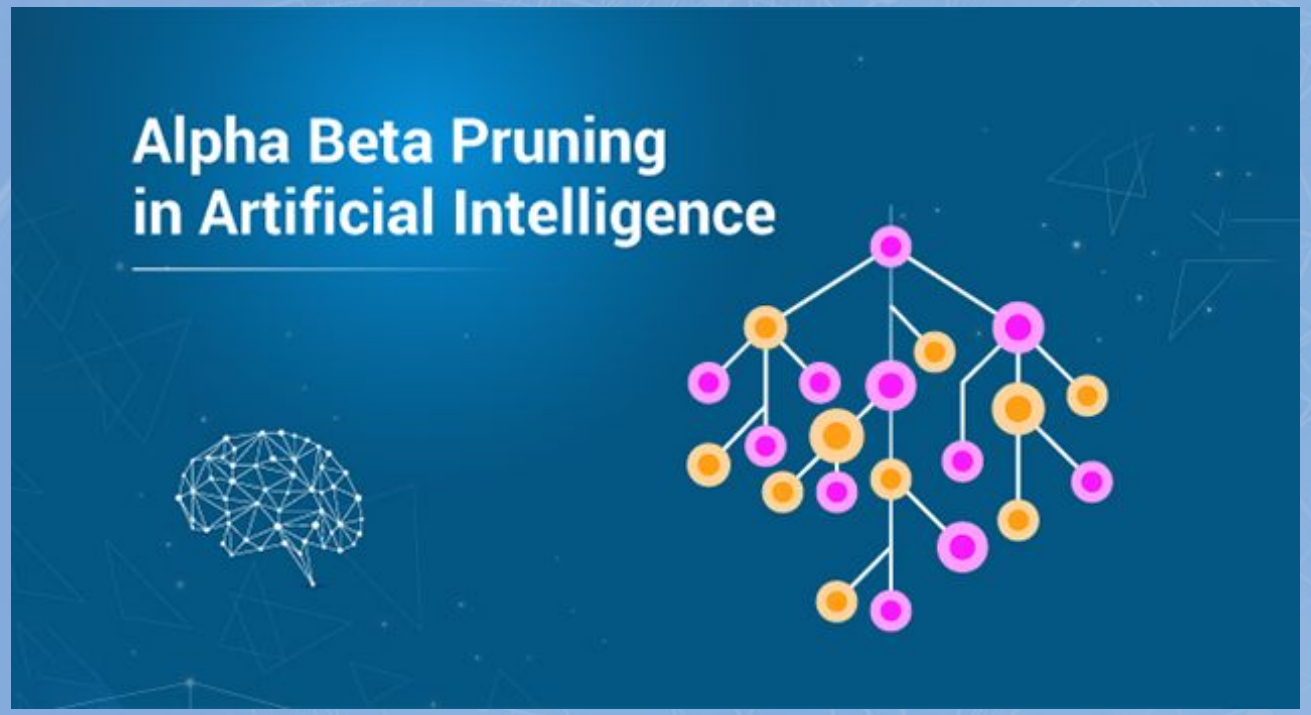


Artificial Intelligence

The Pick Numbered-Tokens Game

http://github.com/QuarternionMark/COMP472-Uh

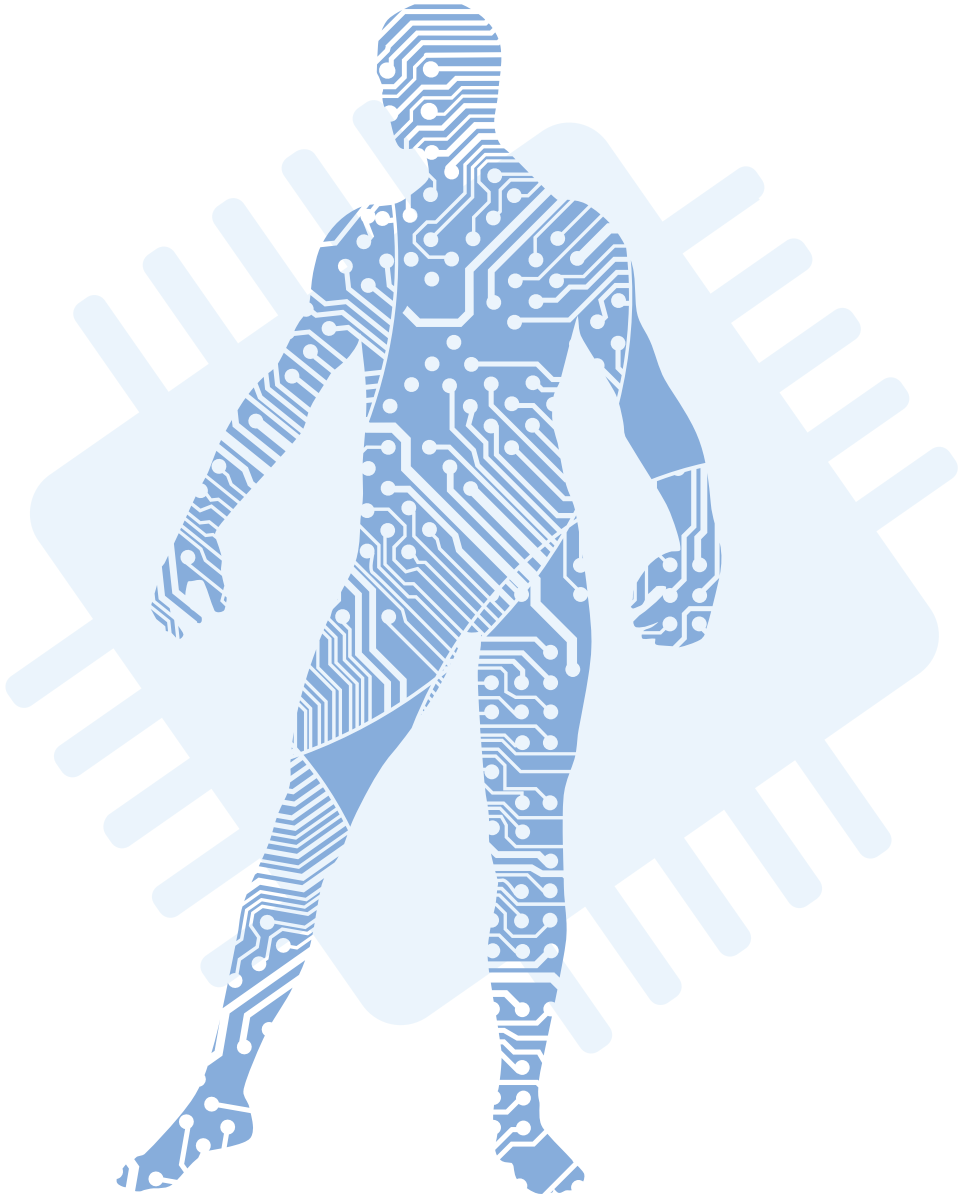
