TARC
TUNKU ABDUL RAHMAN UNIVERSITY COLLEGE

Artificial Intelligence

Chapter 3 Uninformed Search

Search Strategies

- Uniformed search / blind search
- Informed search / heuristic search

Uninformed Search

- Breadth-first search
- Depth-first search
- Depth-limited search
- Iterative deepening depth-first search
- Bidirectional search

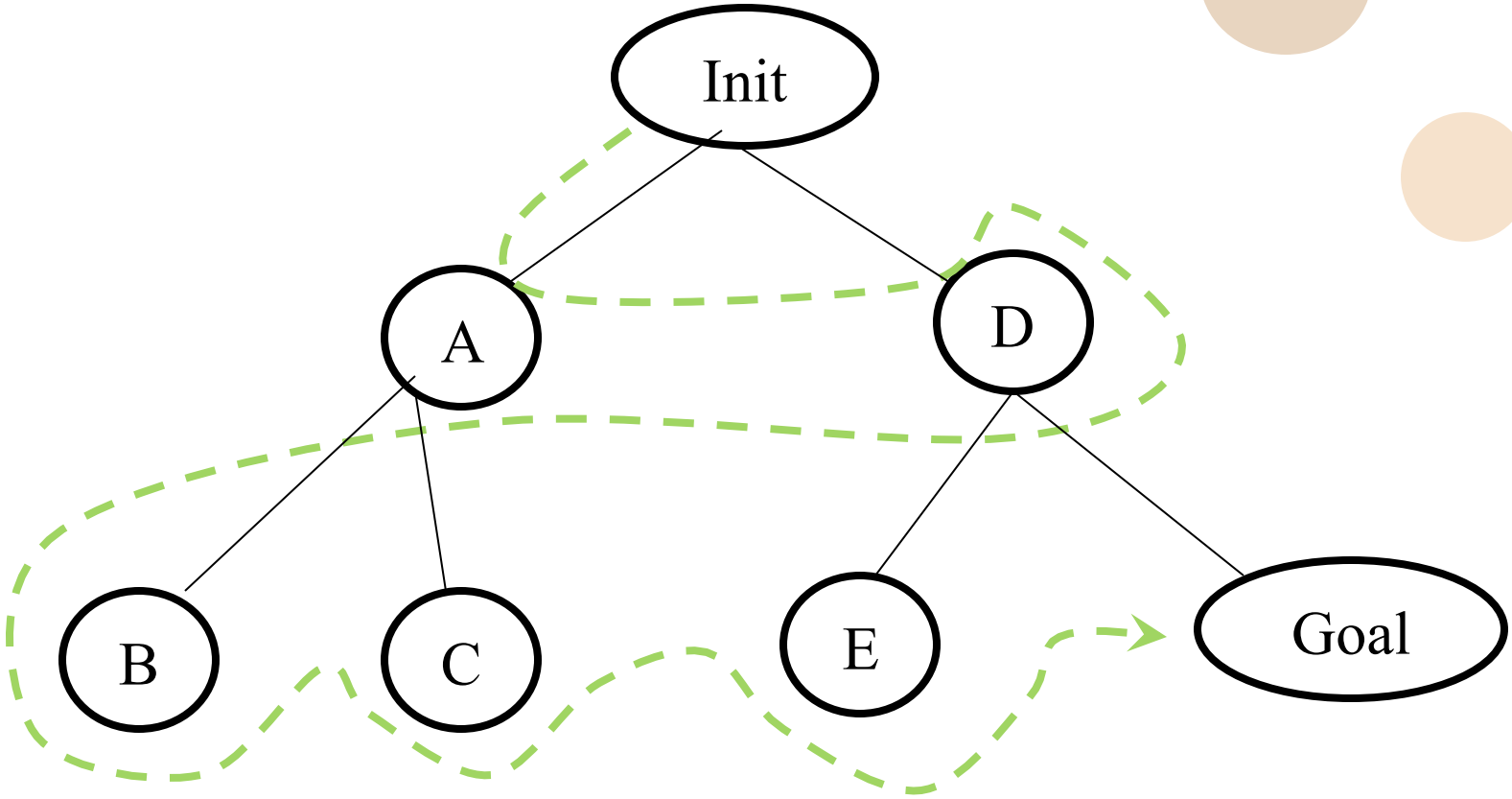
Breadth-first search

- All the nodes are expanded at a given depth in the search tree before any nodes at the next level are expanded.

Algorithm

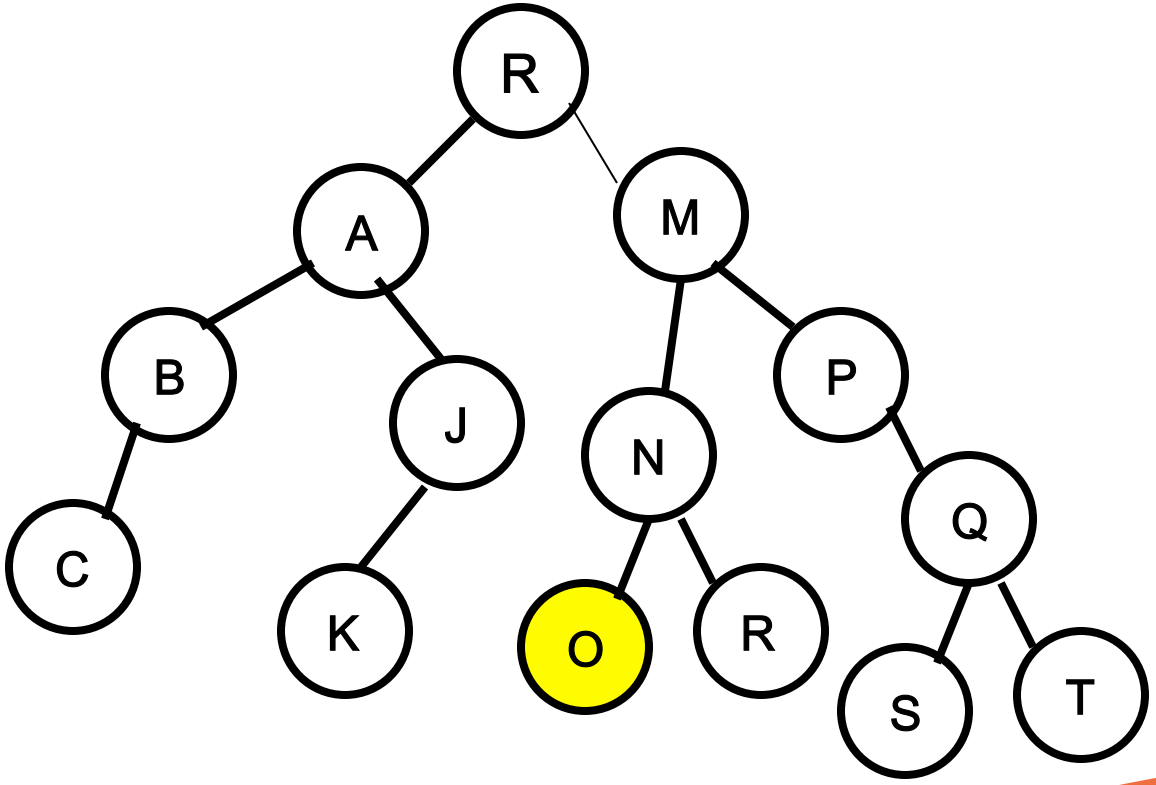
1. Begin with the root node.
2. Examine all of the nodes in each level before moving on to the next level.
3. Repeat the process and work downward from left to right until a solution is found.
4. Return Fail if there is no solution.

Breadth First Search



Breadth First Search

- Can you tell me the sequence of the states if using breadth-first search?



