

ECS 170 Connect 4 Programming Assignment Write-Up

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Question 1:

(a) I believe my evaluation function (evaluationFunction) is reasonable here since the middle columns have more ways to connect 4 than the edges so it is more important to check them each game starts. Prior to the current evaluation function, I tried using 8 individual for loops to represent different evaluating situation when counting 3, counting 2, and counting 1 when evaluating horizontally from left to right (column 0-6), vertically from bottom to top(row 5-0), left-diagonally and right diagonally with ignoring 4 corners which are impossible to win, then passing `env.board[r][c]` for each for loop, with too many different for loops to iterate and too many board environment to pass, it resulted in extremely low time and space efficiency, and the minimaxAI algorithm always tended to go left instead of starting off from the most likely winning center column(optimal position). Therefore, I modified my evaluation function by changing it to always start off evaluating from the center columns to approach the optimal next moves and achieve the highest chances of winning against randomAI, stupidAI and monteCarloAI. Without using any for loops the iteration process from different ROW_COUNT and COLUMN_COUNT ranges can be deducted, and so the evaluating efficiency is significantly improved.

(b) For my evaluation function below:

```
def evaluationFunction(self, board):

    eval = 0 #counts iterate

    center= [row[3] for row in board]
#starting off at the column center

    eval+= center.count(self.position)*5
#iterate count 3 with corresponding weights
    center = [row[4] for row in board]
#for column 4 still center of column
    eval+= center.count(self.position)*3
#iterate count 2 with corresponding weights
    center = [row[2] for row in board]
#for column 2 still center of column
    eval += center.count(self.position)*3
#iterate count 1 with corresponding weights

    return eval
#return counts
```

(c) So it will not be a trivial state like the empty board. For example, it will check what would happen if adding one to every single move instead of having to evaluate what happens if one player drops in column 0, but then the second player drops from 0-6, then I would have to evaluate all of those. Instead of having to do that, here we suppose that one player drops at column 0-6 through each row while evaluating the most optimal move for the other player. Thus, from above, even though there are still certain cases minimaxAI and alphaBetaAI are unable to beat monteCarloAI, I still believe that my evaluation function is reasonable.

Question 2:

Players.py modified.
both minimax and the evaluation function implemented.

Question 3:

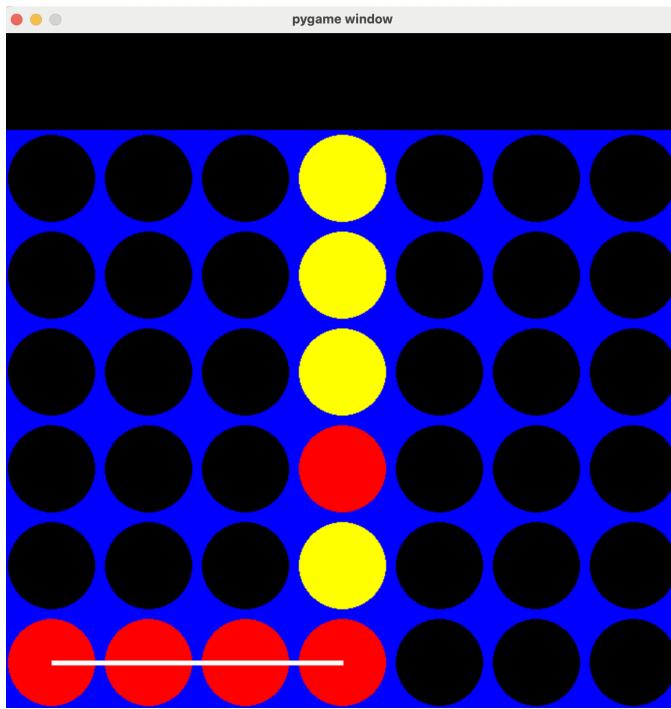
Won all 20 games against stupidAI and randomAI:

minimaxAI as Player1 VS stupidAI:

GAME 1:

Terminal command:

```
python3 main.py -p2 stupidAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 1
```



Terminal Result:

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
```

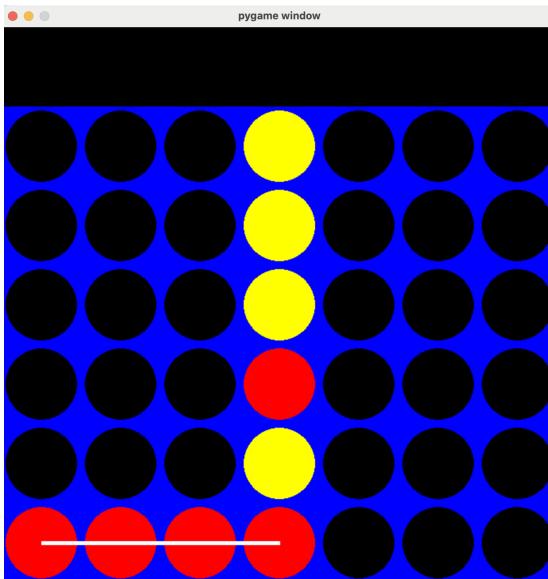
```
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[15, 15, 18, 18, 18, 15, 15]
[2] 18
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]]
[18, inf, 19, 21, inf, 18, 16]
[1] inf
[[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 1 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 1 1 1 0 0 0]]
[inf, inf, inf, -inf, inf, inf, inf]
[0] inf
[[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[1 1 1 1 0 0 0]]
Player 1 has won
```

WON GAME ONE

GAME 2:

Terminal command:

```
python3 main.py -p2 stupidAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 2
```



Terminal result:

```
[[0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 2 0 0 0]]  
[[0 0 0 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 1 0 0 0]  
 [0 0 0 2 0 0 0]  
 [0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0]  
 [0 0 0 0 0 0]  
 [0 0 0 2 0 0 0]  
 [0 0 0 1 0 0 0]  
 [0 0 0 2 0 0 0]
```

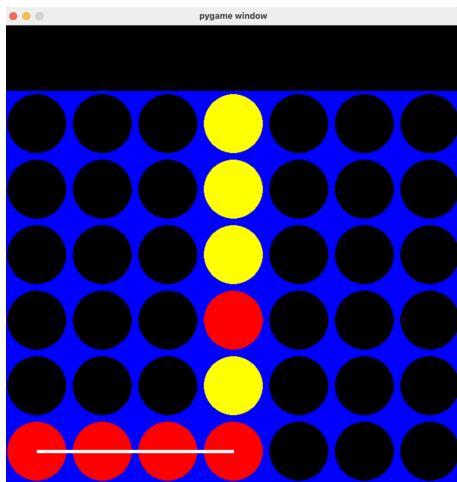
```
[0 0 0 1 0 0 0]]  
[15, 15, 18, 18, 18, 15, 15]  
[2] 18  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[18, inf, 19, 21, inf, 18, 16]  
[1] inf  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[inf, inf, inf, -inf, inf, inf, inf]  
[0] inf  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[1 1 1 1 0 0 0]]  
Player 1 has won
```

WON GAME TWO

GAME 3:

Terminal command:

```
python3 main.py -p2 stupidAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 3
```



Terminal result:

```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]
```

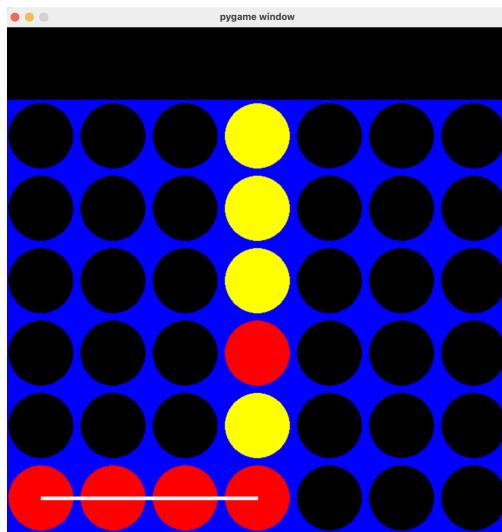
```
[0 0 0 1 0 0 0]]  
[15, 15, 18, 18, 18, 15, 15]  
[2] 18  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[18, inf, 19, 21, inf, 18, 16]  
[1] inf  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[inf, inf, inf, -inf, inf, inf, inf]  
[0] inf  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[1 1 1 1 0 0 0]]  
Player 1 has won
```

WON GAME THREE

GAME 4:

Terminal command:

```
python3 main.py -p2 stupidAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]
```

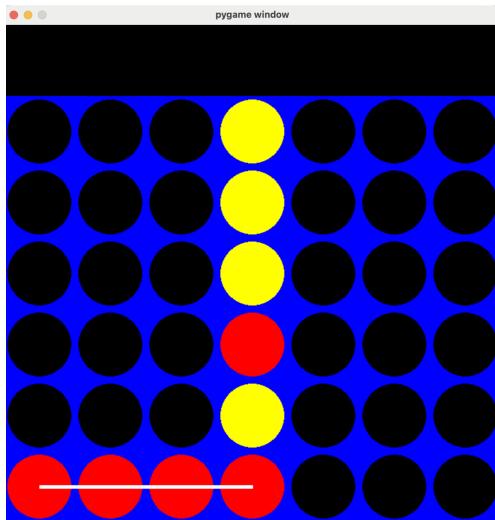
```
[0 0 0 1 0 0 0]]  
[15, 15, 18, 18, 18, 15, 15]  
[2] 18  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[18, inf, 19, 21, inf, 18, 16]  
[1] inf  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[inf, inf, inf, -inf, inf, inf, inf]  
[0] inf  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[1 1 1 1 0 0 0]]  
Player 1 has won
```

WON GAME FOUR

GAME 5:

Terminal command:

```
python3 main.py -p2 stupidAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 5
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 0 0 0]]  
[[0 0 0 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]]
```

```
[0 0 0 1 0 0 0]]  
[15, 15, 18, 18, 18, 15, 15]  
[2] 18  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[18, inf, 19, 21, inf, 18, 16]  
[1] inf  
[[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[inf, inf, inf, -inf, inf, inf, inf]  
[0] inf  
[[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[1 1 1 1 0 0 0]]  
Player 1 has won
```

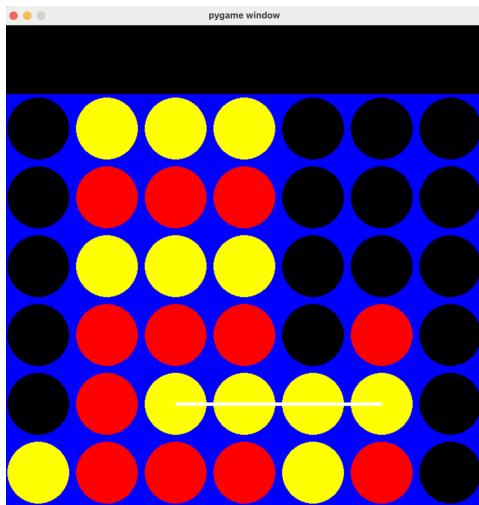
WON GAME FIVE

minimaxAI as Player2 VS stupidAI:

GAME 6:

Terminal command:

```
python3 main.py -p1 stupidAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 1
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0]]  
[5, 5, 8, 10, 8, 5, 5]  
[3] 10  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 0 0]  
[0 0 0 1 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0]  
[0 0 0 2 0 0]  
[0 0 0 1 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 0 0]]
```

```
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[13, 13, 16, 18, 16, 13, 13]
[3] 18
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[18, 18, 21, -inf, 21, 18, 18]
[2] 21
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[21, 21, 24, -inf, 24, 21, 21]
[2] 24
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]]
```

```
[0 0 1 1 0 0 0]]  
[[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[24, 24, 27, -inf, 27, 24, 24]  
[2] 27  
[[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 1 1 1 0 0 0]]  
[-inf, -inf, -inf, -inf, -inf, -inf, -inf]  
[0] -inf  
[[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[2 1 1 1 0 0 0]]  
[[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 1 2 2 0 0 0]  
[2 1 1 1 0 0 0]]  
[-inf, -inf, -inf, -inf, 30, -inf, -inf]  
[4] 30  
[[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 1 2 2 0 0 0]  
[2 1 1 1 2 0 0]]  
[[0 0 2 2 0 0 0]]
```

```
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, -inf, -inf]
[1] 30
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, 30, 30]
[1] 30
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, -inf, 30, 30]
[5] 30
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 2 0]
[2 1 1 1 2 1 0]]
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]]
```

```
[0 1 1 1 0 1 0]
[0 1 2 2 0 2 0]
[2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, inf, 30, inf]
```

```
[4] inf
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 1 0]
[0 1 2 2 2 2 0]
[2 1 1 1 2 1 0]]
```

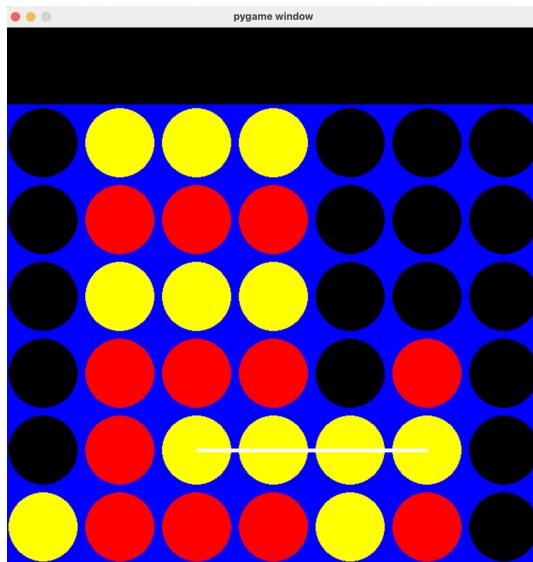
Player 2 has won

WON GAME SIX

GAME 7:

Terminal command:

```
python3 main.py -p1 stupidAI -p2 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 2
```



Terminal result:

```
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]]
```

```
[0 0 0 1 0 0 0]]  
[5, 5, 8, 10, 8, 5, 5]  
[3] 10  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[13, 13, 16, 18, 16, 13, 13]  
[3] 18  
[[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]]  
[18, 18, 21, -inf, 21, 18, 18]
```

```
[2] 21
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[21, 21, 24, -inf, 24, 21, 21]
[2] 24
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[24, 24, 27, -inf, 27, 24, 24]
[2] 27
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, -inf, -inf, -inf]
[0] -inf
[[0 0 2 2 0 0 0]]
```

```
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[2 1 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, 30, -inf, -inf]
[4] 30
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, -inf, -inf]
[1] 30
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, 30, 30]
[1] 30
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]]
```

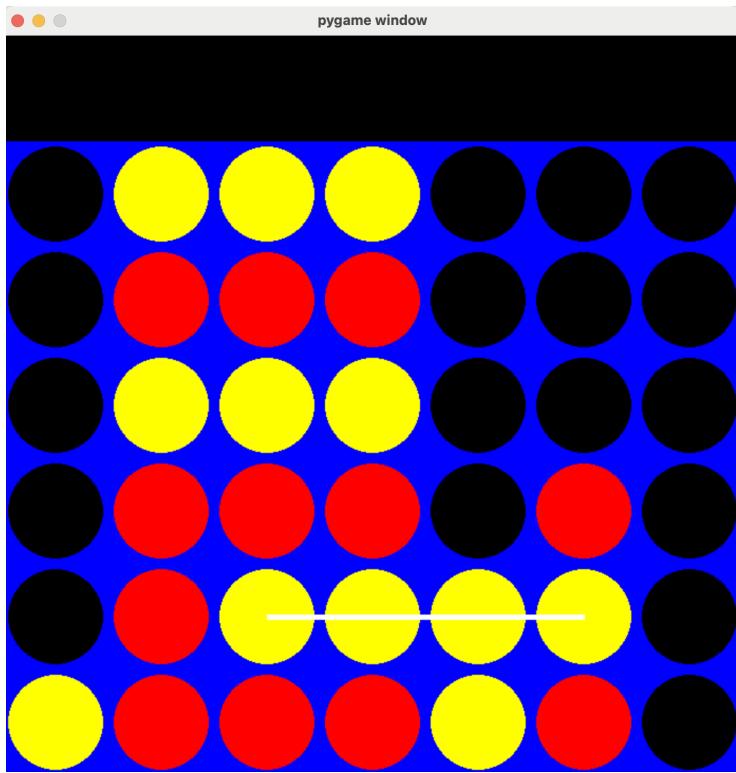
```
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, -inf, 30, 30]
[5] 30
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 2 0]
 [2 1 1 1 2 1 0]]
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 1 0]
 [0 1 2 2 0 2 0]
 [2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, inf, 30, inf]
[4] inf
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 1 0]
 [0 1 2 2 2 2 0]
 [2 1 1 1 2 1 0]]
Player 2 has won
```

WON GAME SEVEN

GAME 8

Terminal command:

```
python3 main.py -p1 stupidAI -p2 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 3
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
```

```
[3] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[13, 13, 16, 18, 16, 13, 13]
[3] 18
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]]
[18, 18, 21, -inf, 21, 18, 18]
[2] 21
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]]
[21, 21, 24, -inf, 24, 21, 21]
[2] 24
[[0 0 0 2 0 0 0]]
```

```
[0 0 0 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[24, 24, 27, -inf, 27, 24, 24]
[2] 27
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, -inf, -inf, -inf]
[0] -inf
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[2 1 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, 30, -inf, -inf]
[4] 30
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]]
```

```
[0 0 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, -inf, -inf]
[1] 30
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, 30, 30]
[1] 30
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, -inf, 30, 30]
[5] 30
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 2 0]
```

```
[2 1 1 1 2 1 0]]  
[[0 2 2 2 0 0 0]  
[0 1 1 1 0 0 0]  
[0 2 2 2 0 0 0]  
[0 1 1 1 0 1 0]  
[0 1 2 2 0 2 0]  
[2 1 1 1 2 1 0]]
```

```
[-inf, -inf, -inf, -inf, inf, 30, inf]
```

```
[4] inf
```

```
[[0 2 2 2 0 0 0]  
[0 1 1 1 0 0 0]  
[0 2 2 2 0 0 0]  
[0 1 1 1 0 1 0]  
[0 1 2 2 2 2 0]  
[2 1 1 1 2 1 0]]
```

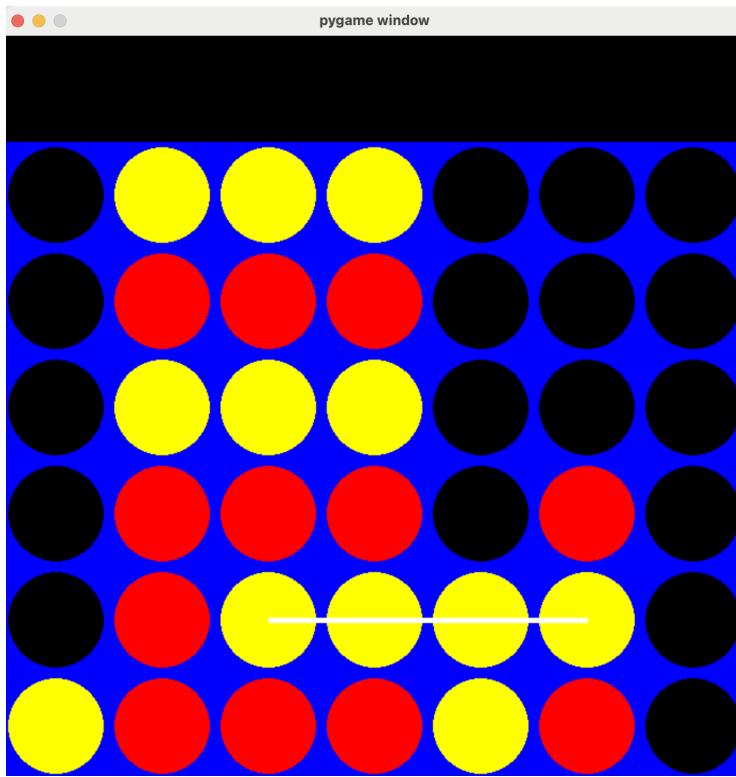
```
Player 2 has won
```

WON GAME EIGHT

GAME 9:

Terminal command:

```
python3 main.py -p1 stupidAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
 [5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]]
[13, 13, 16, 18, 16, 13, 13]
[3] 18
[[0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]]
[[0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]]
[18, 18, 21, -inf, 21, 18, 18]
[2] 21
[[0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 2 2 0 0]
 [0 0 1 1 0 0]]
[[0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 1 1 0 0]
 [0 0 2 2 0 0]
 [0 0 1 1 0 0]]
[21, 21, 24, -inf, 24, 21, 21]
[2] 24
[[0 0 0 2 0 0]
 [0 0 0 1 0 0]]
```

```
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[24, 24, 27, -inf, 27, 24, 24]
[2] 27
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, -inf, -inf, -inf]
[0] -inf
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[2 1 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, 30, -inf, -inf]
[4] 30
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]]
```

```
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, -inf, -inf]
[1] 30
[[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, 30, 30]
[1] 30
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, -inf, 30, 30]
[5] 30
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 2 0]
[2 1 1 1 2 1 0]]
```

```
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 1 0]
 [0 1 2 2 0 2 0]
 [2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, inf, 30, inf]
```

[4] inf

```
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 1 0]
 [0 1 2 2 2 2 0]
 [2 1 1 1 2 1 0]]
```

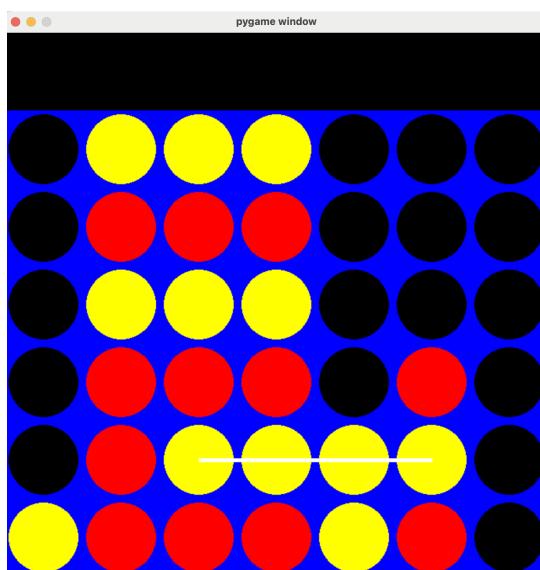
Player 2 has won

WON GAME NINE

GAME 10:

Terminal command:

```
python3 main.py -p1 stupidAI -p2 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 5
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[13, 13, 16, 18, 16, 13, 13]
[3] 18
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]]
```

[18, 18, 21, -inf, 21, 18, 18]

[2] 21

[[0 0 0 2 0 0 0]]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]]

[[0 0 0 2 0 0 0]]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]]

[21, 21, 24, -inf, 24, 21, 21]

[2] 24

[[0 0 0 2 0 0 0]]

[0 0 0 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]]

[[0 0 0 2 0 0 0]]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]]

[24, 24, 27, -inf, 27, 24, 24]

[2] 27

[[0 0 2 2 0 0 0]]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]]

[[0 0 2 2 0 0 0]]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 1 0 0 0]

[0 0 2 2 0 0 0]

[0 1 1 1 0 0 0]]

[-inf, -inf, -inf, -inf, -inf, -inf, -inf]

[0] -inf

```
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [2 1 1 1 0 0 0]]
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 0 0 0]]
[-inf, -inf, -inf, -inf, 30, -inf, -inf]
[4] 30
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, -inf, -inf]
[1] 30
[[0 0 2 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[[0 0 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]
 [0 1 2 2 0 0 0]
 [2 1 1 1 2 0 0]]
[-inf, 30, -inf, -inf, -inf, 30, 30]
[1] 30
[[0 2 2 2 0 0 0]
 [0 1 1 1 0 0 0]]
```

```
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 0 0]]
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 0 0]
[2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, -inf, 30, 30]
[5] 30
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 1 2 2 0 2 0]
[2 1 1 1 2 1 0]]
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 1 0]
[0 1 2 2 0 2 0]
[2 1 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, inf, 30, inf]
[4] inf
[[0 2 2 2 0 0 0]
[0 1 1 1 0 0 0]
[0 2 2 2 0 0 0]
[0 1 1 1 0 1 0]
[0 1 2 2 2 2 0]
[2 1 1 1 2 1 0]]
Player 2 has won
```

WON GAME TEN

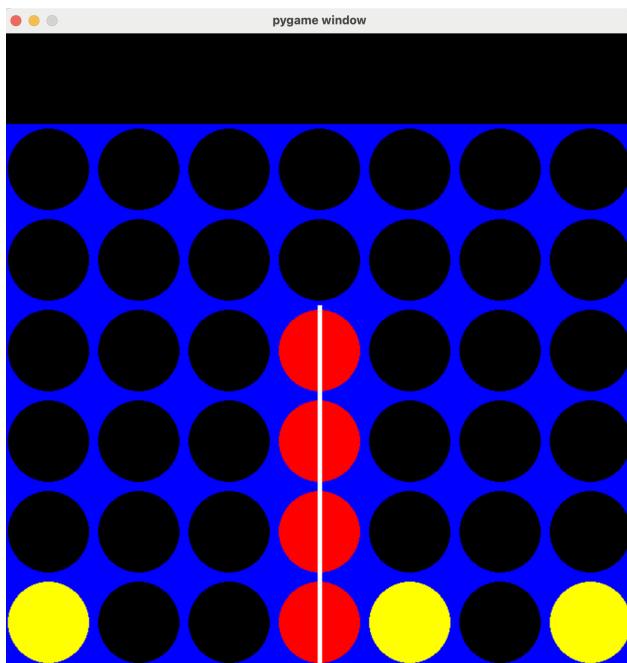
Successfully beat all stupidAI with minimaxAI

minimaxAI as Player1 VS randomAI:

GAME 11:

Terminal command:

```
python3 main.py -p2 randomAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 1
```



Terminal result:

```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 2 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 1 2 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]
```

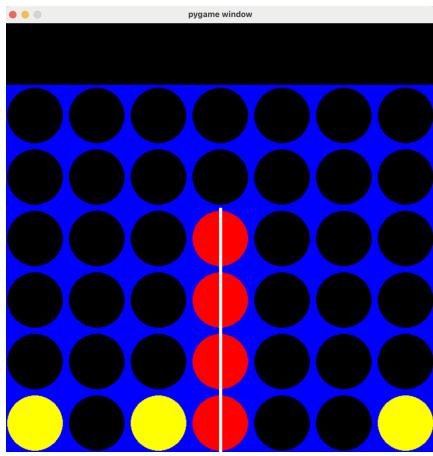
```
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 2]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 2]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[2 0 0 1 2 0 2]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[2 0 0 1 2 0 2]]
Player 1 has won
```

WON GAME ELEVEN

GAME 12:

Terminal command:

```
python3 main.py -p2 randomAI -p1 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 2
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
 [[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 2]]
 [10, 10, 13, 15, 13, 10, 10]
 [3] 15
 [[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 2]]
 [[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 2]]
 [20 0 1 0 0 2]
 [15, 15, 18, 20, 18, 15, 15]
 [3] 20
 [[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]]
```

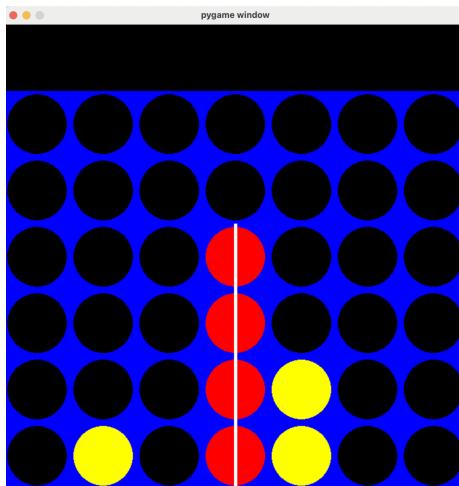
```
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[2 0 0 1 0 0 2]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[2 0 2 1 0 0 2]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[2 0 2 1 0 0 2]]
Player 1 has wo
```

WON GAME TWELVE

GAME 13:

Terminal command:

```
python3 main.py -p2 randomAI -p1 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 3
```



Terminal result:

```
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 2 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 2 0 1 2 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[0 2 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]
[0 2 0 1 2 0 0]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
```

[0 2 0 1 2 0 0]]

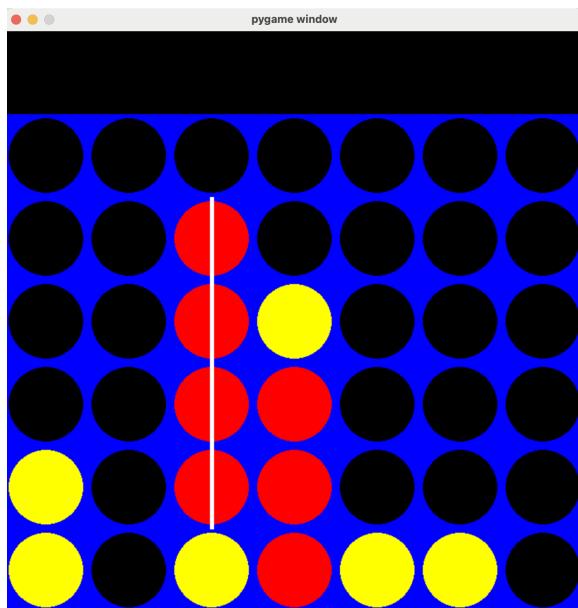
Player 1 has won

WON GAME THIRTEEN

GAME 14:

Terminal command:

```
python3 main.py -p2 randomAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 2 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 0 2 1 0 0]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 2]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 2]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 2]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 1 1 0 0]
 [0 0 2 1 0 2]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 1 1 0 0]
 [2 0 2 1 0 2]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 1 1 0 0]
 [0 0 1 1 0 0]]
```

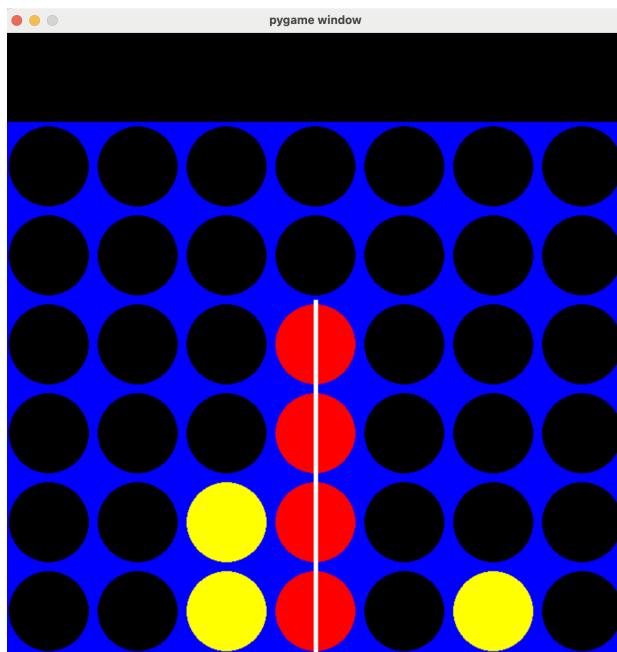
```
[2 0 2 1 0 2 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 1 1 0 0 0]  
[2 0 1 1 0 0 0]  
[2 0 2 1 0 2 0]]  
[26, 26, 29, 29, 29, 26, 26]  
[2] 29  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 1 2 0 0 0]  
[0 0 1 1 0 0 0]  
[2 0 1 1 0 0 0]  
[2 0 2 1 0 2 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 1 2 0 0 0]  
[0 0 1 1 0 0 0]  
[2 0 1 1 0 0 0]  
[2 0 2 1 2 2 0]]  
[29, 29, inf, 34, inf, inf, 29]  
[2] inf  
[[0 0 0 0 0 0 0]  
[0 0 1 0 0 0 0]  
[0 0 1 2 0 0 0]  
[0 0 1 1 0 0 0]  
[2 0 1 1 0 0 0]  
[2 0 2 1 2 2 0]]  
Player 1 has won
```

WON GAME FOURTEEN

GAME 15:

Terminal command:

```
python3 main.py -p2 randomAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 5
```



Terminal result:

```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 2 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]
```

```
[0 0 2 1 0 0 0]
[0 0 2 1 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 2 0]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 2 0]]
```

Player 1 has won

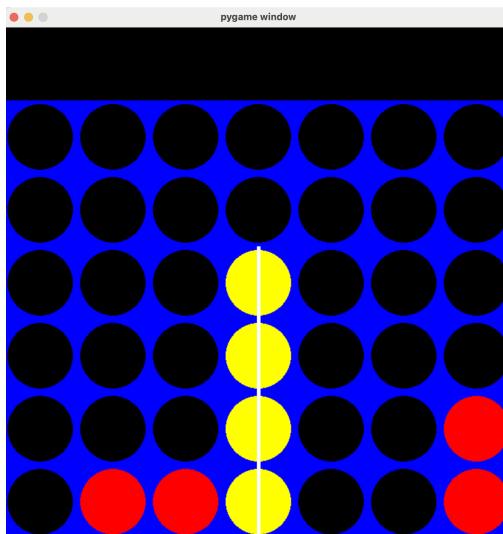
WON GAME FIFTEEN

minimaxAI as Player2 VS randomAI:

GAME 16:

Terminal command:

```
python3 main.py -p1 randomAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 1
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 1 0 0 0 0]]  
[5, 5, 8, 10, 8, 5, 5]  
[3] 10  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 1 0 2 0 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 1 0 2 0 0 1]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

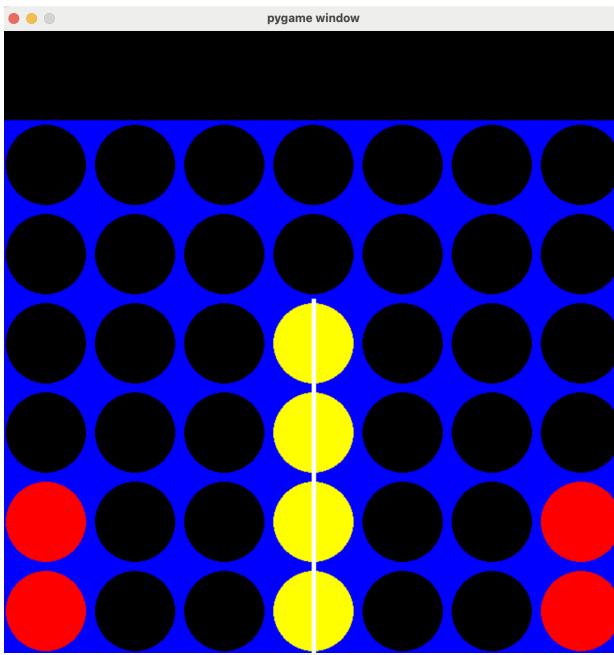
```
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 1]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 1]
 [0 1 0 2 0 0 1]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 1]
 [0 1 0 2 0 0 1]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 1]
 [0 1 1 2 0 0 1]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 1]
 [0 1 1 2 0 0 1]]
Player 2 has won
```

WON GAME SIXTEEN

GAME 17:

Terminal command:

```
python3 main.py -p1 randomAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 2
```



Terminal result:

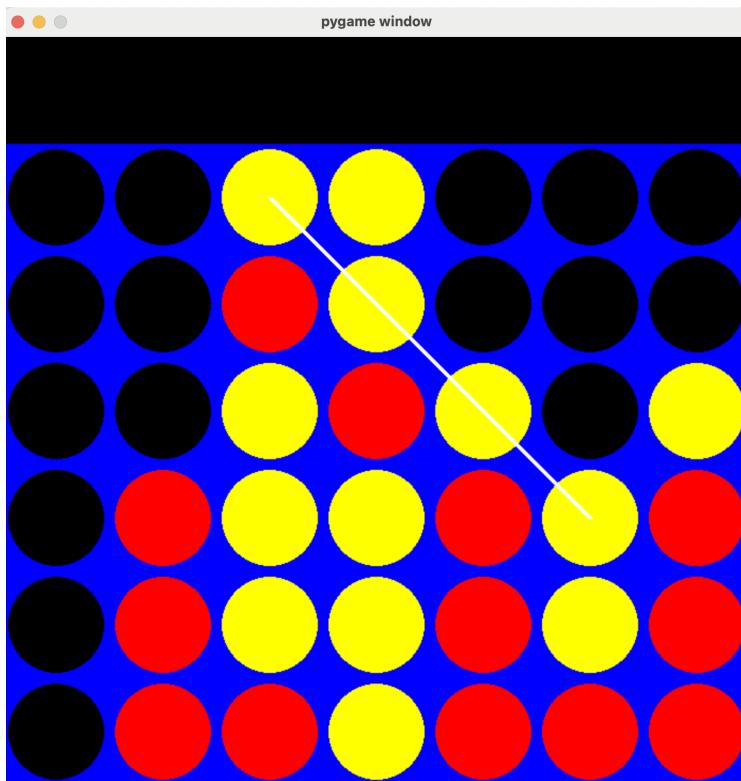
```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 1]]  
[5, 5, 8, 10, 8, 5, 5]  
[3] 10  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 1]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[1 0 0 2 0 0 1]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[1 0 0 2 0 0 1]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[1 0 0 2 0 0 0]
[1 0 0 2 0 0 1]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[1 0 0 2 0 0 0]
[1 0 0 2 0 0 1]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[1 0 0 2 0 0 1]
[1 0 0 2 0 0 1]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[1 0 0 2 0 0 1]
[1 0 0 2 0 0 1]]
Player 2 has won
```

WON GAME SEVENTEEN

GAME 18:
Terminal command:

```
python3 main.py -p1 randomAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 3
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 1 0 0 0 0]]  
[5, 5, 8, 10, 8, 5, 5]  
[3] 10  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 1 0 2 0 0]]  
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]
```

[0 1 0 2 1 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 1 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 1 1 2 1 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 1 2 1 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 1 2 1 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 2 0 0 0]
[0 1 1 2 1 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 2 1 0 0]
[0 1 1 2 1 0 0]]
[23, 23, 26, 26, 26, 23, 23]

```
[2] 26
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 2 0 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0]]
[-inf, -inf, -inf, -inf, 29, -inf, -inf]
[4] 29
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 2 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 2 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 2 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0 1]]
[29, 29, 32, 32, 32, -inf, 29]
[2] 32
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 1 2 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0 1]]
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 0 2 1 2 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0 1]]
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 0 2 1 2 0]
 [0 0 2 2 1 0]
 [0 0 2 2 1 0]
 [0 1 1 2 1 0 1]]
[32, 32, 35, 35, 35, -inf, 32]
[2] 35
[[0 0 2 0 0 0]]
```

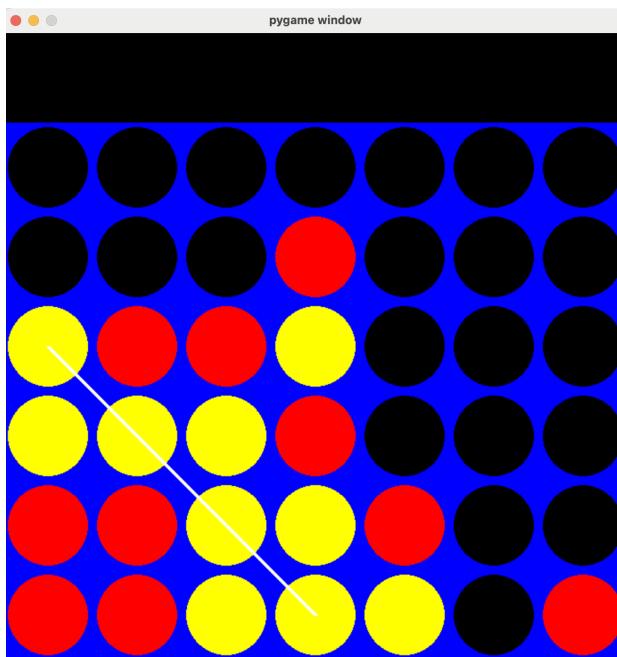
```
[0 0 1 0 0 0 0]
[0 0 2 1 2 0 0]
[0 0 2 2 1 0 0]
[0 0 2 2 1 0 0]
[0 1 1 2 1 0 1]]
[[0 0 2 0 0 0 0]
[0 0 1 0 0 0 0]
[0 0 2 1 2 0 0]
[0 0 2 2 1 0 0]
[0 1 2 2 1 0 0]
[0 1 1 2 1 0 1]]
[35, 35, -inf, 38, 38, -inf, 35]
[3] 38
[[0 0 2 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 2 0 0]
[0 0 2 2 1 0 0]
[0 1 2 2 1 0 0]
[0 1 1 2 1 0 1]]
[[0 0 2 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 2 0 0]
[0 0 2 2 1 0 0]
[0 1 2 2 1 0 1]
[0 1 1 2 1 0 1]]
[38, 38, -inf, 43, 41, -inf, 38]
[3] 43
[[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 2 0 0]
[0 0 2 2 1 0 0]
[0 1 2 2 1 0 1]
[0 1 1 2 1 0 1]]
[[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 2 0 0]
[0 0 2 2 1 0 1]
[0 1 2 2 1 0 1]
[0 1 1 2 1 0 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 43]
[6] 43
[[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 2 0 2]]
```

```
[0 0 2 2 1 0 1]
[0 1 2 2 1 0 1]
[0 1 1 2 1 0 1]]
[[0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 2 1 2 0 2]
 [0 0 2 2 1 0 1]
 [0 1 2 2 1 0 1]
 [0 1 1 2 1 1 1]]
[-inf, -inf, -inf, -inf, -inf, 43, -inf]
[5] 43
[[0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 2 1 2 0 2]
 [0 0 2 2 1 0 1]
 [0 1 2 2 1 2 1]
 [0 1 1 2 1 1 1]]
[[0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 2 1 2 0 2]
 [0 1 2 2 1 0 1]
 [0 1 2 2 1 2 1]
 [0 1 1 2 1 1 1]]
[-inf, 43, -inf, -inf, -inf, inf, -inf]
[5] inf
[[0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 2 1 2 0 2]
 [0 1 2 2 1 2 1]
 [0 1 2 2 1 2 1]
 [0 1 1 2 1 1 1]]
Player 2 has won
```