Search Algorithms

01 Min-Max Search (unused)

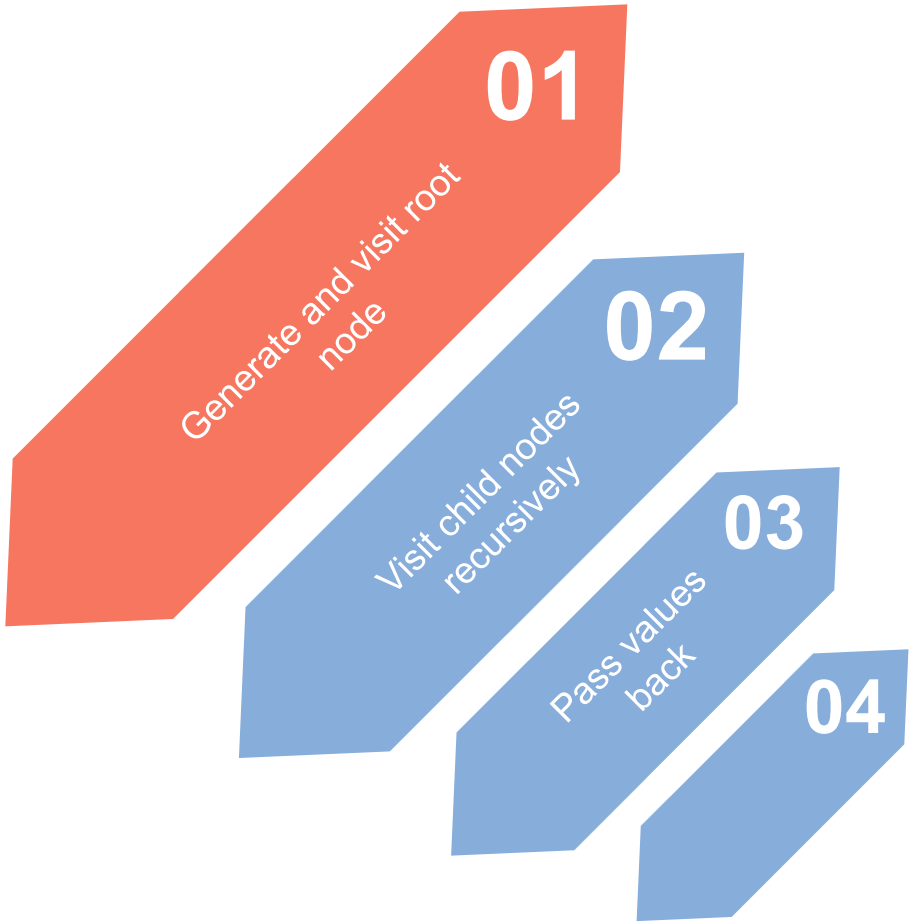
Find the best action on the assumption that opponent plays optimally.