Advantages

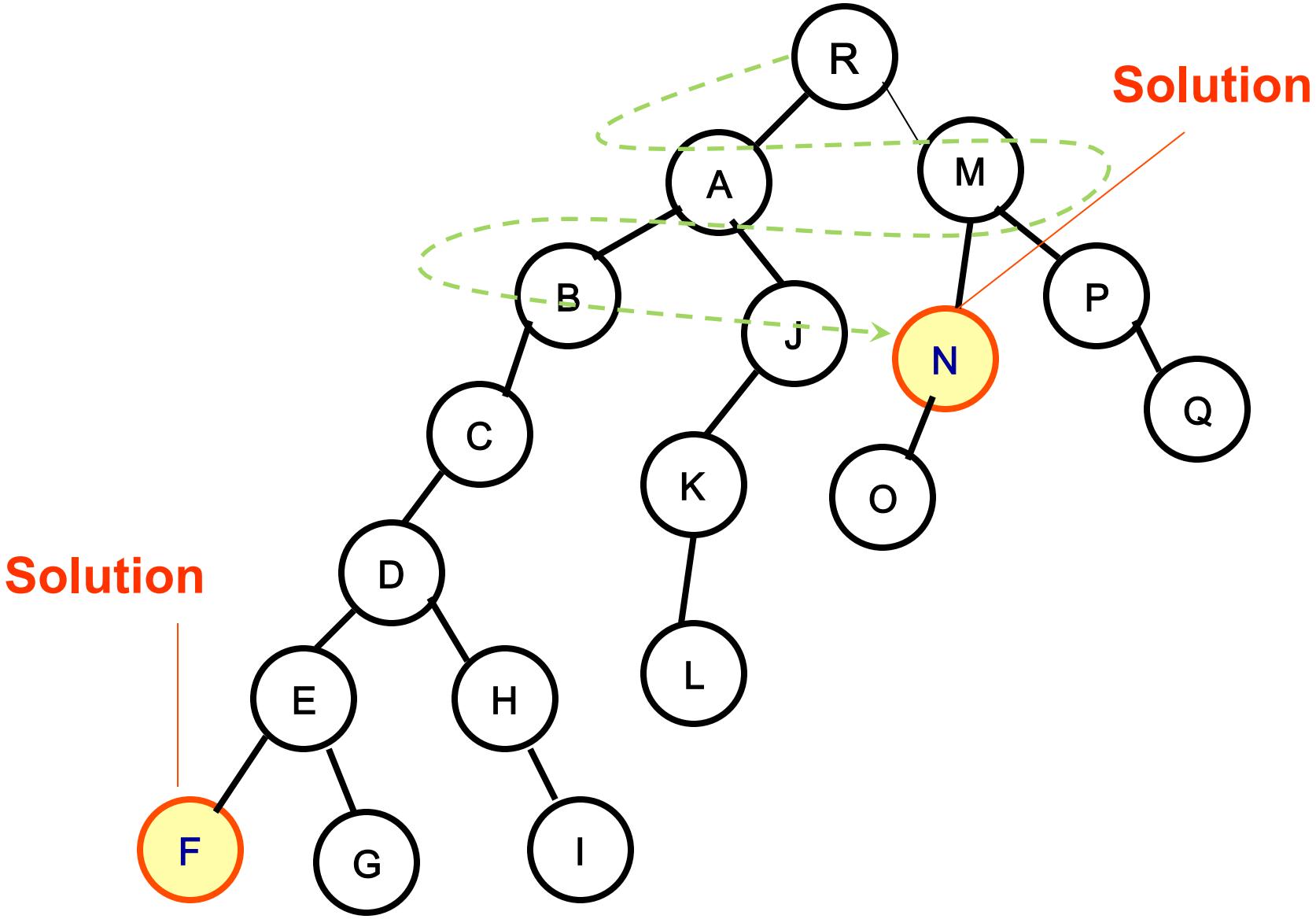
Completeness

- Guarantees a solution.

Optimality

- Will always find the shortest path between initial state and goal state, with the least number of steps.

Example



Limitations

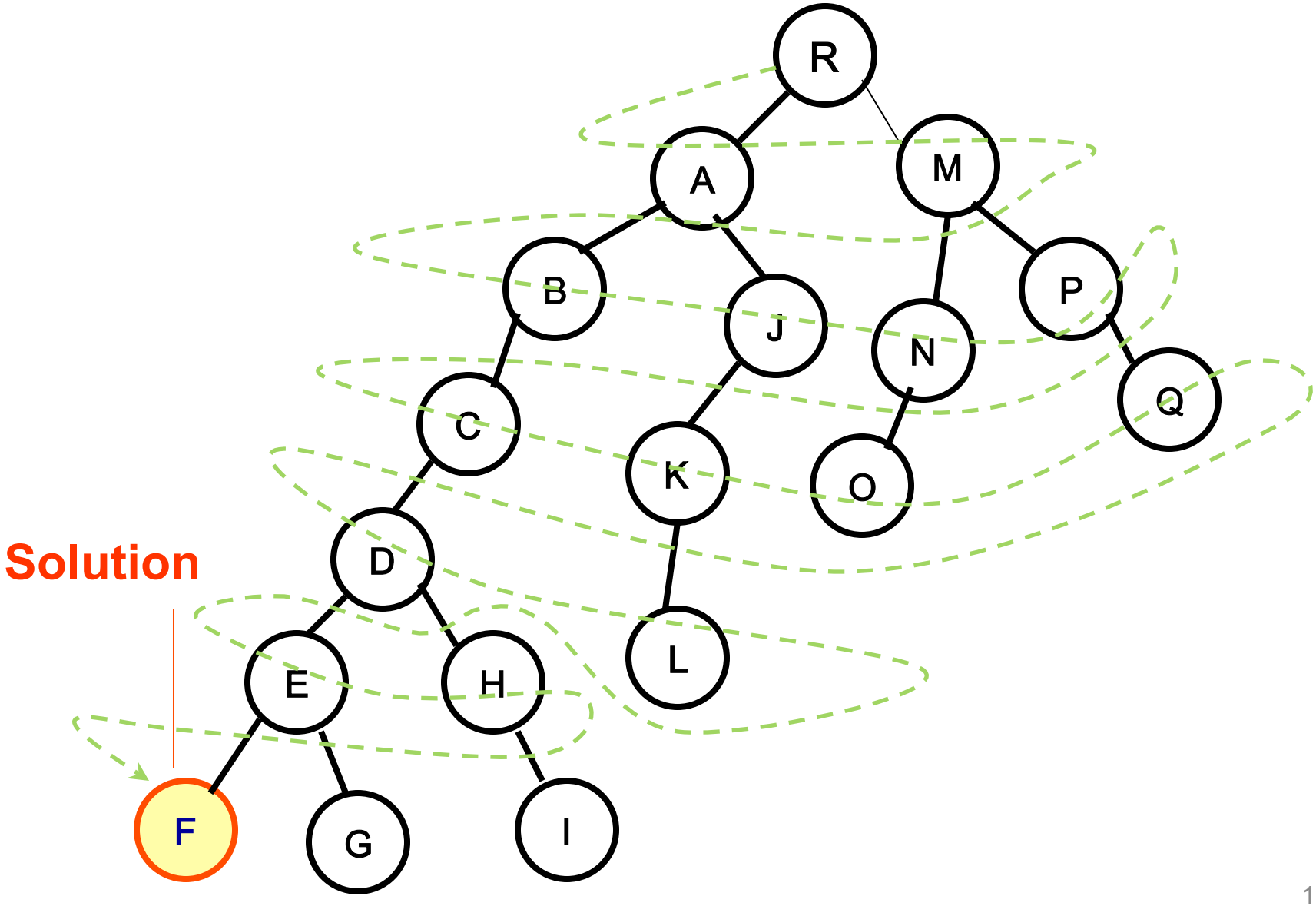
Time Complexity

- Need longer time to get the goal if the goal state is on the far deeper level.

