CSE 221 Algorithms: Ch7

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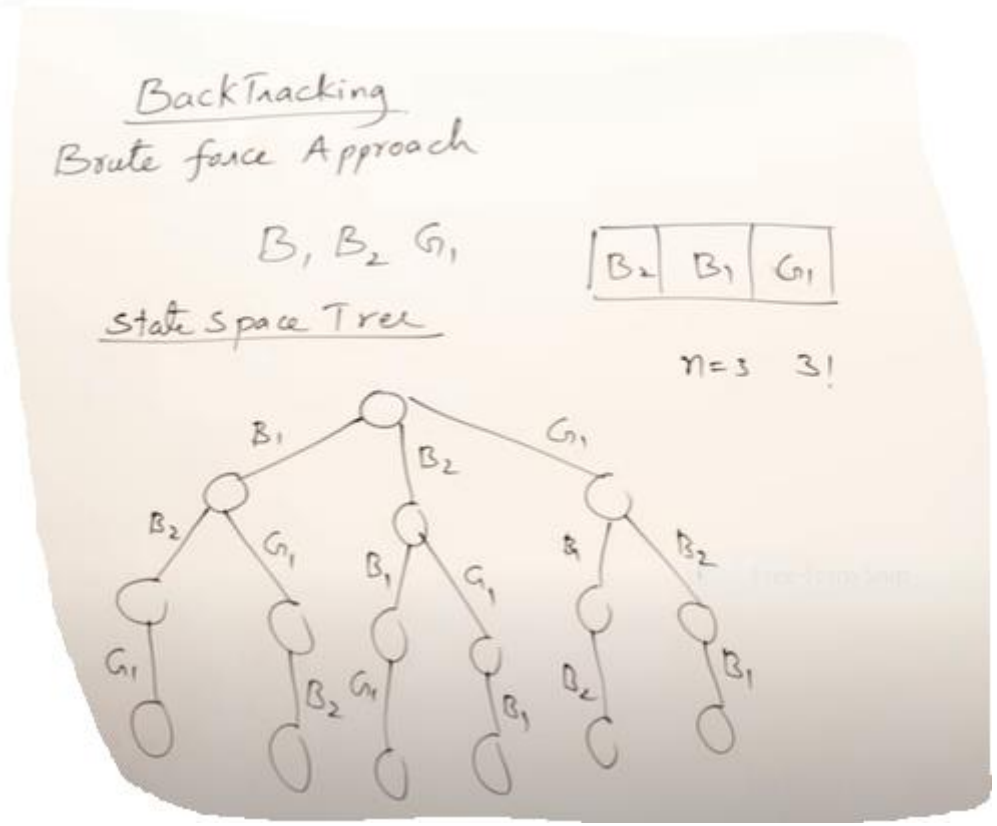
Backtracking

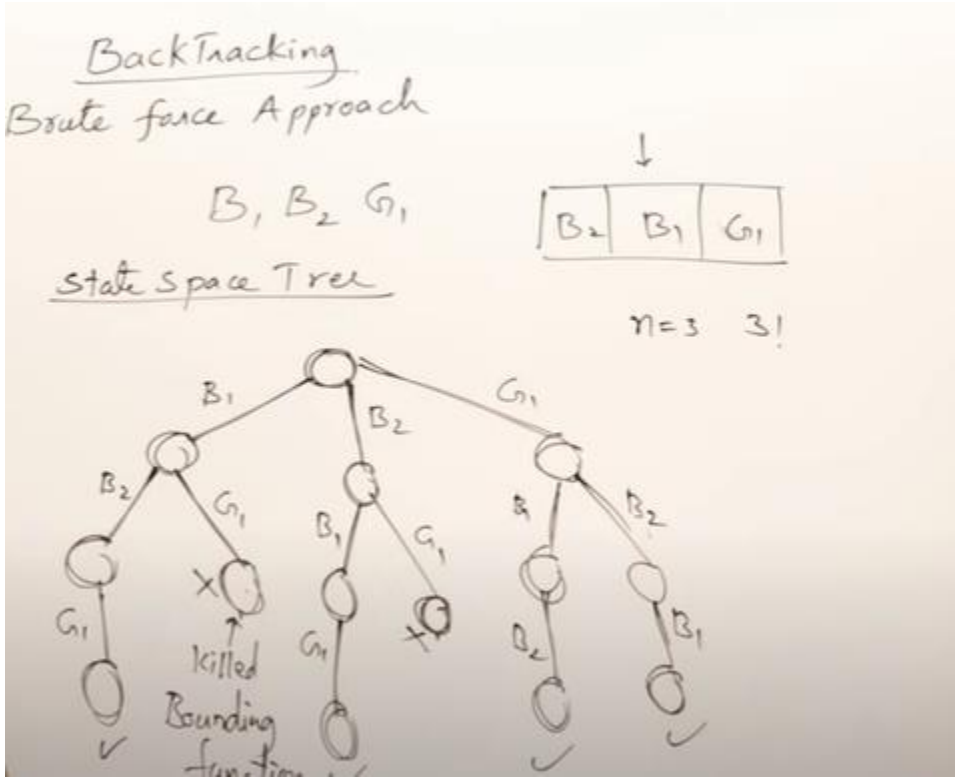
- Backtracking is an algorithmic-technique for solving problems recursively by trying to build a solution incrementally, one piece at a time, removing those solutions that fail to satisfy the constraints of the problem at any point of time (by time, here, is referred to the time elapsed till reaching any level of the search tree).

