

REPORT

On

Connect 4 Game



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Github Repository Link: https://github.com/dipSaha3232/AI_Connect_four

Technology: Java and Java FX

Features:

- ❑ Connect 4 Board Game
- ❑ Player vs Player
- ❑ Player vs AI
- ❑ Easy, Medium, Hard as Game Type

Game Mechanics:

- Minimax algorithm has been used to implement AI's moves.
- Alpha-Beta pruning has been implemented to make the game tree search more optimised and move time by AI to be minimised.
- **Heuristics:**
 - Every possible column move in the board has been given a weighted score and made the AI to take the maximum optimal score value .
 - For the first move, the center column value has been given the most score weight to start with.
 - In other move situations,
 - Four same pieces in line have been given the most score weight.
 - Three same pieces in line and an empty piece has been given the 2nd most score weight.
 - Two pieces and two empty pieces have been given the third most score weight.
 - 3 opposition pieces in line and an empty space carries the least score weight.

Evaluation Function:

- `evaluate_winodw(int window[], int piece)` function has been used as the evaluation function.
- In situations where AI needs to give a move, all valid move locations pieces are checked and scored are counted. If there are no opposite colored pieces in a particular check window of four in a line, then the score is counted as the most and if opposite players get 3 pieces in line, the counted score is deducted.

Max Game Tree Depth = 8

Additional Logics:

- Game Tree depth=3 has been labelled as Easy difficulty, depth=5 labelled as Medium and depth=8 has been labelled as hard game type.