Space Complexity

- Need to expand all the branches before proceed to next level.
- Memory consumption is high

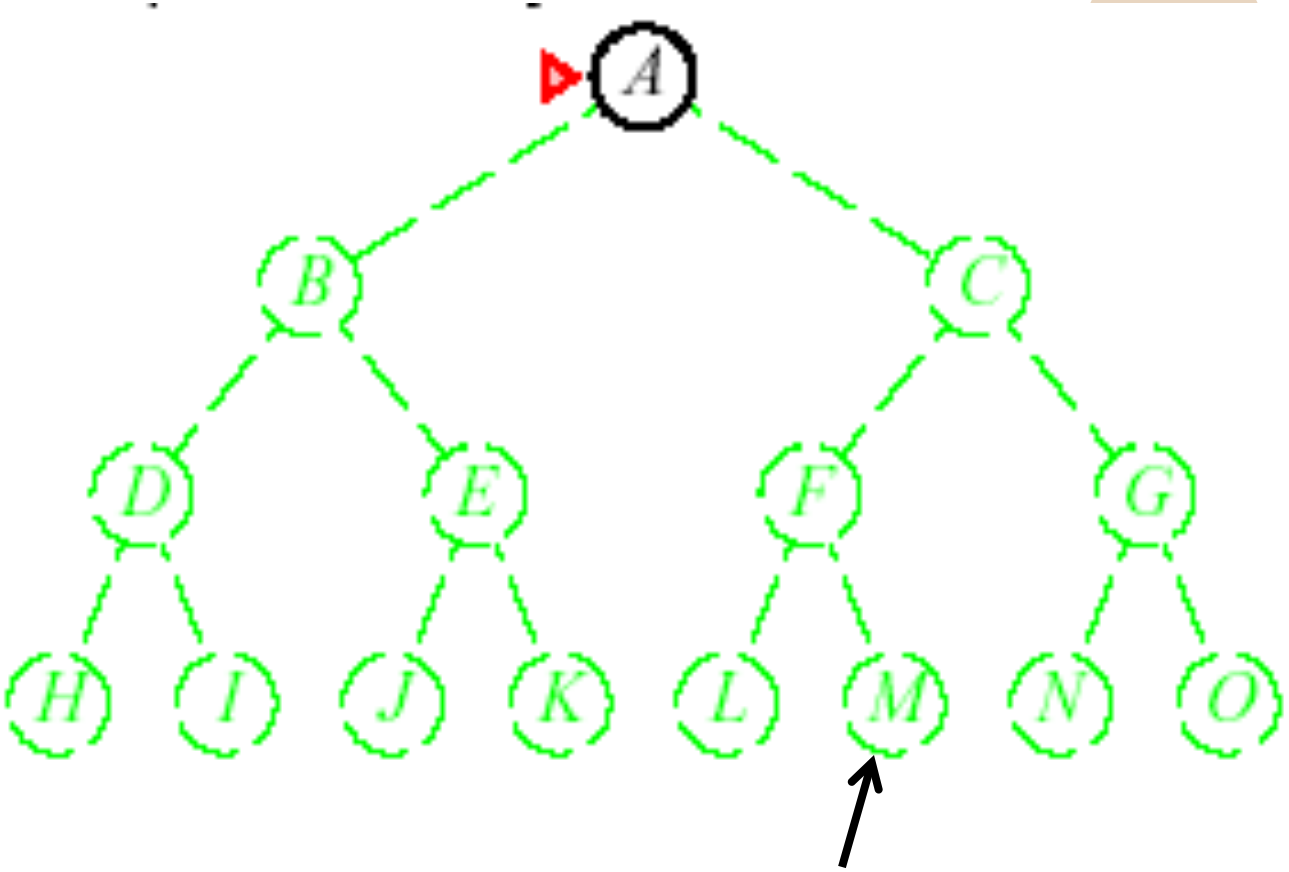
Example



Depth-First Search

- Always expands the deepest node in the current fringe of the search tree.
- Nodes leading from dead end will be discarded from memory.
- Then the search will back up to the next shallowest node that still has unexplored successors.
- Implemented by calling tree search using **LIFO (last-in-first-out)** strategy.

Example



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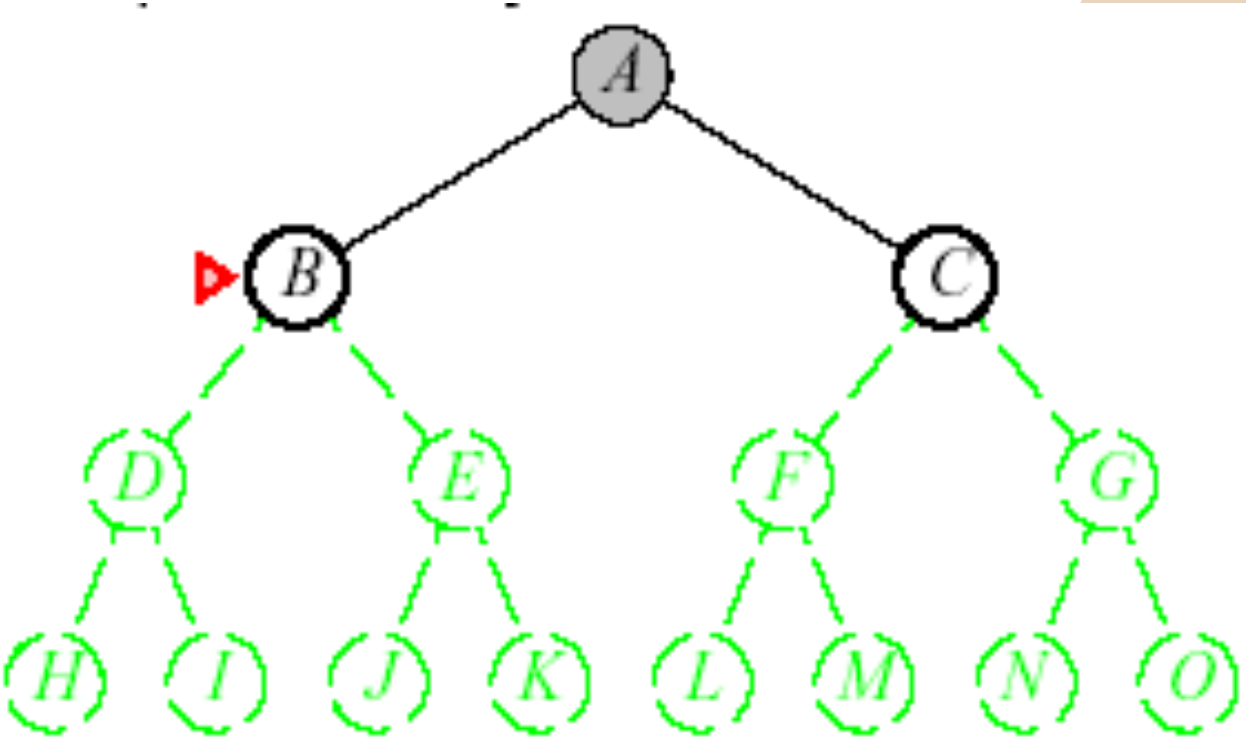