- Generally, every constraint satisfaction problem which has clear and well-defined constraints on any objective solution, that incrementally builds candidate to the solution and abandons a candidate (“backtracks”) as soon as it determines that the candidate cannot possibly be completed to a valid solution, can be solved by Backtracking.

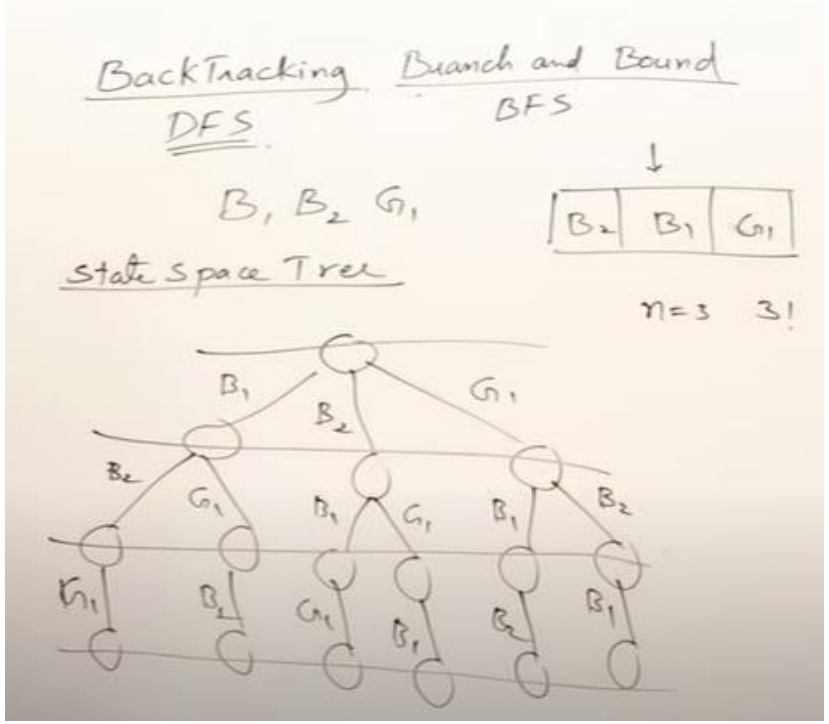
- In recursion, the function calls itself until it reaches a base case. In backtracking, we use recursion to explore all the possibilities until we get the best result for the problem.