WON GAME EIGHTEEN

GAME 19:
Terminal command:

```
python3 main.py -p1 randomAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 1 0 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 1 0 2 0 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [1 1 0 2 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]]
```

[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[1 1 0 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[1 1 0 2 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[1 1 0 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 1 0 2 0 0]
[1 1 0 2 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 1 0 2 0 0]
[1 1 2 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[1 1 0 2 0 0]
[1 1 2 2 0 0]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]

```
[0 0 0 1 0 0 0]
[1 1 2 2 0 0 0]
[1 1 2 2 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[1 1 2 2 0 0 0]
[1 1 2 2 0 0 0]]
[24, 24, 29, 29, 29, 26, 24]
[2] 29
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 1 0 0 0]
[1 1 2 2 0 0 0]
[1 1 2 2 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[1 1 2 2 0 0 0]
[1 1 2 2 0 0 0]]
[-inf, 27, -inf, -inf, -inf, -inf, -inf]
[1] 27
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 2 1 0 0 0]
[1 1 2 2 0 0 0]
[1 1 2 2 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 2 1 0 0 0]
[1 1 2 2 0 0 0]
[1 1 2 2 0 0 1]]
[29, 29, 30, 32, inf, 29, 27]
[4] inf
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 2 1 0 0 0]
[1 1 2 2 0 0 0]]
```

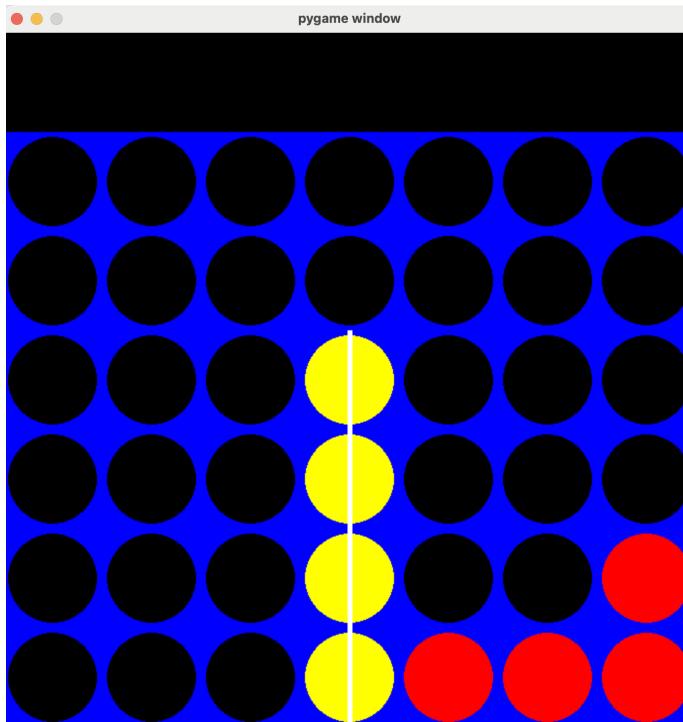
```
[1 1 2 2 2 0 1]]  
[[0 0 0 0 0 0 0]]  
[0 0 0 1 0 0 0]  
[0 1 1 2 0 0 0]  
[0 2 2 1 0 0 0]  
[1 1 2 2 0 0 0]  
[1 1 2 2 2 0 1]]  
[inf, 32, 35, 35, inf, inf, 32]  
[0] inf  
[[0 0 0 0 0 0 0]]  
[0 0 0 1 0 0 0]  
[0 1 1 2 0 0 0]  
[2 2 2 1 0 0 0]  
[1 1 2 2 0 0 0]  
[1 1 2 2 2 0 1]]  
[[0 0 0 0 0 0 0]]  
[0 0 0 1 0 0 0]  
[0 1 1 2 0 0 0]  
[2 2 2 1 0 0 0]  
[1 1 2 2 1 0 0]  
[1 1 2 2 2 0 1]]  
[inf, -inf, -inf, -inf, -inf, inf, -inf]  
[0] inf  
[[0 0 0 0 0 0 0]]  
[0 0 0 1 0 0 0]  
[2 1 1 2 0 0 0]  
[2 2 2 1 0 0 0]  
[1 1 2 2 1 0 0]  
[1 1 2 2 2 0 1]]  
Player 2 has won
```

WON GAME NINETEEN

GAME 20:

Terminal command:

```
python3 main.py -p1 randomAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 5
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 1 0]]
```

```
[5, 5, 8, 10, 8, 5, 5]
```

```
[3] 10
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 2 1 0]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 2 1]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 2 1]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 2]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 2]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 2]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 2]]
```

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 2]]
```

```
[10, 10, 13, 15, 13, 10, 10]
```

```
[3] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 1 1 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 1 1 1]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 1 1 1]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 1]
 [0 0 0 2 1 1 1]]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 1]
 [0 0 0 2 1 1 1]]
```

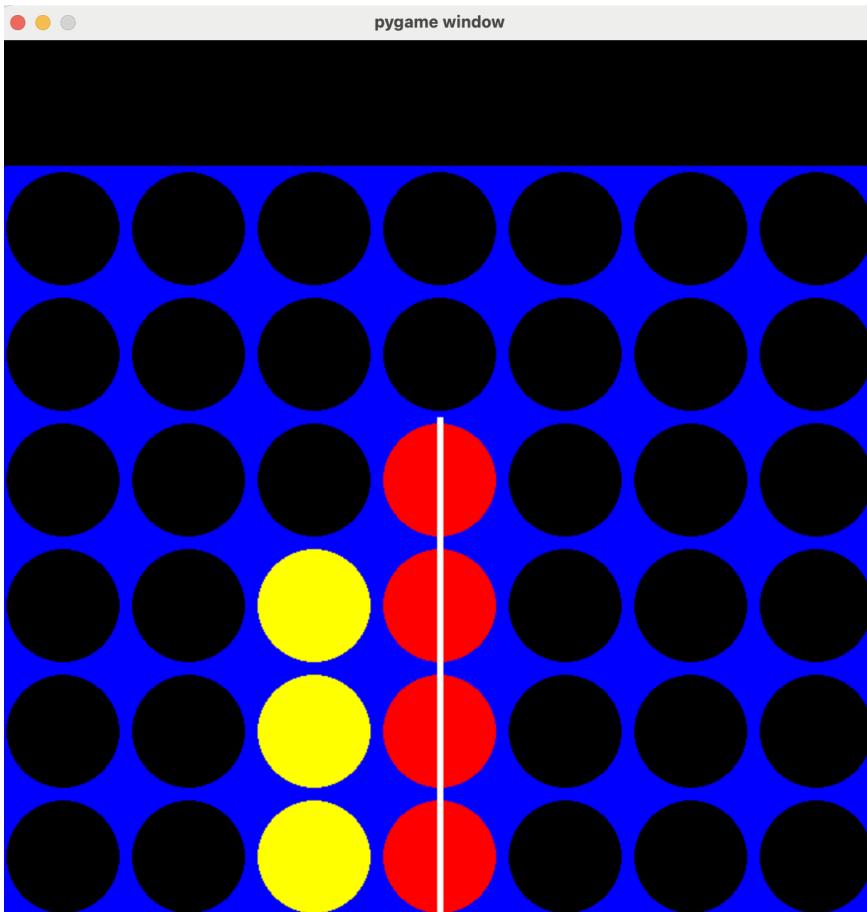
Player 2 has won

WON GAME TWENTY

**Won all 20 games against stupidAI and randomAI
minimaxAI as Player1 VS monteCarloAI:**

GAME 1:**Terminal command:**

```
python3 main.py -p2 monteCarloAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 3
```

**Terminal result:**

```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 2 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15
```

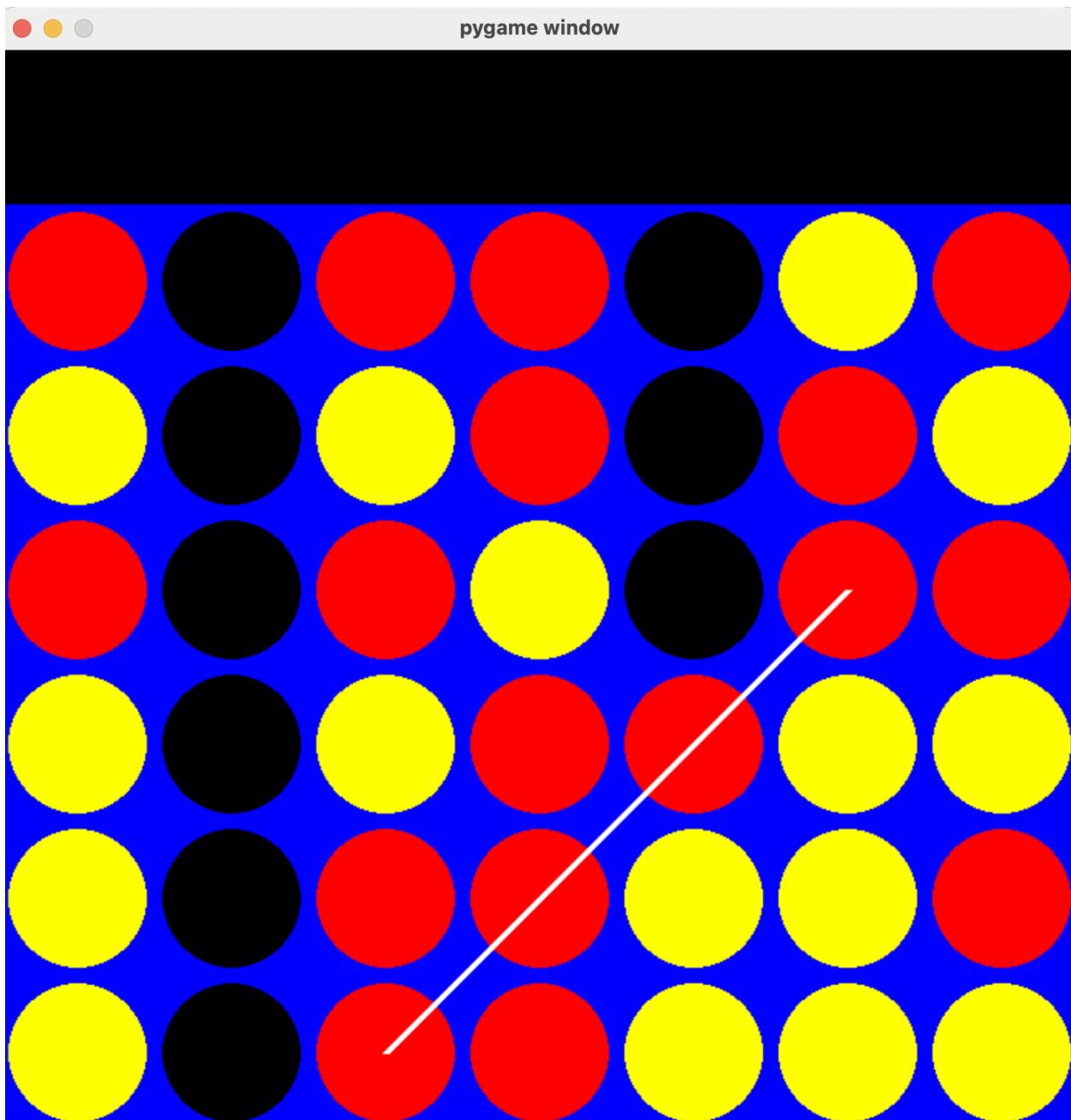
```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 1 0 0]
 [0 0 2 1 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 0]
 [0 0 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 1 0 0]
 [0 0 2 1 0 0]
 [0 0 2 1 0 0]]
[-inf, -inf, 23, inf, -inf, -inf, -inf]
[3] inf
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 0]
 [0 0 2 1 0 0]
 [0 0 2 1 0 0]]
Player 1 has won
```

WON GAME 1 AT SEED 3 AS PLAYER 1

GAME 2:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0]]
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 2 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 2 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 2 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 0]
 [2 0 0 1 0 2 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 0]
 [2 0 0 1 0 2 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 1 0 0 0]
 [2 0 1 1 0 2 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]]
```

```
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 2 0]
[2 0 1 1 0 2 0]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[26, -inf, 29, 29, 29, 26, 26]
[2] 29
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 2 0]
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[-inf, -inf, -inf, -inf, -inf, 29, -inf]
[5] 29
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[[0 0 0 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
```

```
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[29, -inf, 32, 32, 32, 29, 29]
[2] 32
[[0 0 1 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
[0 0 1 1 0 2 0]
[2 0 1 1 0 2 0]]
[[0 0 1 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
[0 0 1 1 0 2 0]
[2 0 1 1 2 2 0]]
[32, -inf, -inf, 35, -inf, 32, 32]
[3] 35
[[0 0 1 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
[0 0 1 1 0 2 0]
[2 0 1 1 2 2 0]]
[[0 0 1 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
[0 0 1 1 0 2 0]
[2 0 1 1 2 2 0]]
[35, -inf, -inf, 40, -inf, 35, 35]
[3] 40
[[0 0 1 1 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 1 0]
[0 0 2 1 0 2 0]
[2 0 1 1 0 2 0]
[2 0 1 1 2 2 0]]
[[0 0 1 1 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 1 0]
[2 0 2 1 0 2 0]
[2 0 1 1 0 2 0]
[2 0 1 1 2 2 0]]
```