02 Alpha-Beta Pruning

Stop examining branches which are guaranteed to not be selected.



Min-Max Search (unused)



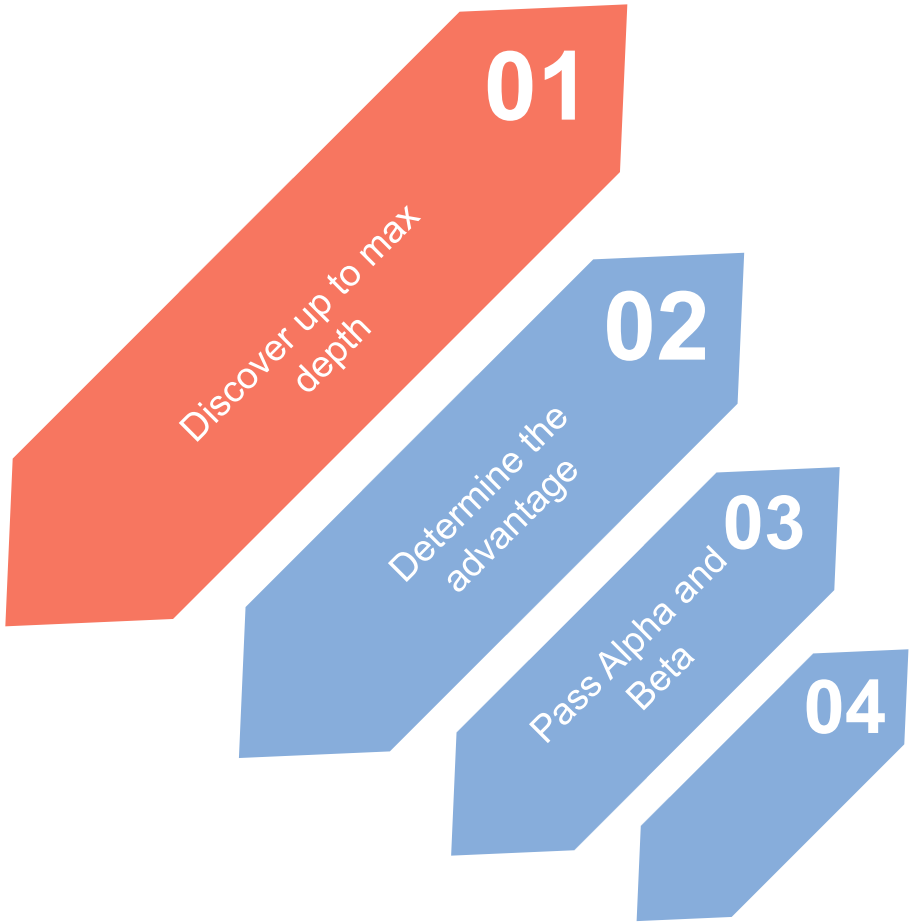
Generate the root node using the input, and visit it
The game state is properly reproduced with the output, and possible actions are found.

Visit each child node recursively
Explore child until reaching a Game End state (leaf nodes).

Pass the values back and select the “best result”
Each leaf node returns a value depending on who won.

Select best action and return up to the root node
Min selects the lowest value, while Max selects the highest value from their children’s actions.

Alpha-Beta Pruning



Discover nodes up to the max depth
Nodes at the max depth are considered leaf nodes.

Use the Heuristic to determine the advantage.
1 is Max winning, -1 is Min winning. Values in between are nodes where the game hasn't been ended yet, and the closer to 1 or -1, the better the advantage for Min or Max.