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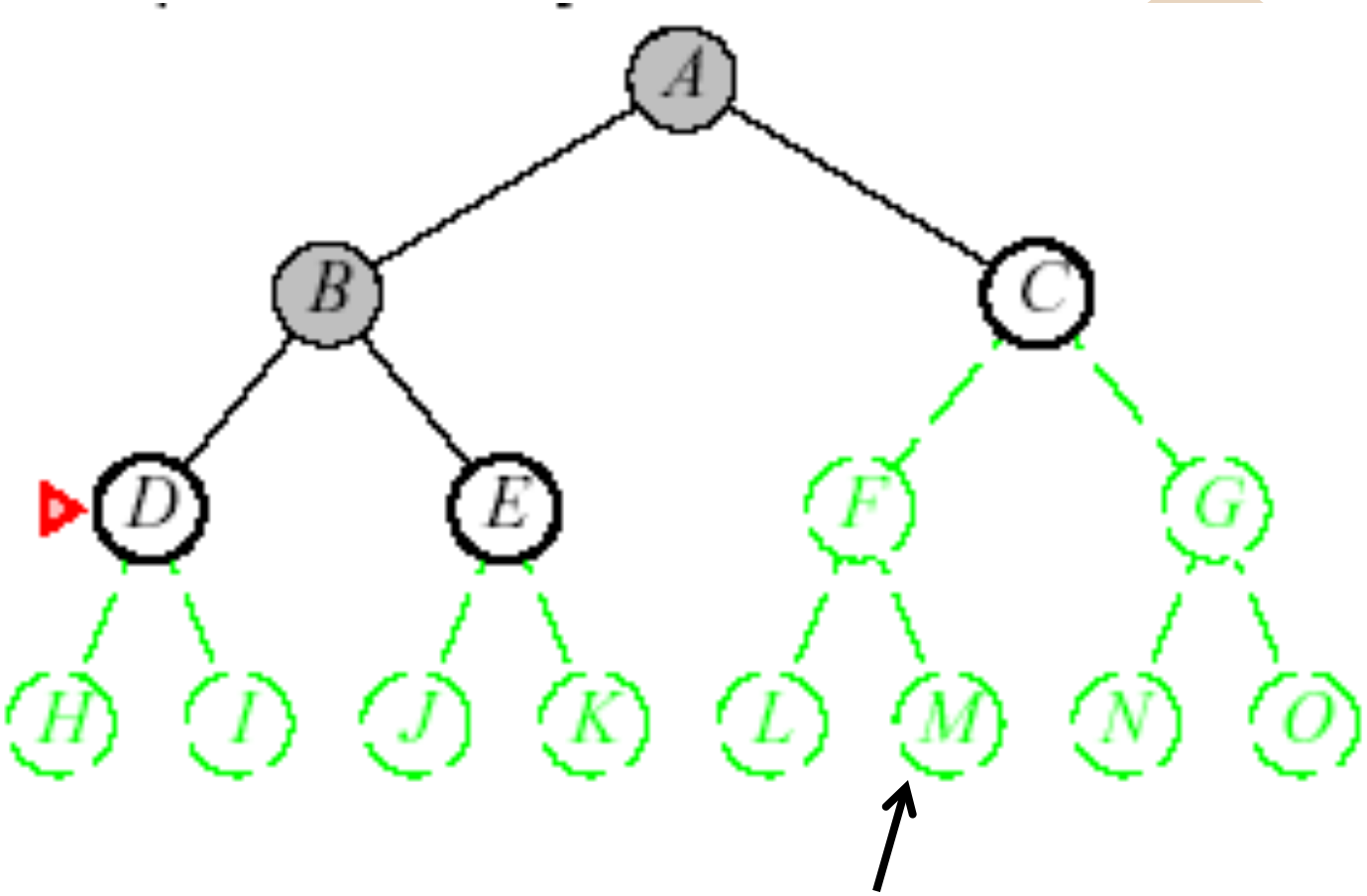

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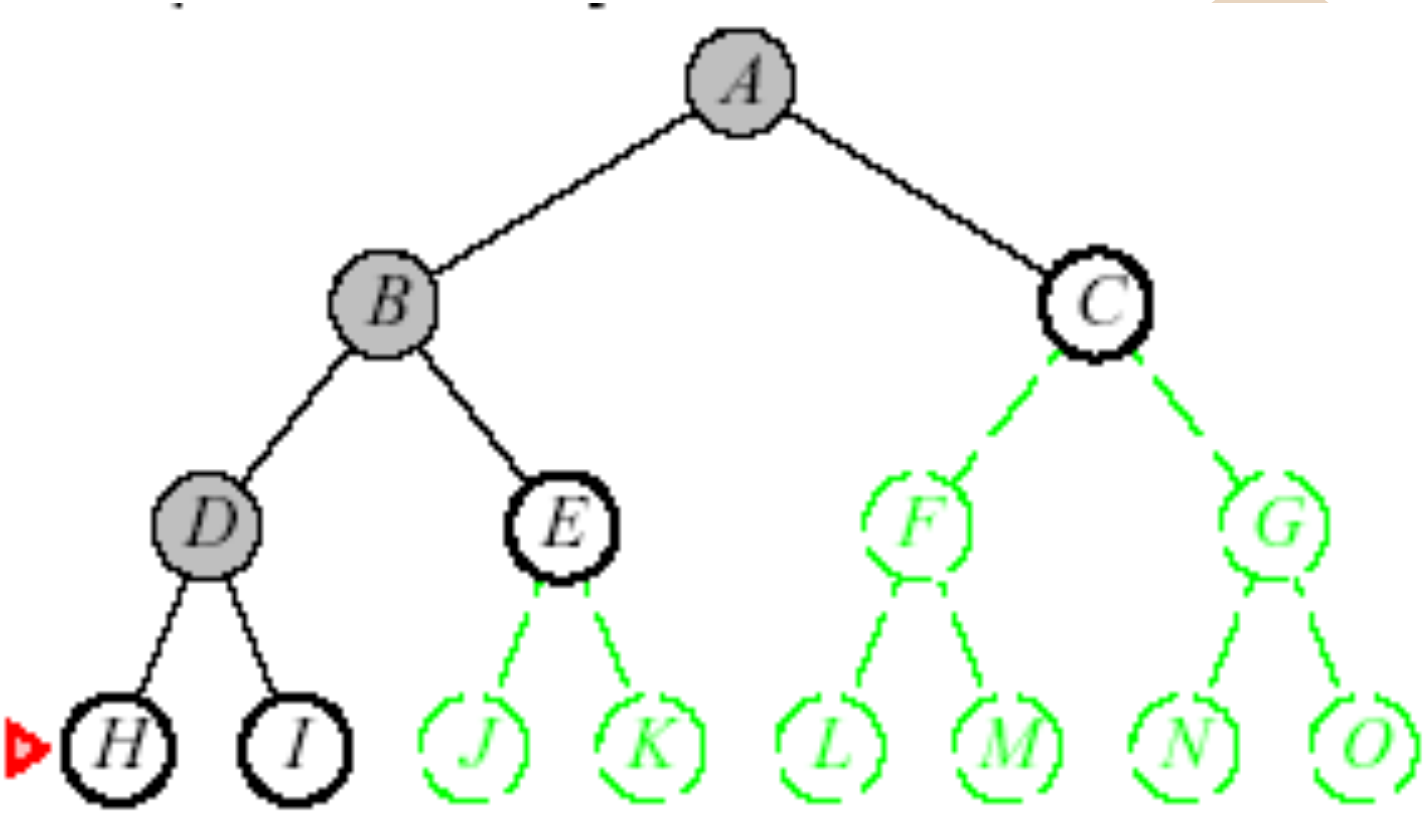