[40, -inf, -inf, -inf, -inf, -inf, -inf]

[0] 40

[[0 0 1 1 0 0 0]]

[0 0 2 1 0 0 0]

[1 0 1 2 0 1 0]

[2 0 2 1 0 2 0]

[2 0 1 1 0 2 0]

[2 0 1 1 2 2 0]]

[[0 0 1 1 0 0 0]]

[2 0 2 1 0 0 0]

[1 0 1 2 0 1 0]

[2 0 2 1 0 2 0]

[2 0 1 1 0 2 0]

[2 0 1 1 2 2 0]]

[40, -inf, -inf, -inf, -inf, 40, 40]

[0] 40

[[1 0 1 1 0 0 0]]

[2 0 2 1 0 0 0]

[1 0 1 2 0 1 0]

[2 0 2 1 0 2 0]

[2 0 1 1 0 2 0]

[2 0 1 1 2 2 0]]

[[1 0 1 1 0 0 0]]

[2 0 2 1 0 0 0]

[1 0 1 2 0 1 0]

[2 0 2 1 0 2 0]

[2 0 1 1 0 2 0]

[2 0 1 1 2 2 2]]

[-inf, -inf, -inf, -inf, -inf, 40, 40]

[5] 40

[[1 0 1 1 0 0 0]]

[2 0 2 1 0 1 0]

[1 0 1 2 0 1 0]

[2 0 2 1 0 2 0]

[2 0 1 1 0 2 0]

[2 0 1 1 2 2 2]]

[[1 0 1 1 0 2 0]]

[2 0 2 1 0 1 0]

[1 0 1 2 0 1 0]

[2 0 2 1 0 2 0]

[2 0 1 1 0 2 0]

[2 0 1 1 2 2 2]]

[-inf, -inf, -inf, -inf, -inf, -inf, 40]

[6] 40

```
[[1 0 1 1 0 2 0]
 [2 0 2 1 0 1 0]
 [1 0 1 2 0 1 0]
 [2 0 2 1 0 2 0]
 [2 0 1 1 0 2 1]
 [2 0 1 1 2 2 2]]
 [[1 0 1 1 0 2 0]
 [2 0 2 1 0 1 0]
 [1 0 1 2 0 1 0]
 [2 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 1 1 2 2 2]]
 [-inf, -inf, -inf, -inf, -inf, -inf, 40]
 [6] 40
 [[1 0 1 1 0 2 0]
 [2 0 2 1 0 1 0]
 [1 0 1 2 0 1 1]
 [2 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 1 1 2 2 2]]
 [[1 0 1 1 0 2 0]
 [2 0 2 1 0 1 2]
 [1 0 1 2 0 1 1]
 [2 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 1 1 2 2 2]]
 [-inf, -inf, -inf, -inf, -inf, -inf, 40]
 [6] 40
 [[1 0 1 1 0 2 1]
 [2 0 2 1 0 1 2]
 [1 0 1 2 0 1 1]
 [2 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 1 1 2 2 2]]
 [[1 0 1 1 0 2 1]
 [2 0 2 1 0 1 2]
 [1 0 1 2 0 1 1]
 [2 0 2 1 0 2 2]
 [2 0 1 1 2 2 1]
 [2 0 1 1 2 2 2]]
 [-inf, -inf, -inf, -inf, inf, -inf, -inf]
 [4] inf
 [[1 0 1 1 0 2 1]
 [2 0 2 1 0 1 2]]
```

```
[1 0 1 2 0 1 1]  
[2 0 2 1 1 2 2]  
[2 0 1 1 2 2 1]  
[2 0 1 1 2 2 2]
```

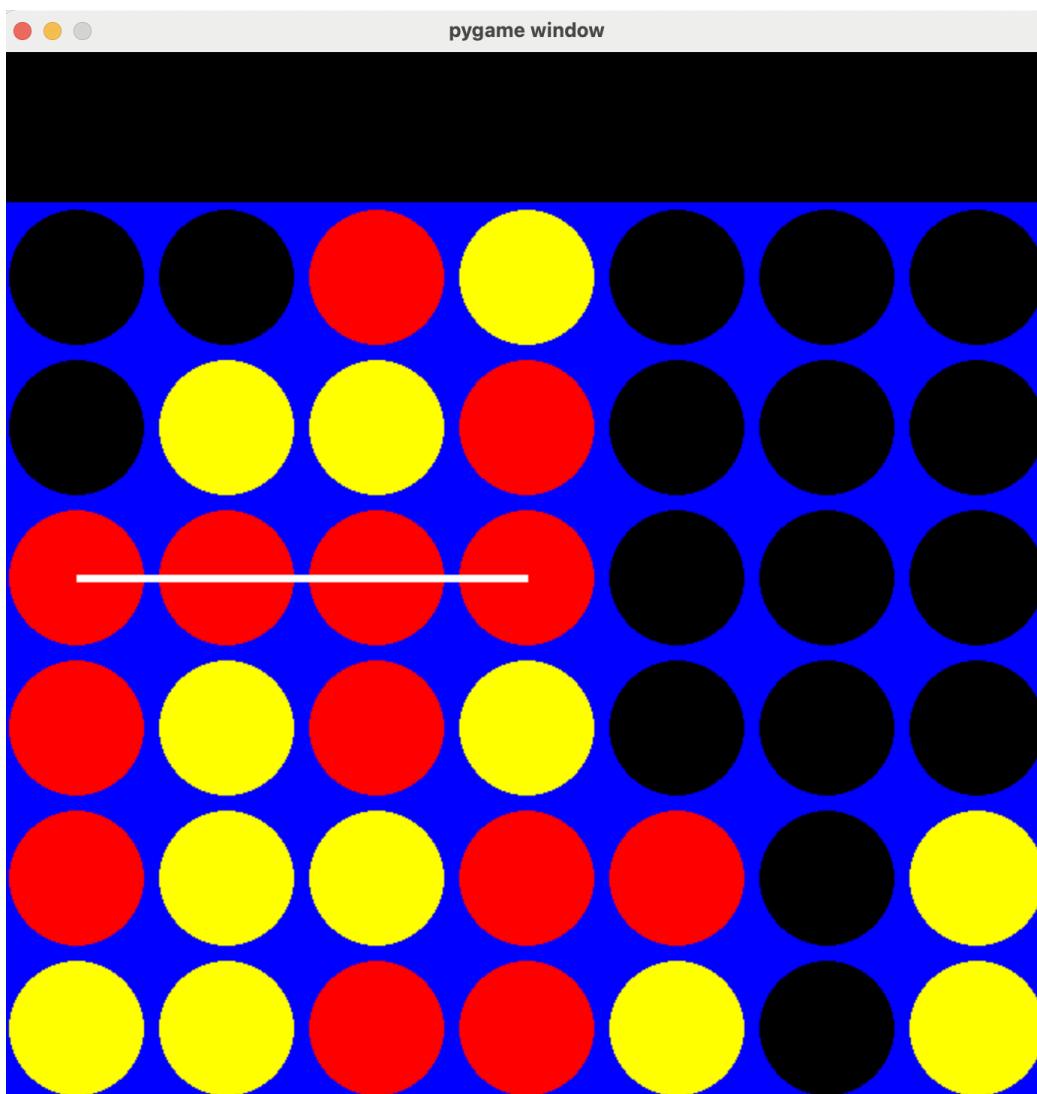
Player 1 has won

WON GAME 2 AT SEED 4 AS PLAYER 1

GAME 3:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 6
```



Terminal result:

```
[[0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[[0 0 0 0 0 0]]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 2 0 1 0 0]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 2 0 1 2 0]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]]
```

```
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 2 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 1 0 0 0]
[0 2 1 1 2 0 0]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 2 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 2 1 0 0 0]
[0 2 1 1 2 0 0]]
[26, 26, 29, 29, 29, 26, 26]
[2] 29
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 2 1 0 0 0]
[0 2 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 1 0 0 0]
[0 2 1 2 0 0 0]
[0 2 2 1 0 0 0]
[0 2 1 1 2 0 0]]
[-inf, 29, -inf, -inf, -inf, -inf, -inf]
[1] 29
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 1 1 1 0 0 0]
[0 2 1 2 0 0 0]
[0 2 2 1 0 0 0]]
```

[0 2 1 1 2 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 2 0 0 0 0]

[0 1 1 1 0 0 0]

[0 2 1 2 0 0 0]

[0 2 2 1 0 0 0]

[0 2 1 1 2 0 0]]

[29, 29, 32, 32, 32, 29, 29]

[2] 32

[[0 0 1 0 0 0 0]]

[0 0 2 0 0 0 0]

[0 1 1 1 0 0 0]

[0 2 1 2 0 0 0]

[0 2 2 1 0 0 0]

[0 2 1 1 2 0 0]]

[[0 0 1 0 0 0 0]]

[0 0 2 0 0 0 0]

[0 1 1 1 0 0 0]

[0 2 1 2 0 0 0]

[0 2 2 1 0 0 0]

[2 2 1 1 2 0 0]]

[32, 32, -inf, 35, 35, 32, 32]

[3] 35

[[0 0 1 0 0 0 0]]

[0 0 2 1 0 0 0]

[0 1 1 1 0 0 0]

[0 2 1 2 0 0 0]

[0 2 2 1 0 0 0]

[2 2 1 1 2 0 0]]

[[0 0 1 2 0 0 0]]

[0 0 2 1 0 0 0]

[0 1 1 1 0 0 0]

[0 2 1 2 0 0 0]

[0 2 2 1 0 0 0]

[2 2 1 1 2 0 0]]

[35, 35, -inf, -inf, 38, 35, 35]

[4] 38

[[0 0 1 2 0 0 0]]

[0 0 2 1 0 0 0]

[0 1 1 1 0 0 0]

[0 2 1 2 0 0 0]

[0 2 2 1 1 0 0]

[2 2 1 1 2 0 0]]

[[0 0 1 2 0 0 0]]

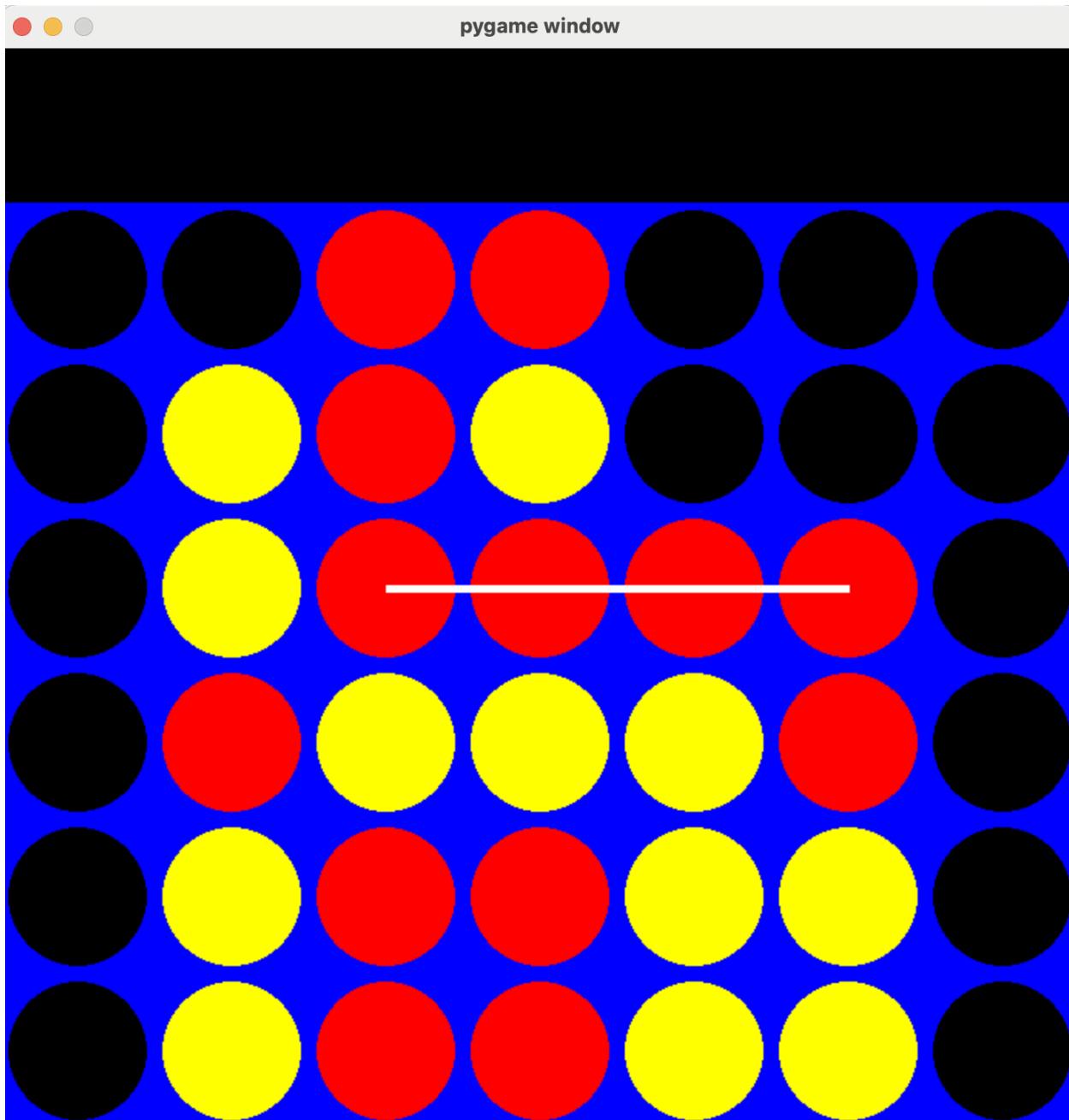
```
[0 0 2 1 0 0 0]
[0 1 1 1 0 0 0]
[0 2 1 2 0 0 0]
[0 2 2 1 1 0 0]
[2 2 1 1 2 0 2]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 1 2 0 0 0]
 [1 2 2 1 1 0 0]
 [2 2 1 1 2 0 2]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 1 1 1 0 0 0]
 [0 2 1 2 0 0 0]
 [1 2 2 1 1 0 2]
 [2 2 1 1 2 0 2]]
[inf, 38, -inf, -inf, -inf, 38, 38]
[0] inf
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 1 1 1 0 0 0]
 [1 2 1 2 0 0 0]
 [1 2 2 1 1 0 2]
 [2 2 1 1 2 0 2]]
[[0 0 1 2 0 0 0]
 [0 2 2 1 0 0 0]
 [0 1 1 1 0 0 0]
 [1 2 1 2 0 0 0]
 [1 2 2 1 1 0 2]
 [2 2 1 1 2 0 2]]
[inf, inf, -inf, -inf, -inf, inf, inf]
[0] inf
[[0 0 1 2 0 0 0]
 [0 2 2 1 0 0 0]
 [1 1 1 1 0 0 0]
 [1 2 1 2 0 0 0]
 [1 2 2 1 1 0 2]
 [2 2 1 1 2 0 2]]
```

Player 1 has won

WON GAME 3 AT SEED 6 AS PLAYER 1

GAME 4:**Terminal command:**

