERAJ CHAUDHARY (17BCS009)
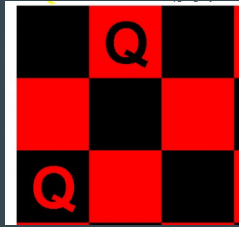PRIYA A TIRU (17BCS021)
VIVEK RAI (17BCS033)

PROBLEM STATEMENT/ HARDNESS

Using a regular chess board, the challenge is to place 8 queens on the board such that no queen is attacking any of the other.
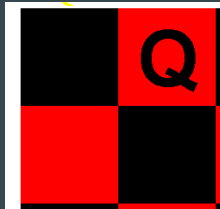
SOLVING N-QUEENS PROBLEM

N < 4

Cannot use N Queens

Search Space: The set of objects among which we search for the solution

Example: N-queen configurations

Goal condition: This is the characteristics of the object we want to find in the   search   space?

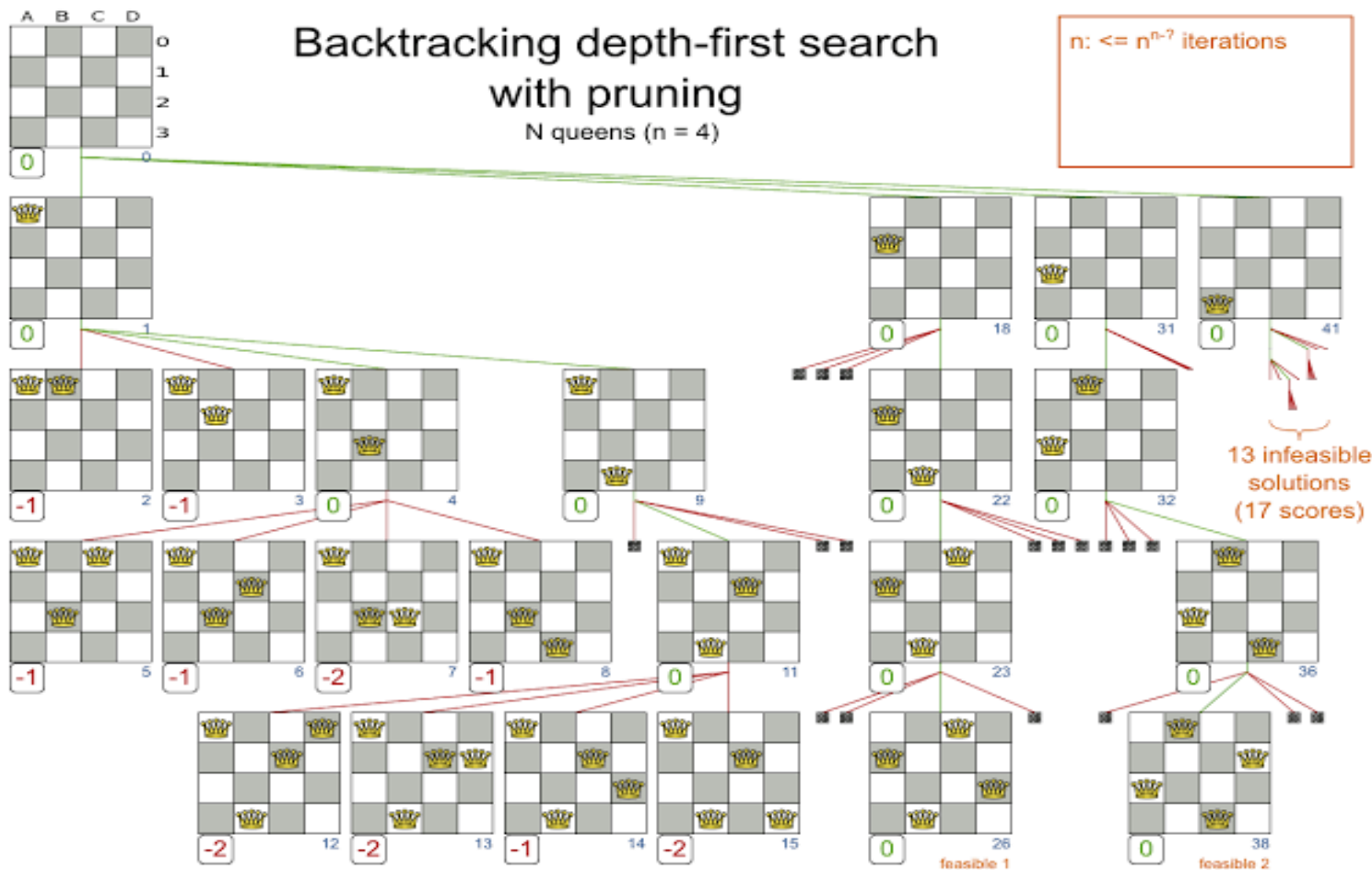Example: Non-attacking n-queen configuration

SOLUTION USING BACKTRACKING

- One of the approach that guarantees a solution, though it can be slow

- Can be seen as a form of intelligent depth-first search

Backtracking depth-first search with pruning
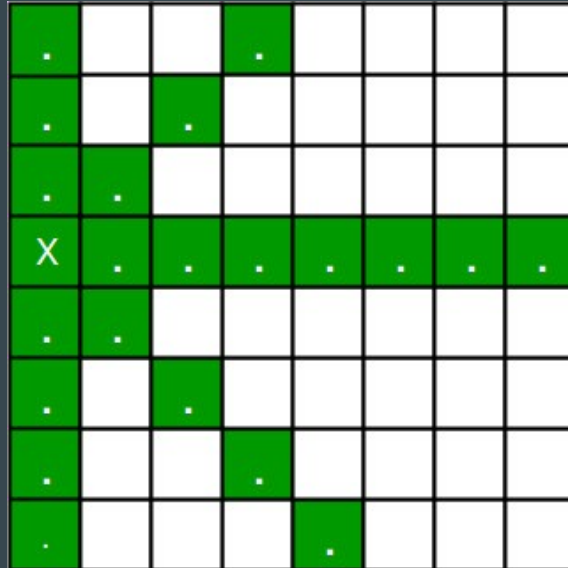
N queens (n = 4)

n: <= n^{n-?} iterations

13 infeasible solutions (17 scores)

feasible 1

feasible 2

MATHEMATICAL FORMULATION Iterative (non-search)

- For N > 4 only
- N is even except N ≠ 6K+2 :
  - Row 1 to N/2: Queen on 2*Row
  - Row N/2+1 to N: Queen on 2*Row-N-1
- N is even, N = 6K+2

  - Row 1 to N/2: Queen on (2*Row + N/2 - 3)mod N +1

  - Row N/2+1 to N: Queen on N - (2*(N-Row+1) + N/2 - 3)mod N

- N is odd:

  - When N is even, no queen is placed on position (1,1).

  - So this just places the first N-1 queens as on an N-1 (even) sized board, then places the last queen on the bottom right position (N,N).
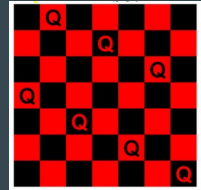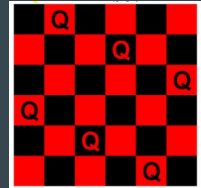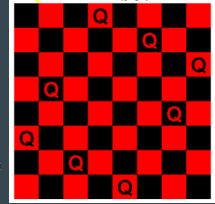
CONSTRAINTS

1. There can be only one queen in a column , and another constraint prohibits two queens on the same diagonal.
2. No queens on the same row.

Thank you