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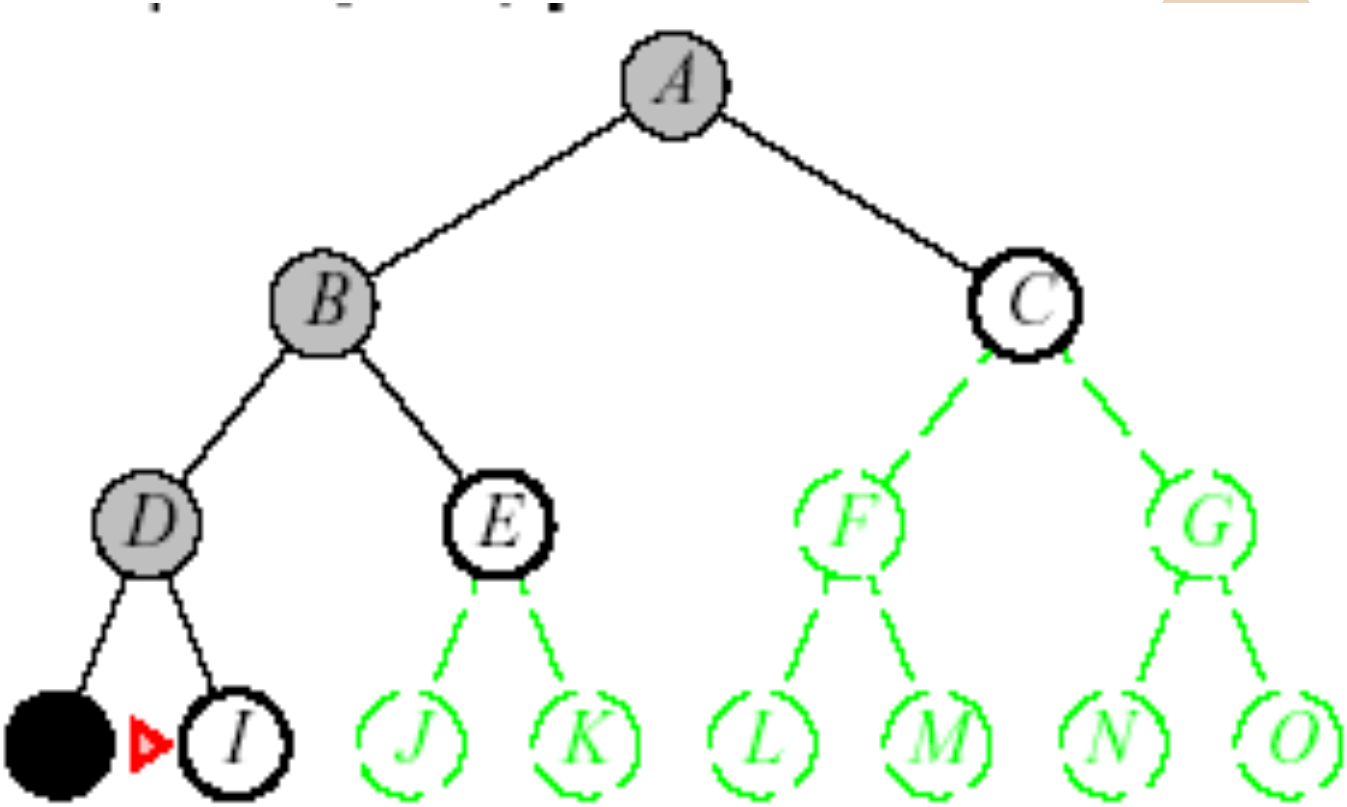

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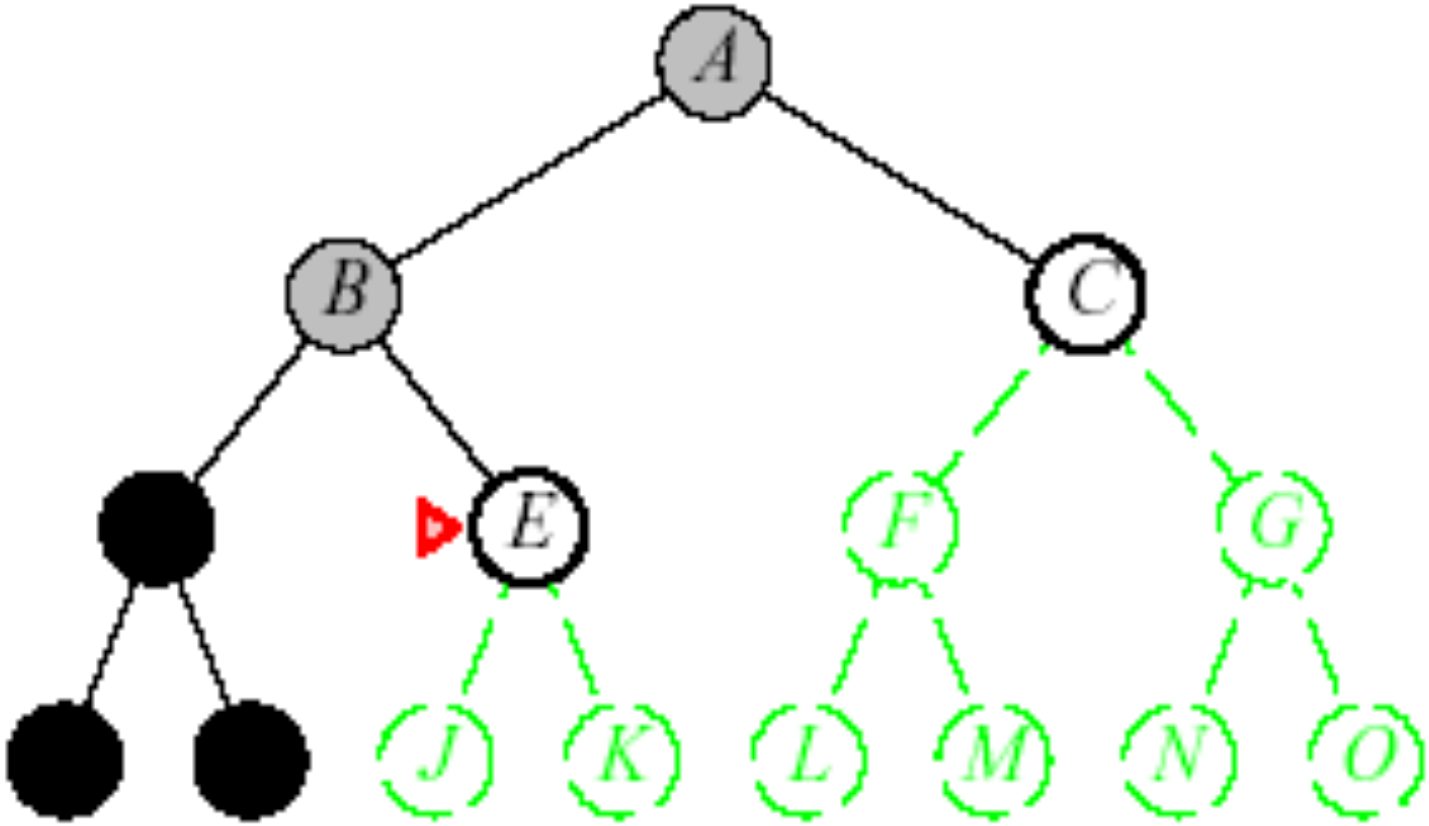