```
python3 main.py -p2 monteCarloAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 7
```

**Terminal result:**

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 2 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 2 0 0]
[0 0 0 1 2 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 2 0 0]
[0 0 1 1 2 0 0]]
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 2 0]
 [0 0 0 1 2 0]
 [0 0 1 1 2 0]]
```

```
[-inf, -inf, -inf, -inf, 26, -inf, -inf]
```

```
[4] 26
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 1 0]
 [0 0 0 2 2 0]
 [0 0 0 1 2 0]
 [0 0 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 1 0]
 [0 0 0 2 2 0]
 [0 0 0 1 2 0]
 [0 2 1 1 2 0]]
```

```
[26, 26, 29, 29, 29, 26, 26]
```

```
[2] 29
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 1 0]
 [0 0 0 2 2 0]
 [0 0 1 1 2 0]
 [0 2 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 1 0]
 [0 0 2 2 2 0]
 [0 0 1 1 2 0]
 [0 2 1 1 2 0]]
```

```
[29, -inf, 32, 32, 32, 29, 29]
```

```
[2] 32
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [0 0 1 1 2 0]
 [0 2 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]]
```

```
[0 0 1 1 1 0 0]
[0 0 2 2 2 0 0]
[0 0 1 1 2 0 0]
[0 2 1 1 2 2 0]]
[32, -inf, 35, 35, 35, -inf, 32]
[2] 35
[[0 0 0 0 0 0 0]
 [0 0 1 0 0 0 0]
 [0 0 1 1 1 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 1 2 0 0]
 [0 2 1 1 2 2 0]]
[[0 0 0 0 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 1 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 1 2 0 0]
 [0 2 1 1 2 2 0]]
[33, -inf, 36, 38, 36, -inf, 33]
[3] 38
[[0 0 0 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 1 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 1 2 0 0]
 [0 2 1 1 2 2 0]]
[[0 0 0 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 1 0 0]
 [0 0 2 2 2 0 0]
 [0 2 1 1 2 0 0]
 [0 2 1 1 2 2 0]]
[-inf, 38, -inf, -inf, -inf, -inf, -inf]
[1] 38
[[0 0 0 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 1 0 0]
 [0 1 2 2 2 0 0]
 [0 2 1 1 2 0 0]
 [0 2 1 1 2 2 0]]
[[0 0 0 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 2 1 1 1 0 0]
 [0 1 2 2 2 0 0]
```

```
[0 2 1 1 2 0 0]
[0 2 1 1 2 2 0]]
[38, 38, 41, -inf, 41, -inf, 38]
[2] 41
[[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 2 0 0]
[0 2 1 1 2 0 0]
[0 2 1 1 2 2 0]]
[[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 2 0 0]
[0 2 1 1 2 2 0]
[0 2 1 1 2 2 0]]
```

[-inf, -inf, -inf, -inf, -inf, 41, -inf]

```
[5] 41
[[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 2 1 0]
[0 2 1 1 2 2 0]
[0 2 1 1 2 2 0]]
[[0 0 1 1 0 0 0]
[0 2 1 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 2 1 0]
[0 2 1 1 2 2 0]
[0 2 1 1 2 2 0]]
```

[41, 41, -inf, -inf, 44, inf, 41]

```
[5] inf
[[0 0 1 1 0 0 0]
[0 2 1 2 0 0 0]
[0 2 1 1 1 1 0]
[0 1 2 2 2 1 0]
[0 2 1 1 2 2 0]
[0 2 1 1 2 2 0]]
```

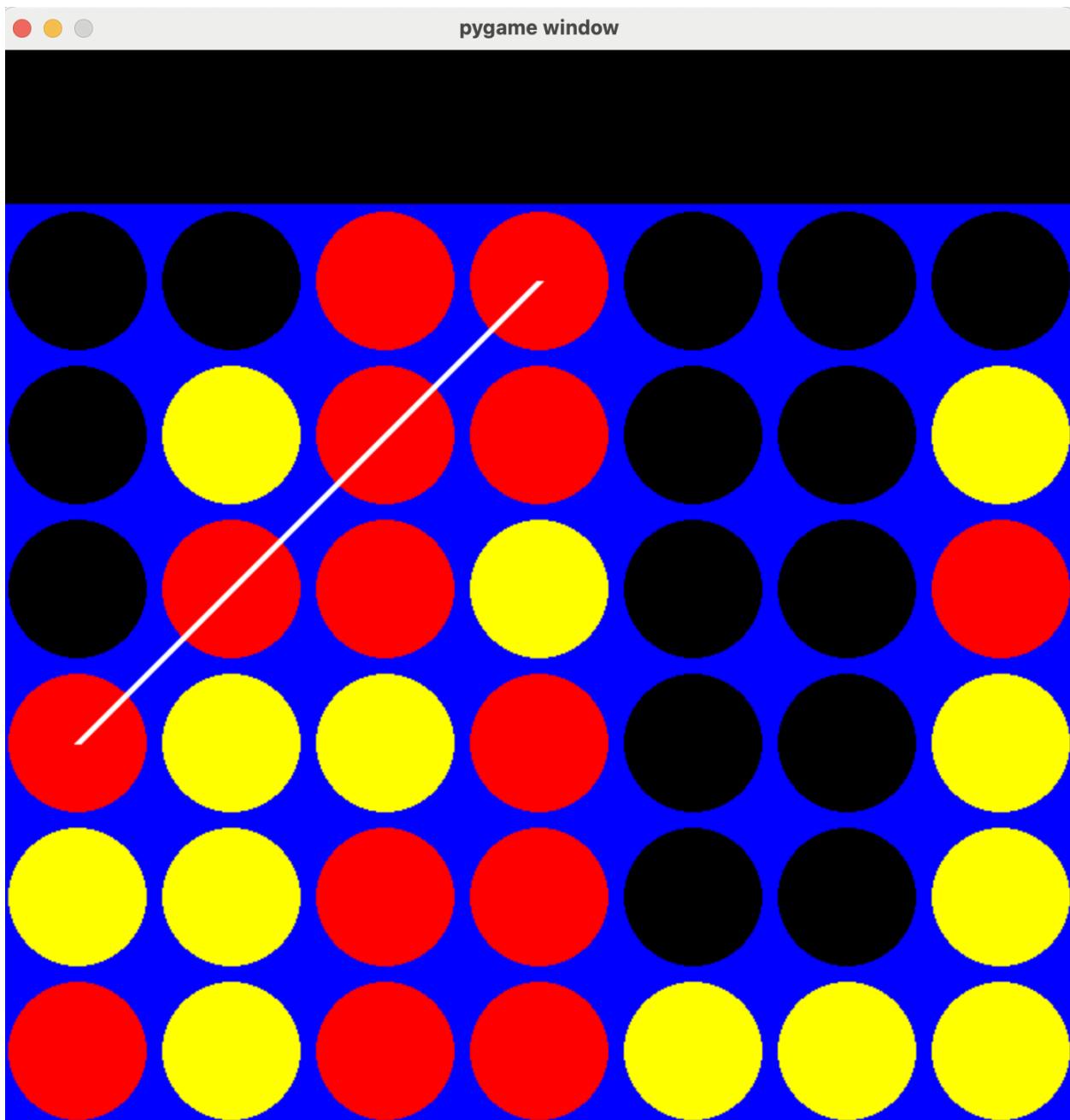
Player 1 has won

WON GAME 4 AT SEED 7 AS PLAYER 1

GAME 5:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 8
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0]]  
[[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 2]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 2]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 2]
[0 0 0 1 0 0 2]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 2]
[0 0 0 1 0 0 2]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 2]
[0 0 0 1 0 0 2]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 0 2]
[0 0 1 1 0 0 2]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
```

[0 0 0 1 0 0 2]
[0 0 0 1 0 0 2]
[0 0 1 1 0 0 2]]

[-inf, -inf, -inf, -inf, -inf, -inf, 23]

[6] 23

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 1]

[0 0 0 1 0 0 2]

[0 0 0 1 0 0 2]

[0 0 1 1 0 0 2]]

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 1]

[0 0 0 1 0 0 2]

[0 0 0 1 0 0 2]

[0 2 1 1 0 0 2]]

[23, 23, 26, 26, 26, 23, 23]

[2] 26

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 1]

[0 0 0 1 0 0 2]

[0 0 1 1 0 0 2]

[0 2 1 1 0 0 2]]

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 1]

[0 0 2 1 0 0 2]

[0 0 1 1 0 0 2]

[0 2 1 1 0 0 2]]

[26, 26, 29, 29, 29, 26, 26]

[2] 29

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 1 2 0 0 1]

[0 0 2 1 0 0 2]

[0 0 1 1 0 0 2]

[0 2 1 1 0 0 2]]

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 1 2 0 0 1]

[0 0 2 1 0 0 2]

[0 2 1 1 0 0 2]

[0 2 1 1 0 0 2]]
[29, -inf, -inf, -inf, -inf, -inf, -inf]
[0] 29
[[0 0 0 0 0 0 0]]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 1]
[0 0 2 1 0 0 2]
[0 2 1 1 0 0 2]
[1 2 1 1 0 0 2]]
[[0 0 0 0 0 0 0]]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 1]
[0 2 2 1 0 0 2]
[0 2 1 1 0 0 2]
[1 2 1 1 0 0 2]]
[-inf, 29, -inf, -inf, -inf, -inf, -inf]
[1] 29
[[0 0 0 0 0 0 0]]
[0 0 0 0 0 0 0]
[0 1 1 2 0 0 1]
[0 2 2 1 0 0 2]
[0 2 1 1 0 0 2]
[1 2 1 1 0 0 2]]
[[0 0 0 0 0 0 0]]
[0 0 0 0 0 0 0]
[0 1 1 2 0 0 1]
[0 2 2 1 0 0 2]
[0 2 1 1 0 0 2]
[1 2 1 1 0 2 2]]
[29, 29, 32, 32, 32, 29, 29]
[2] 32
[[0 0 0 0 0 0 0]]
[0 0 1 0 0 0 0]
[0 1 1 2 0 0 1]
[0 2 2 1 0 0 2]
[0 2 1 1 0 0 2]
[1 2 1 1 0 2 2]]
[[0 0 0 0 0 0 0]]
[0 2 1 0 0 0 0]
[0 1 1 2 0 0 1]
[0 2 2 1 0 0 2]
[0 2 1 1 0 0 2]
[1 2 1 1 0 2 2]]
[32, 32, 35, 35, 35, 32, 32]

```
[2] 35
[[0 0 1 0 0 0 0]
 [0 2 1 0 0 0 0]
 [0 1 1 2 0 0 1]
 [0 2 2 1 0 0 2]
 [0 2 1 1 0 0 2]
 [1 2 1 1 0 2 2]]
[[0 0 1 0 0 0 0]
 [0 2 1 0 0 0 0]
 [0 1 1 2 0 0 1]
 [0 2 2 1 0 0 2]
 [2 2 1 1 0 0 2]
 [1 2 1 1 0 2 2]]
[35, 35, -inf, 38, 38, 35, 35]
[3] 38
[[0 0 1 0 0 0 0]
 [0 2 1 1 0 0 0]
 [0 1 1 2 0 0 1]
 [0 2 2 1 0 0 2]
 [2 2 1 1 0 0 2]
 [1 2 1 1 0 2 2]]
[[0 0 1 0 0 0 0]
 [0 2 1 1 0 0 2]
 [0 1 1 2 0 0 1]
 [0 2 2 1 0 0 2]
 [2 2 1 1 0 0 2]
 [1 2 1 1 0 2 2]]
[38, 38, -inf, 43, 41, 38, 38]
[3] 43
[[0 0 1 1 0 0 0]
 [0 2 1 1 0 0 2]
 [0 1 1 2 0 0 1]
 [0 2 2 1 0 0 2]
 [2 2 1 1 0 0 2]
 [1 2 1 1 0 2 2]]
[[0 0 1 1 0 0 0]
 [0 2 1 1 0 0 2]
 [0 1 1 2 0 0 1]
 [0 2 2 1 0 0 2]
 [2 2 1 1 0 0 2]
 [1 2 1 1 2 2 2]]
[inf, 43, -inf, -inf, inf, inf, 43]
[0] inf
[[0 0 1 1 0 0 0]]
```