Backtracking



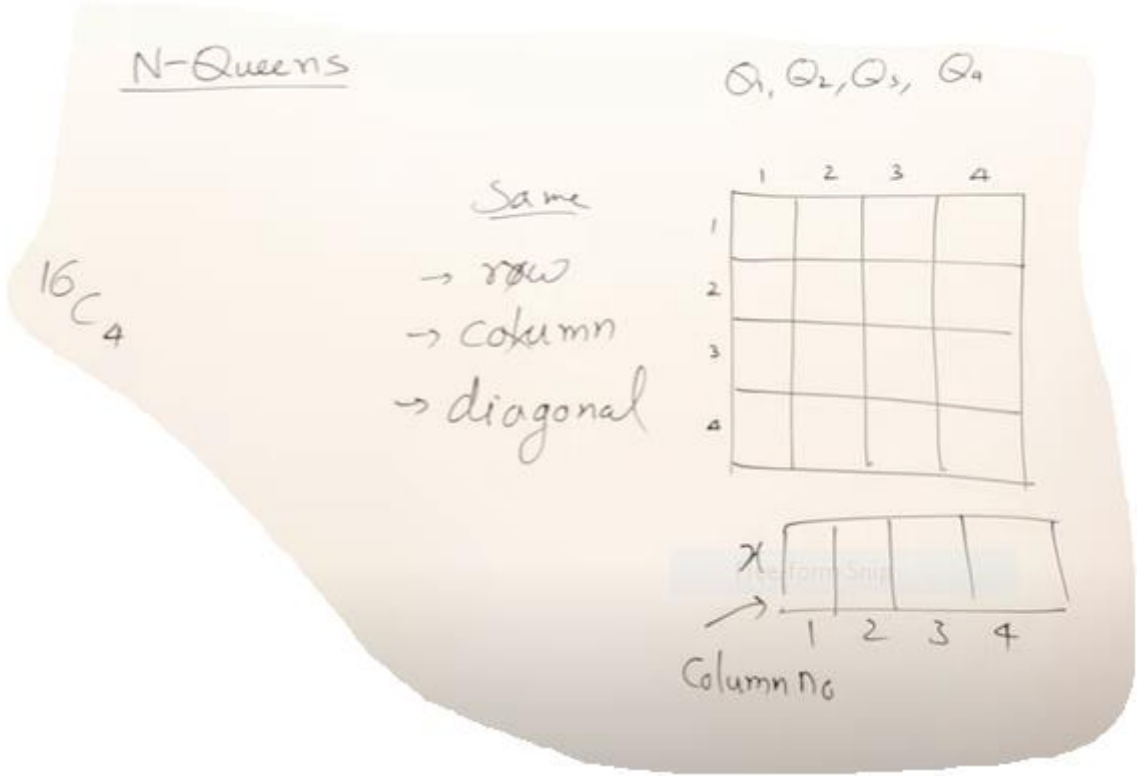


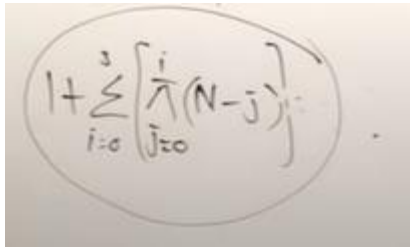
Backtracking



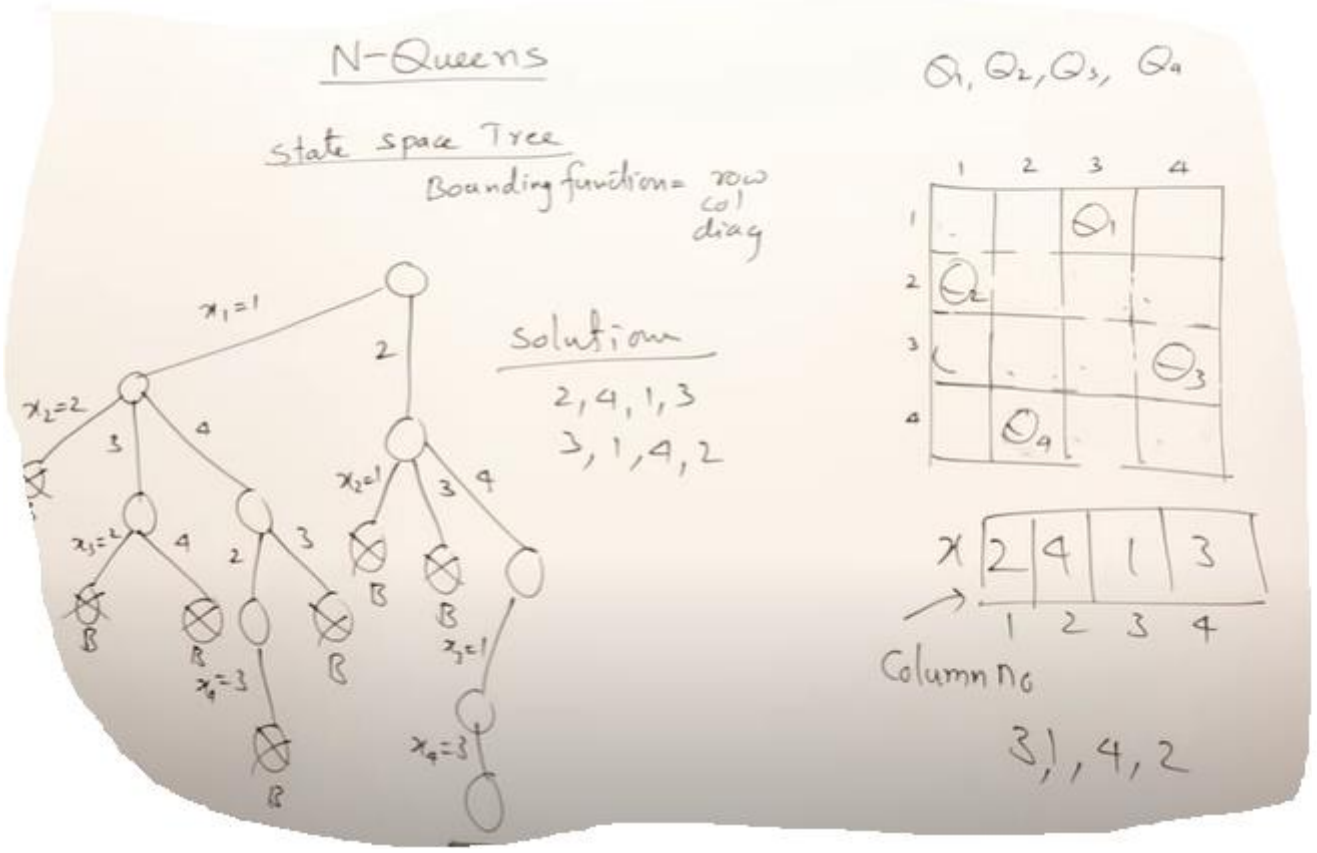
N-Queens Problem

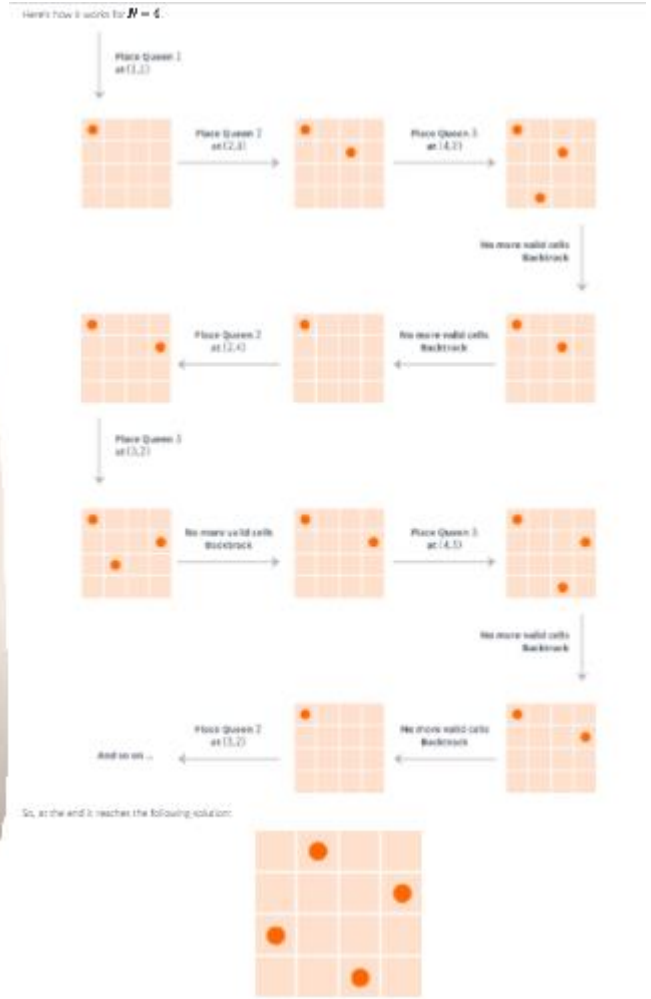
- Let us try to solve a standard Backtracking problem, N-Queen Problem.
- The N Queen is the problem of placing N chess queens on an N×N chessboard so that no two queens attack each