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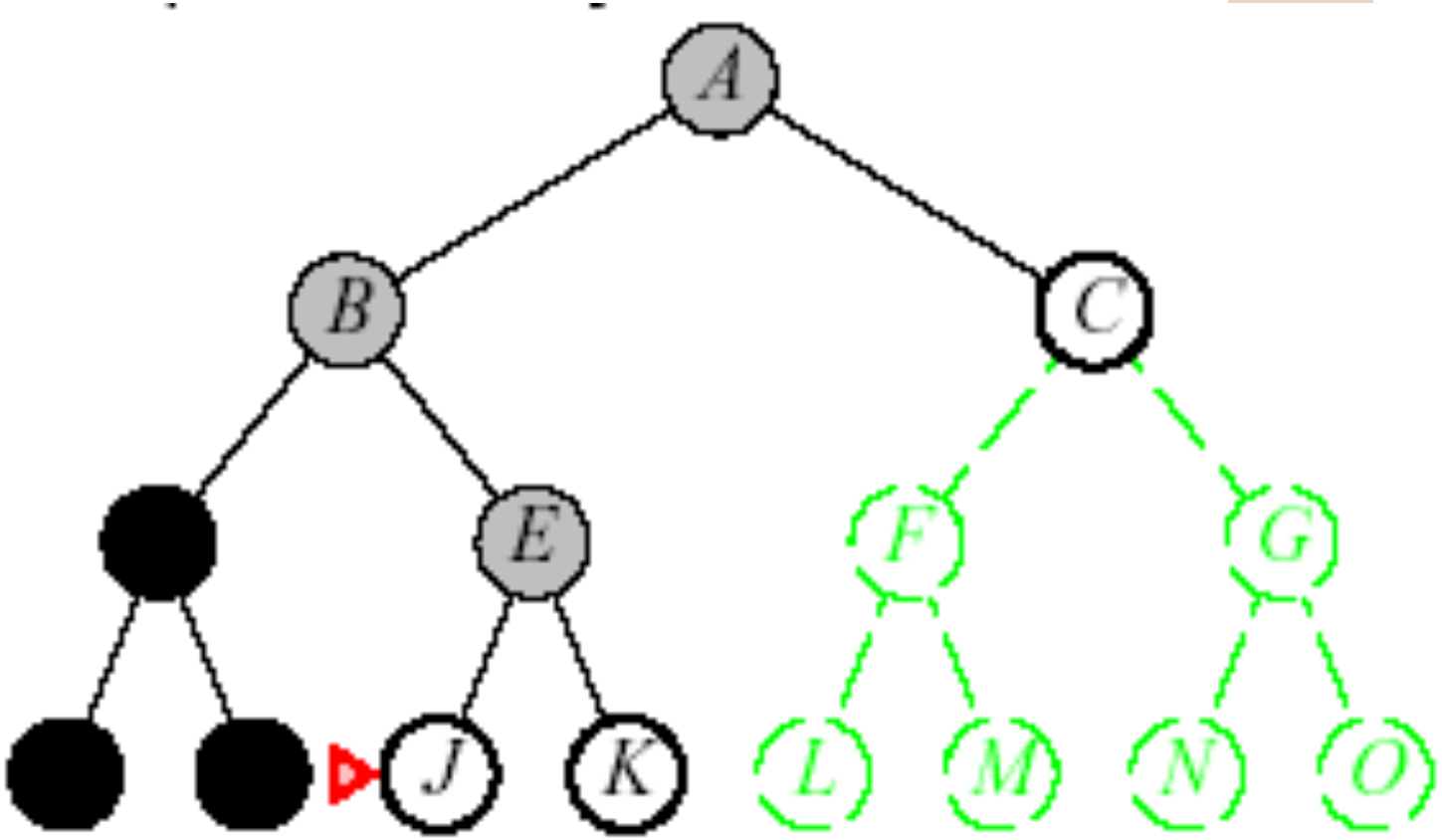

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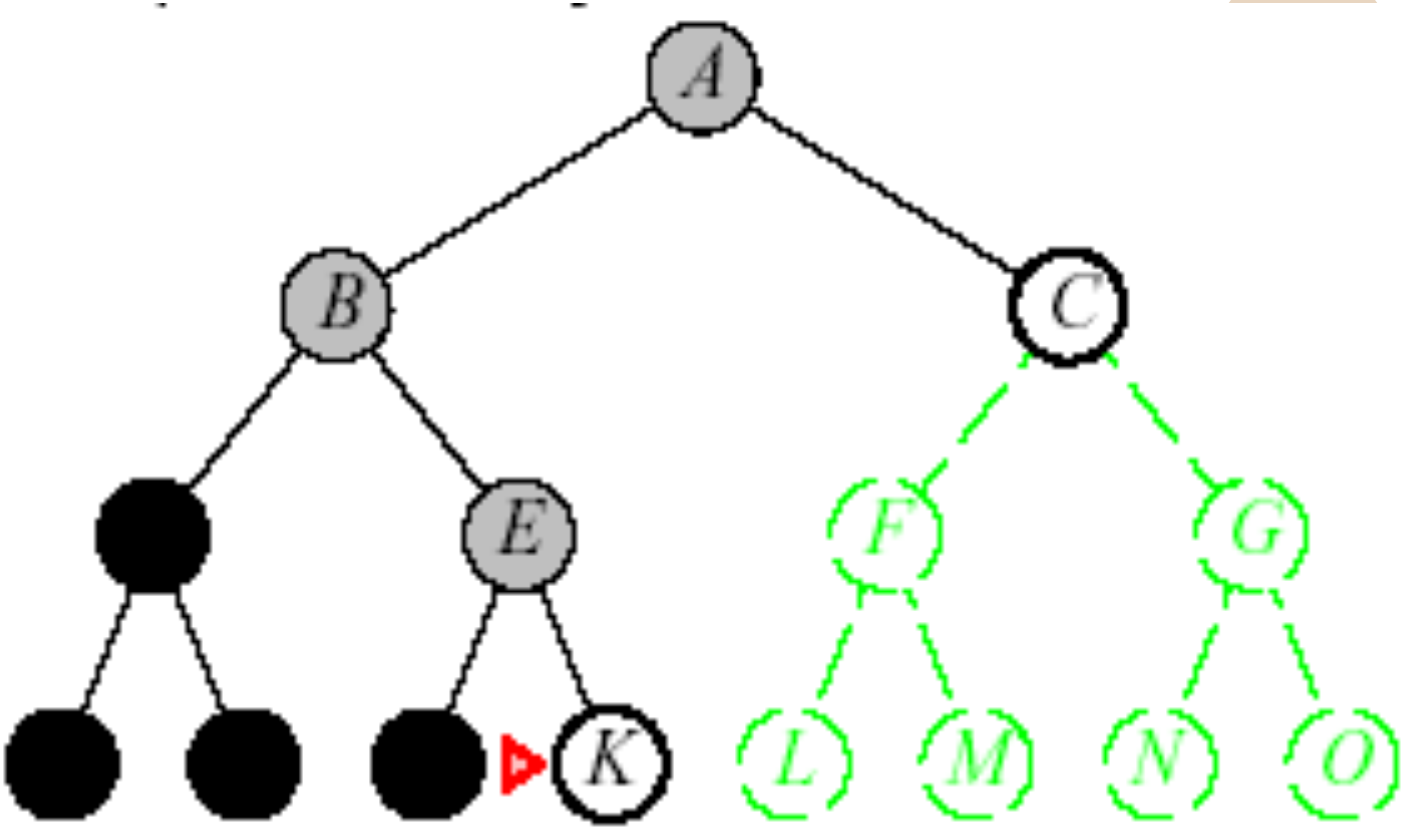

