Backtracking

Definition:

Backtracking is a problem-solving technique that incrementally builds candidates to solutions and abandons a candidate ("backtracks") as soon as it determines that this candidate cannot possibly lead to a valid solution.

Key Points:

- Builds solutions step-by-step
- Abandons a path as soon as it detects failure (pruning)
- Typically implemented with recursion
- Used to explore all possible solutions in a search space efficiently

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Common Uses:

- N-Queens problem
- Sudoku solver
- Maze solving
- Crossword puzzles

- Subset sum problem
- Generating permutations and combinations

How It Works:

1. Make a choice
2. If the choice is valid, move forward
3. If the choice leads to no solution, undo the choice (backtrack)
4. Try other choices

Pseudo Code Example:

csharp

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```
function backtrack(solution):
    if solution is complete:
        print solution
        return
    for choice in possible choices:
        if choice is valid:
            add choice to solution
            backtrack(solution)
```

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            remove choice from solution  # backtrack
```

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