```
[0 2 1 1 0 0 2]
[0 1 1 2 0 0 1]
[1 2 2 1 0 0 2]
[2 2 1 1 0 0 2]
[1 2 1 1 2 2 2]]
```

Player 1 has won

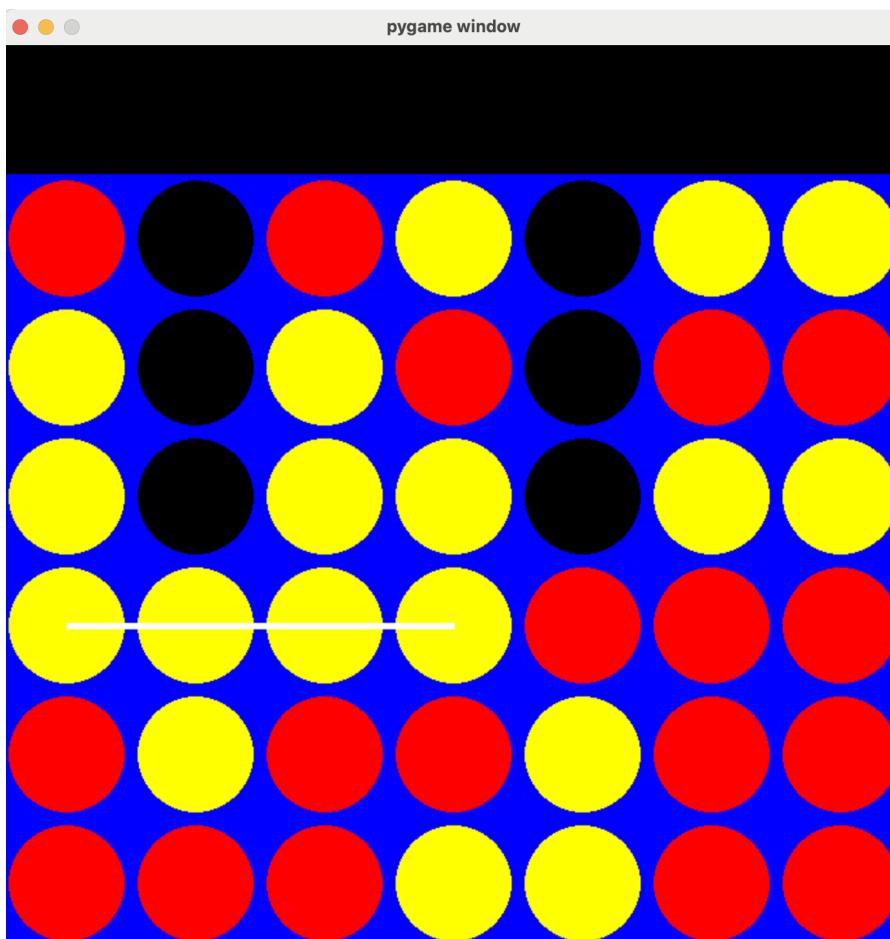
WON GAME 5 AT SEED 8 AS PLAYER 1

minimaxAI as Player2 VS monteCarloAI:

GAME 6:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 2
```



Terminal result:

```
[[0 0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 1]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 1]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 1]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 1]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 1]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 1]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
```

[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 1]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 1]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[24, 24, 29, 29, 27, 24, 24]
[2] 29
[[0 0 0 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[[0 0 1 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]

```
[1 0 1 2 0 0 1]]  
[27, 27, -inf, 32, 30, 27, 27]  
[3] 32  
[[0 0 1 2 0 0 0]  
[0 0 2 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[1 0 1 2 0 0 1]]  
[[0 0 1 2 0 0 0]  
[0 0 2 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[1 0 1 2 0 1 1]]  
[32, 32, -inf, -inf, 35, 32, 32]  
[4] 35  
[[0 0 1 2 0 0 0]  
[0 0 2 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 0 0]  
[1 0 1 2 2 1 1]]  
[[0 0 1 2 0 0 0]  
[0 0 2 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 0 1 0]  
[1 0 1 2 2 1 1]]  
[-inf, -inf, -inf, -inf, 38, -inf, -inf]  
[4] 38  
[[0 0 1 2 0 0 0]  
[0 0 2 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 1 1 2 1 0]  
[1 0 1 2 2 1 1]]  
[[0 0 1 2 0 0 0]  
[0 0 2 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 0 2 2 0 1 0]  
[0 0 1 1 2 1 0]  
[1 0 1 2 2 1 1]]  
[-inf, -inf, -inf, -inf, -inf, 38, -inf]
```

```
[5] 38
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 2 0]
 [0 0 2 2 0 1 0]
 [0 0 1 1 2 1 0]
 [1 0 1 2 2 1 1]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 2 0]
 [0 0 2 2 0 1 0]
 [1 0 1 1 2 1 0]
 [1 0 1 2 2 1 1]]
[38, -inf, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 2 0]
 [2 0 2 2 0 1 0]
 [1 0 1 1 2 1 0]
 [1 0 1 2 2 1 1]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 2 0]
 [2 0 2 2 0 1 0]
 [1 0 1 1 2 1 1]
 [1 0 1 2 2 1 1]]
[38, -inf, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [2 0 2 2 0 2 0]
 [2 0 2 2 0 1 0]
 [1 0 1 1 2 1 1]
 [1 0 1 2 2 1 1]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [2 0 2 2 0 2 0]
 [2 0 2 2 0 1 1]
 [1 0 1 1 2 1 1]
 [1 0 1 2 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
[6] 38
[[0 0 1 2 0 0 0]]
```

```
[0 0 2 1 0 0 0]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 1 0 1 0]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[38, -inf, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
[2 0 2 1 0 1 0]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[[1 0 1 2 0 0 0]
[2 0 2 1 0 1 0]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, 38, 38]
[5] 38
[[1 0 1 2 0 2 0]
[2 0 2 1 0 1 0]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[[1 0 1 2 0 2 0]
[2 0 2 1 0 1 1]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
[6] 38
[[1 0 1 2 0 2 2]
[2 0 2 1 0 1 1]
[2 0 2 2 0 2 2]]
```

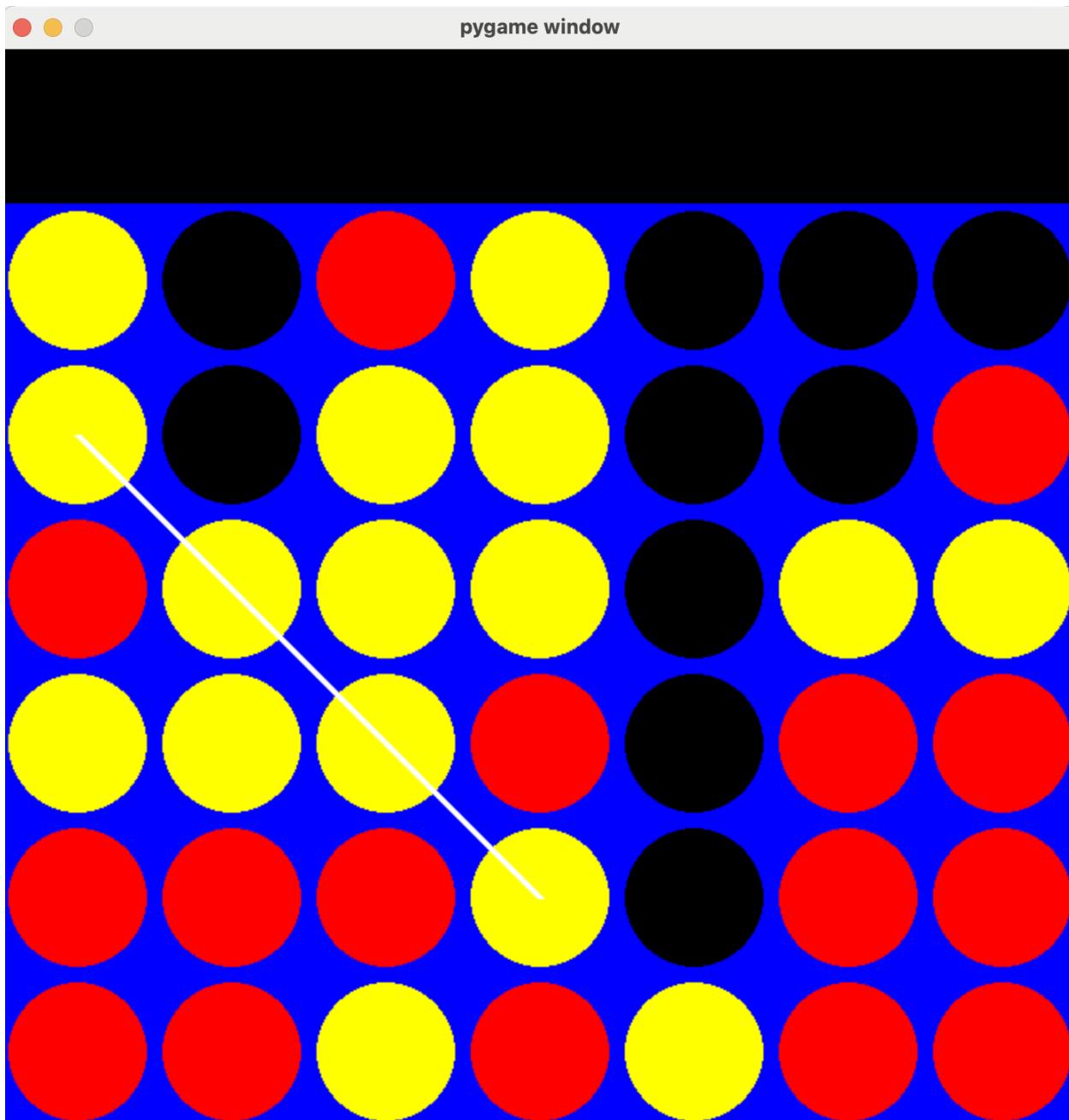
```
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 0 1 2 2 1 1]]
[[1 0 1 2 0 2 2]
[2 0 2 1 0 1 1]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 1 1 2 1 1]
[1 1 1 2 2 1 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[1 0 1 2 0 2 2]
[2 0 2 1 0 1 1]
[2 0 2 2 0 2 2]
[2 0 2 2 0 1 1]
[1 2 1 1 2 1 1]
[1 1 1 2 2 1 1]]
[[1 0 1 2 0 2 2]
[2 0 2 1 0 1 1]
[2 0 2 2 0 2 2]
[2 0 2 2 1 1 1]
[1 2 1 1 2 1 1]
[1 1 1 2 2 1 1]]
[-inf, inf, -inf, -inf, inf, -inf, -inf]
[1] inf
[[1 0 1 2 0 2 2]
[2 0 2 1 0 1 1]
[2 0 2 2 0 2 2]
[2 2 2 2 1 1 1]
[1 2 1 1 2 1 1]
[1 1 1 2 2 1 1]]
Player 2 has won
```

WON GAME 6 AT SEED 2 AS PLAYER 2

GAME 7:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 7
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0]]
```

[5, 5, 8, 10, 8, 5, 5]

[3] 10

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]]

[10, 10, 13, 15, 13, 10, 10]

[3] 15

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[1 0 0 1 0 0 0]]

[15, 15, 18, 18, 18, 15, 15]

[2] 18

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[1 0 2 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]

[0 0 1 2 0 0 0]

[1 0 2 1 0 0 0]]

[18, 18, 21, 21, 21, 18, 18]

[2] 21

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 0 1]]
[21, 21, 24, 24, 24, 21, 21]
[2] 24
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 0 1]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 0 1]]
[-inf, -inf, -inf, -inf, 27, -inf, -inf]
[4] 27
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 2 1]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 1]
 [1 0 2 1 2 1]]
[27, 27, 30, 30, 30, 27, 27]
[2] 30
[[0 0 0 0 0 0]
 [0 0 2 0 0 0]]
```

```
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 1]
[1 0 2 1 2 1 1]]
[[0 0 1 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 1]
[1 0 2 1 2 1 1]]
[30, 30, -inf, 33, 33, 30, 30]
[3] 33
[[0 0 1 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 1]
[1 0 2 1 2 1 1]]
[[0 0 1 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 1]
[0 0 1 2 0 0 1]
[1 0 2 1 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 33]
[6] 33
[[0 0 1 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 2]
[0 0 2 1 0 0 1]
[0 0 1 2 0 0 1]
[1 0 2 1 2 1 1]]
[[0 0 1 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 2]
[0 0 2 1 0 0 1]
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[33, 33, -inf, 38, 36, 33, 33]
[3] 38
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 2]
[0 0 2 1 0 0 1]]
```

```
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 2]
[0 0 2 1 0 1 1]
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, 38, -inf]
[5] 38
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 2 2]
[0 0 2 1 0 1 1]
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 2 2]
[0 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
```