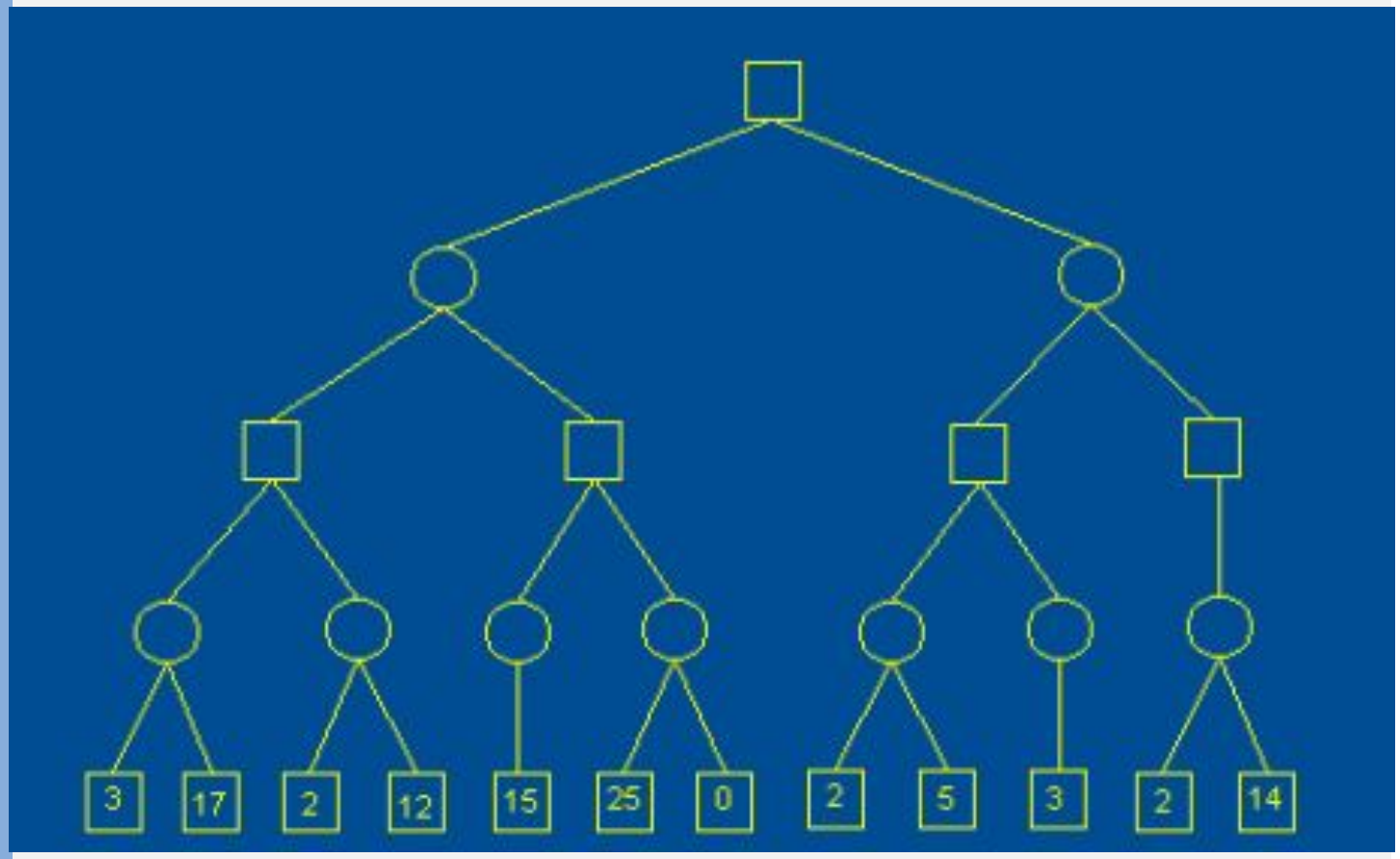
Pass Alpha and Beta values as nodes are visited.
Max updates the Alpha value, while Min updates the Beta value. The updated values are passed to the child nodes.

Stop visiting children when Alpha >= Beta
If Alpha is higher or equal to Beta at any point, the current branch is guaranteed to be unable to influence the result.

Analysis

16 tokens game

Algorithm	Alpha-Beta Pruning	Alpha-Beta Pruning (Max depth: 9)	Min-Max Search
Move	1	7	1
Value	-1.0	-0.5	-1.0
Number of Nodes Visited	3175	4717	34033
Number of Nodes Evaluated	1102	1894	14873
Max Depth Reached	13	9	14
Avg Effective Branching Factor	1.5	1.7	1.8



As more and more artificial intelligence is entering into the world, more and more emotional intelligence must enter into leadership.

- Amit Ray

Thank You

The S-PuzzlePick Numbered-Tokens