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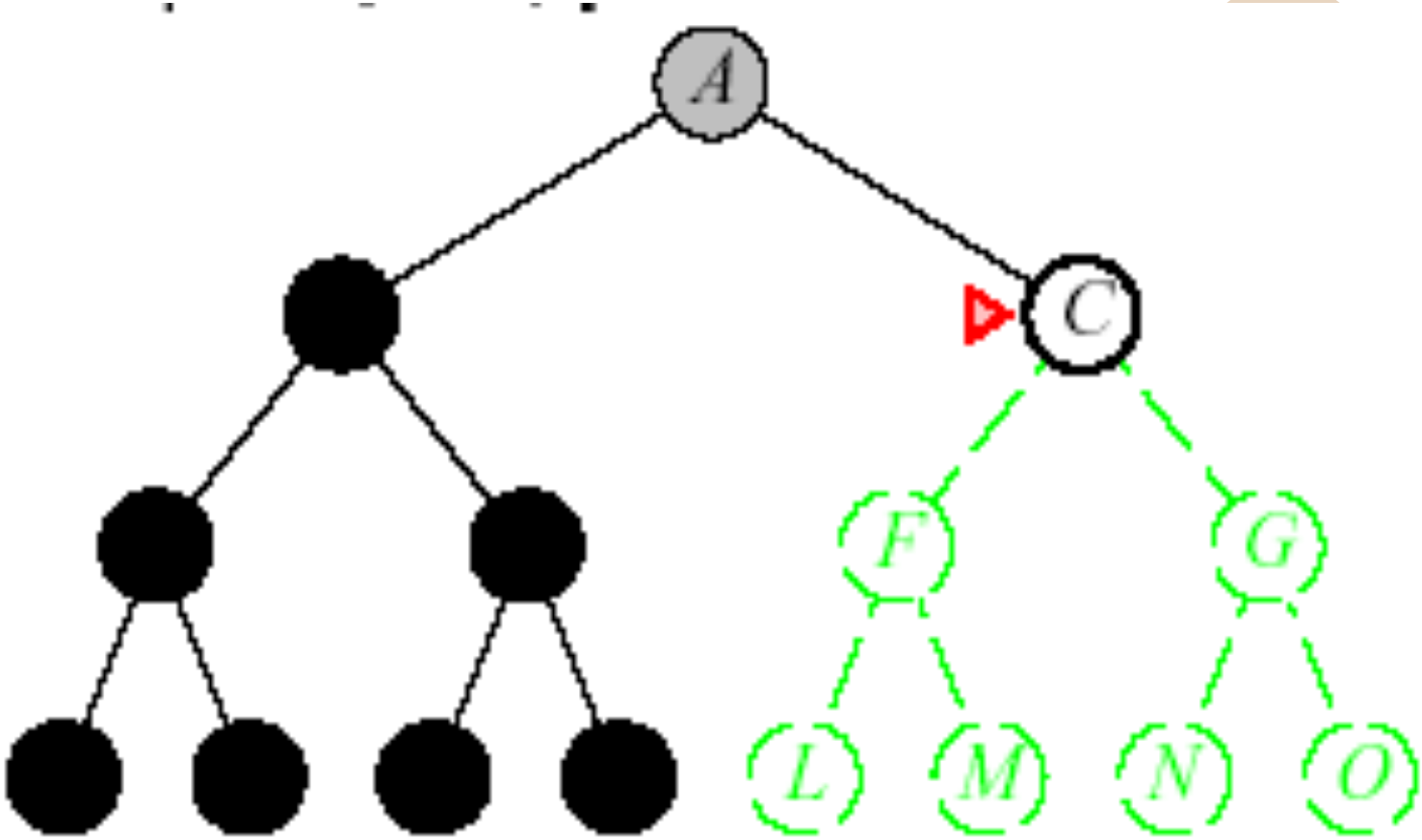

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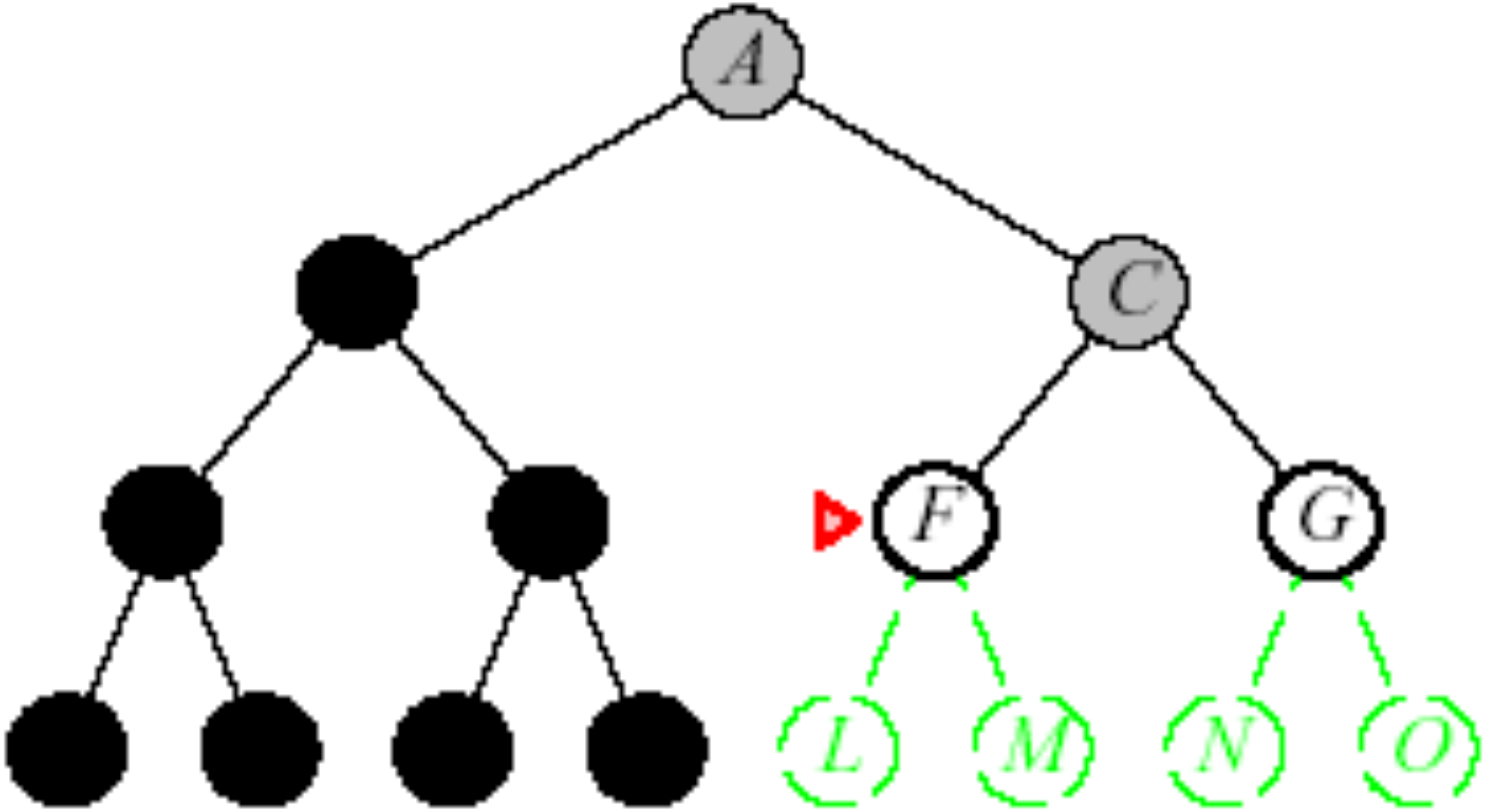