other. For example, following is a solution for 4 Queen problem.

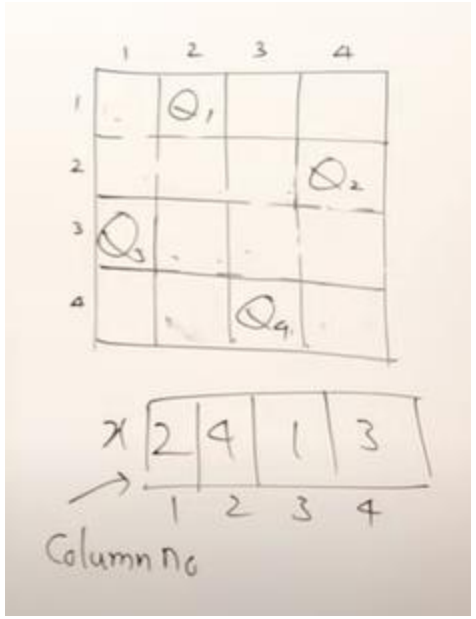




N-Queens Problem







Hamiltonian Cycle

- A Hamiltonian cycle is a closed loop on a graph where every node (vertex) is visited exactly once. A loop is just an edge that joins a node to itself; so a Hamiltonian cycle is a path traveling from a point back to itself, visiting every node en route.