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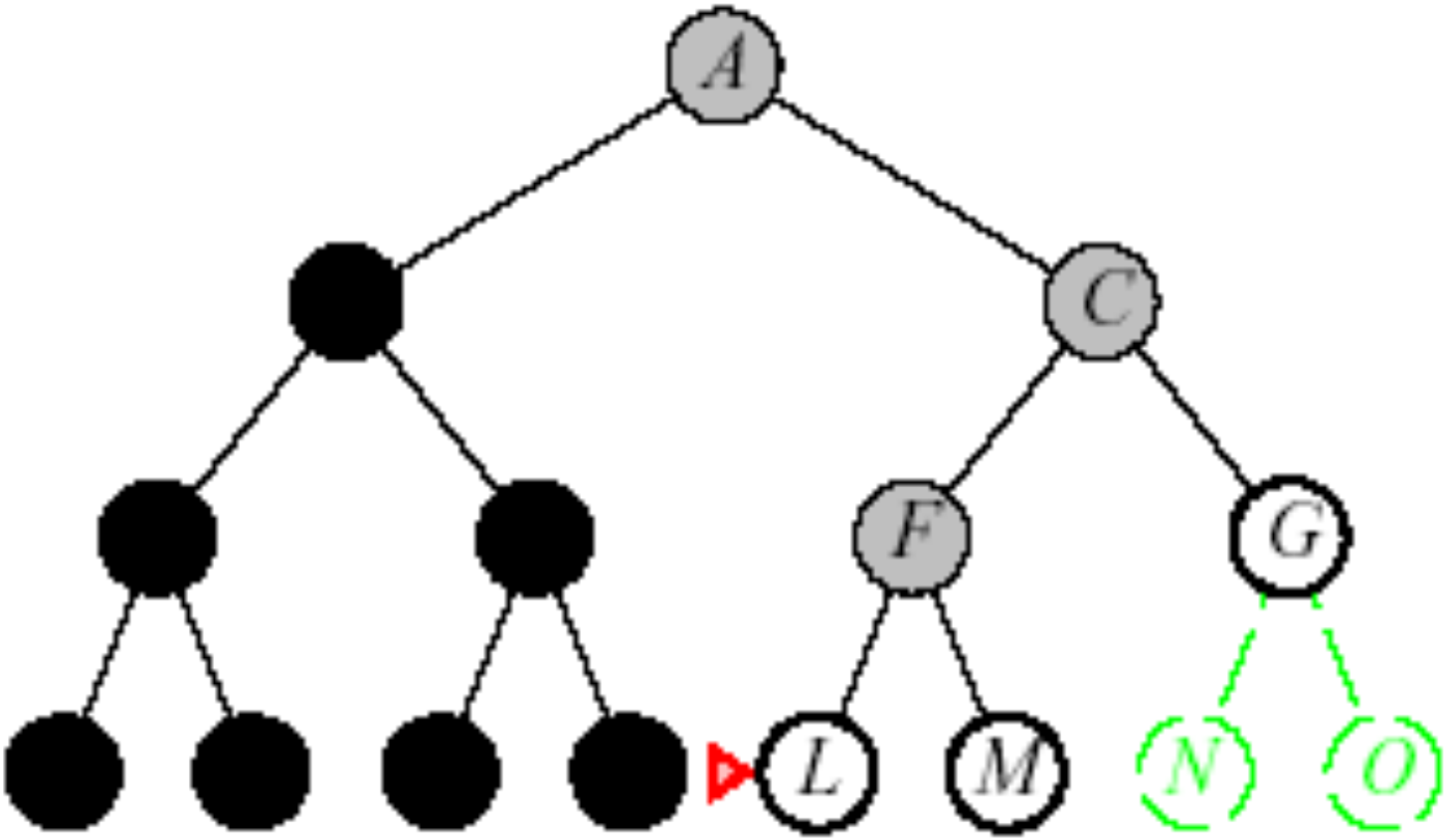

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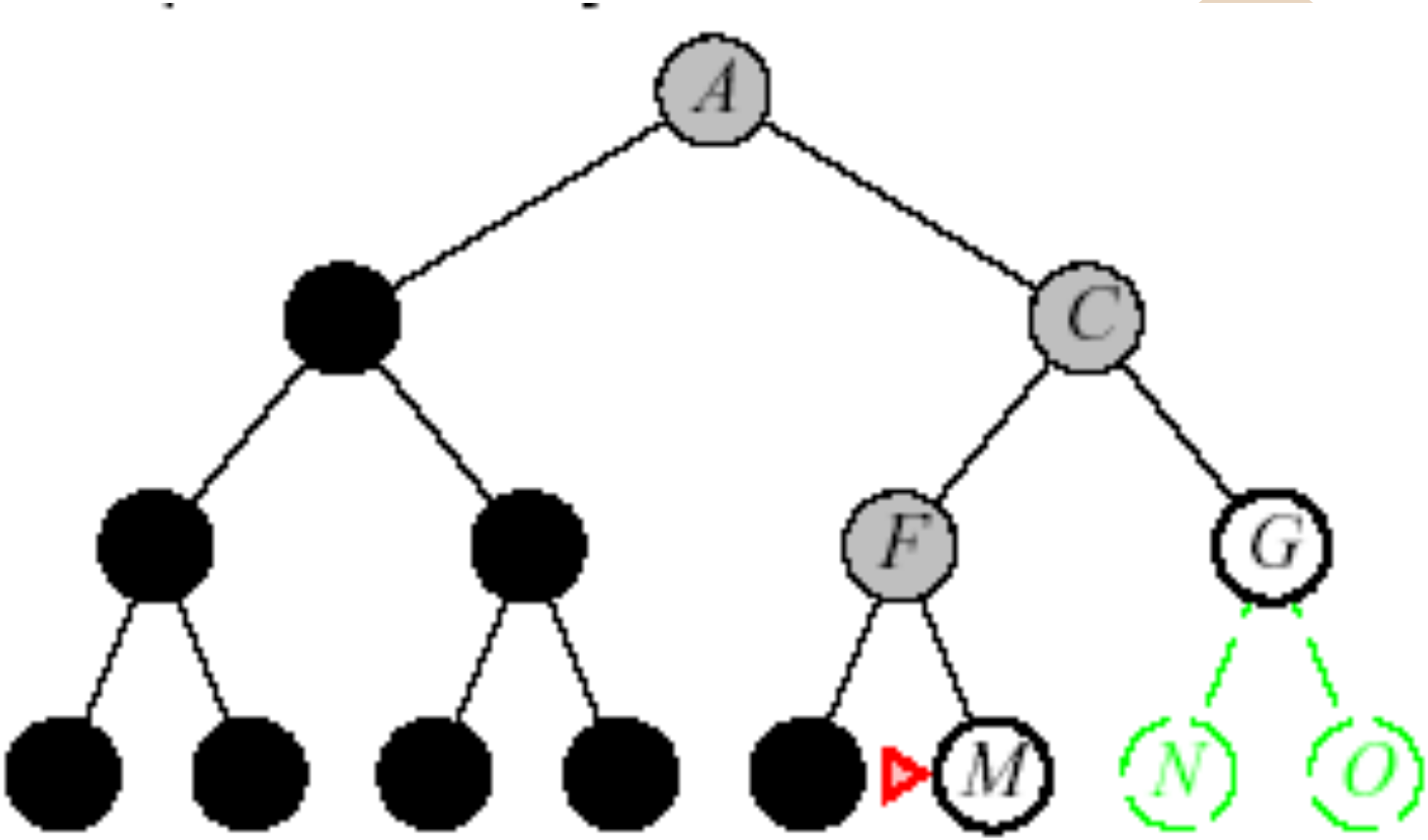

Evaluation

- Evaluate depth-first search strategy based on

1. Completeness
2. Optimality
3. Time Complexity
4. Space Complexity

Depth-Limited Search

- Depth-first search can lead to infinite path.
- Solution – Limit the depth of the expansion to avoid uncontrolled infinite path.
- Problem – how to determine the depth limit, *l*.

Heuristic search

Next Lecture