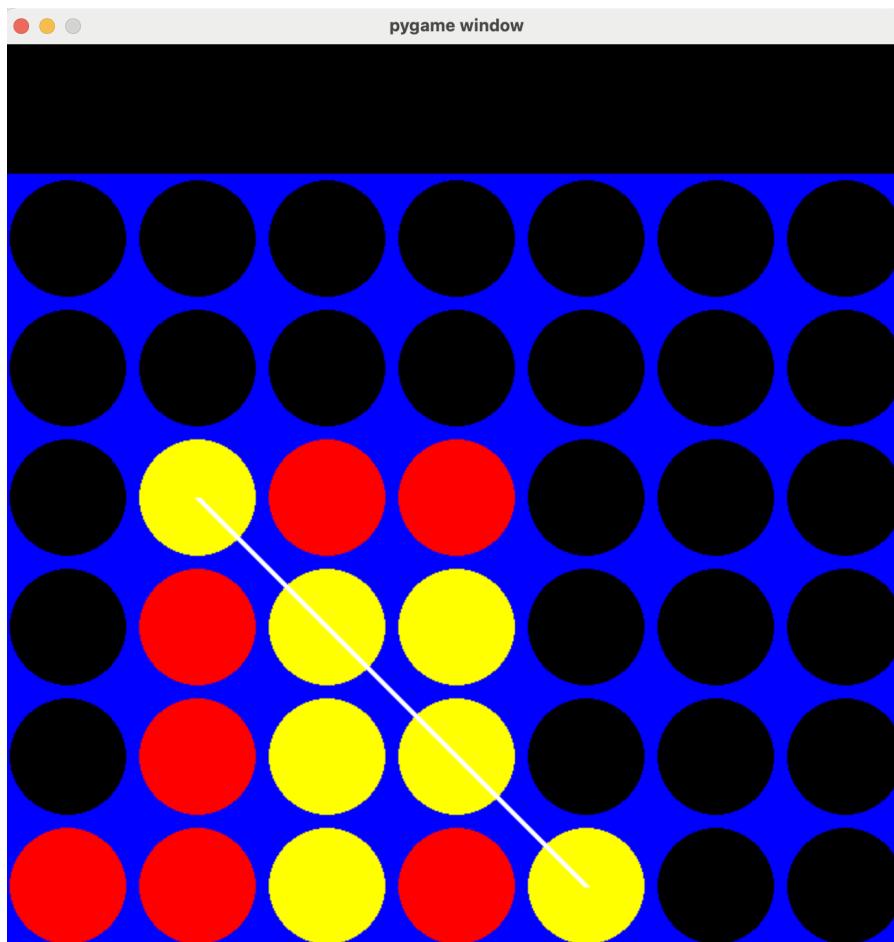
```
[[0 0 1 2 0 0 0]
 [2 0 2 2 0 0 0]
 [1 0 2 2 0 2 2]
 [2 0 2 1 0 1 1]
 [1 0 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[38, -inf, -inf, -inf, -inf, 38, 38]
[0] 38
[[2 0 1 2 0 0 0]
 [2 0 2 2 0 0 0]
 [1 0 2 2 0 2 2]
 [2 0 2 1 0 1 1]
 [1 0 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[[2 0 1 2 0 0 0]
 [2 0 2 2 0 0 0]
 [1 0 2 2 0 2 2]
 [2 0 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[2 0 1 2 0 0 0]
 [2 0 2 2 0 0 0]
 [1 0 2 2 0 2 2]
 [2 2 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[[2 0 1 2 0 0 0]
 [2 0 2 2 0 0 1]
 [1 0 2 2 0 2 2]
 [2 2 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[-inf, inf, -inf, -inf, -inf, inf, inf]
[1] inf
[[2 0 1 2 0 0 0]
 [2 0 2 2 0 0 1]
 [1 2 2 2 0 2 2]
 [2 2 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
Player 2 has won
```

WON GAME 7 AT SEED 7 AS PLAYER 2

GAME 8:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 8
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 1 0 0]]
```

[5, 5, 8, 10, 8, 5, 5]

[3] 10

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[1 0 0 1 0 0 0]]

[10, 10, 13, 15, 13, 10, 10]

[3] 15

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 0 0 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 1 0 1 0 0 0]]

[-inf, -inf, 18, -inf, -inf, -inf, -inf]

[2] 18

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 1 2 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 1 2 1 0 0 0]]

[18, 18, 21, 21, 21, 18, 18]

[2] 21

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 2 2 0 0]
 [1 1 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 1 2 2 0 0]
 [1 1 2 1 0 0]]
[-inf, -inf, 24, -inf, -inf, -inf]
[2] 24
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 2 2 0 0]
 [0 1 2 2 0 0]
 [1 1 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 1 2 2 0 0]
 [0 1 2 2 0 0]
 [1 1 2 1 0 0]]
[-inf, inf, inf, -inf, -inf, -inf]
[1] inf
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 2 0 1 0 0]
 [0 1 2 2 0 0]
 [0 1 2 2 0 0]
 [1 1 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 2 1 1 0 0]
 [0 1 2 2 0 0]
 [0 1 2 2 0 0]
 [1 1 2 1 0 0]]
[24, 24, 27, 29, inf, 24, 24]
[4] inf
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]]
```

```
[0 2 1 1 0 0 0]  
[0 1 2 2 0 0 0]  
[0 1 2 2 0 0 0]  
[1 1 2 1 2 0 0]]
```

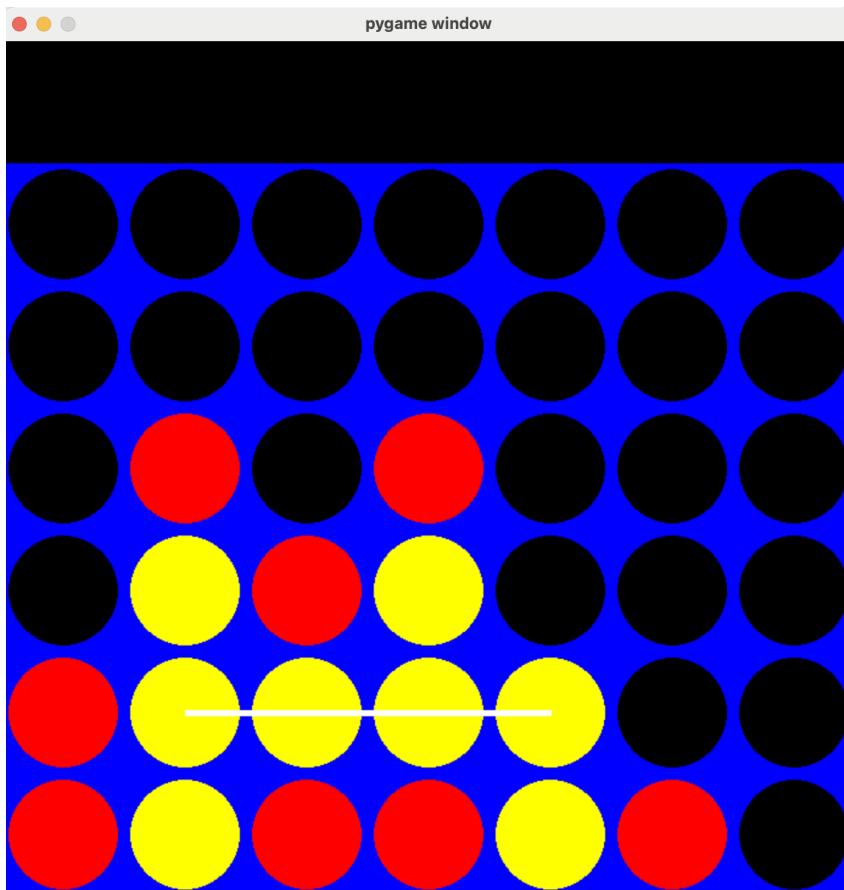
Player 2 has won

WON GAME 8 AT SEED 8 AS PLAYER 2

GAME 9:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 minimaxAI -limit_players 1,2  
-visualize True -verbose True -seed 9
```



Terminal result:

```
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]]
```

[5, 5, 8, 10, 8, 5, 5]

[3] 10

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 1 1 0 0 0]]

[10, 10, 13, 15, 13, 10, 10]

[3] 15

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[0 0 1 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 0 1 1 0 0 0]]

[-inf, 15, -inf, -inf, -inf, -inf, -inf]

[1] 15

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 2 1 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 2 1 1 0 1 0]]

[-inf, -inf, -inf, -inf, 18, -inf, -inf]

[4] 18

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 0 2 0 0]
 [1 2 1 1 2 1 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 2 0 0]
 [1 2 1 1 2 1 0]]
[18, 18, 21, 21, 21, 18, 18]
[2] 21
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 2 2 0 0]
 [1 2 1 1 2 1 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 0 2 2 0 0]
 [1 2 1 1 2 1 0]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 2 2 2 0 0]
 [1 2 1 1 2 1 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 2 2 2 0 0]
 [1 2 1 1 2 1 0]]
[21, inf, 24, 26, inf, 21, 21]
[1] inf
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]]
```

```
[0 0 0 1 0 0 0]
[0 2 1 2 0 0 0]
[1 2 2 2 0 0 0]
[1 2 1 1 2 1 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 1 0 1 0 0 0]
[0 2 1 2 0 0 0]
[1 2 2 2 0 0 0]
[1 2 1 1 2 1 0]]
[21, 21, 24, 26, inf, 21, 21]
[4] inf
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 1 0 1 0 0 0]
[0 2 1 2 0 0 0]
[1 2 2 2 0 0 0]
[1 2 1 1 2 1 0]]
```

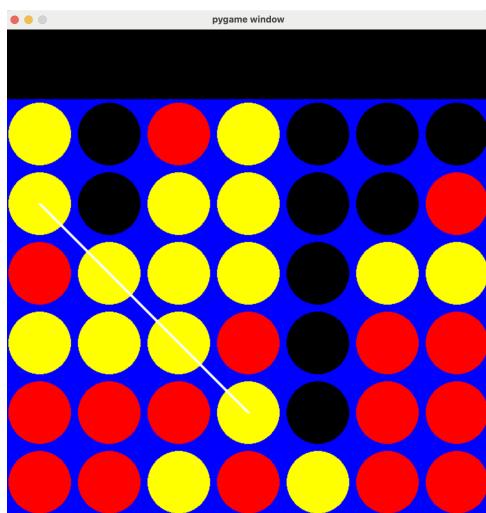
Player 2 has won

WON GAME 9 AT SEED 10 AS PLAYER 2

GAME 10:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 minimaxAI -limit_players 1,2
-visualize True -verbose True -seed 1
```



Terminal result:

```
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[1 0 0 1 0 0]
[15, 15, 18, 18, 18, 15, 15]
[2] 18
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
[0 0 0 2 0 0]
[1 0 2 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0]
[0 0 0 1 0 0]
```

```
[0 0 1 2 0 0 0]
[1 0 2 1 0 0 0]]
[18, 18, 21, 21, 21, 18, 18]
[2] 21
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 0]
[1 0 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 0]
[1 0 2 1 0 1 0]]
[21, 21, 24, 24, 24, 21, 21]
[2] 24
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 0]
[1 0 2 1 0 1 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 0]
[1 0 2 1 0 1 1]]
[-inf, -inf, -inf, -inf, 27, -inf, -inf]
[4] 27
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 0]
[1 0 2 1 2 1 1]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 2 0 0 1]
[1 0 2 1 2 1 1]]
```

[27, 27, 30, 30, 30, 27, 27]

[2] 30

[[0 0 0 0 0 0 0]]

[0 0 2 0 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 1]

[1 0 2 1 2 1 1]]

[[0 0 1 0 0 0 0]]

[0 0 2 0 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 1]

[1 0 2 1 2 1 1]]

[30, 30, -inf, 33, 33, 30, 30]

[3] 33

[[0 0 1 0 0 0 0]]

[0 0 2 2 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 1]

[1 0 2 1 2 1 1]]

[[0 0 1 0 0 0 0]]

[0 0 2 2 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 1]

[0 0 1 2 0 0 1]

[1 0 2 1 2 1 1]]

[-inf, -inf, -inf, -inf, -inf, -inf, 33]

[6] 33

[[0 0 1 0 0 0 0]]

[0 0 2 2 0 0 0]

[0 0 2 2 0 0 2]

[0 0 2 1 0 0 1]

[0 0 1 2 0 0 1]

[1 0 2 1 2 1 1]]

[[0 0 1 0 0 0 0]]

[0 0 2 2 0 0 0]

[0 0 2 2 0 0 2]

[0 0 2 1 0 0 1]

[0 0 1 2 0 1 1]

[1 0 2 1 2 1 1]]

[33, 33, -inf, 38, 36, 33, 33]

[3] 38

```
[[0 0 1 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 2]
 [0 0 2 1 0 0 1]
 [0 0 1 2 0 1 1]
 [1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 2]
 [0 0 2 1 0 1 1]
 [0 0 1 2 0 1 1]
 [1 0 2 1 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, 38, -inf]
[5] 38
[[0 0 1 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 2 2]
 [0 0 2 1 0 1 1]
 [0 0 1 2 0 1 1]
 [1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 2 2]
 [0 0 2 1 0 1 1]
 [1 0 1 2 0 1 1]
 [1 0 2 1 2 1 1]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 2 2]
 [2 0 2 1 0 1 1]
 [1 0 1 2 0 1 1]
 [1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 0 2 2 0 2 2]
 [2 0 2 1 0 1 1]
 [1 0 1 2 0 1 1]
 [1 0 2 1 2 1 1]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
 [2 0 2 2 0 0 0]]
```

```
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[38, -inf, -inf, -inf, -inf, 38, 38]
[0] 38
[[2 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[[2 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 1 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[2 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 2 2 1 0 1 1]
[1 1 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[[2 0 1 2 0 0 0]
[2 0 2 2 0 0 1]
[1 0 2 2 0 2 2]
[2 2 2 1 0 1 1]
[1 1 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[-inf, inf, -inf, -inf, -inf, inf, inf]
[1] inf
[[2 0 1 2 0 0 0]
[2 0 2 2 0 0 1]
[1 2 2 2 0 2 2]
[2 2 2 1 0 1 1]]
```

```
[1 1 1 2 0 1 1]  
[1 1 2 1 2 1 1]]  
Player 2 has won
```

WON GAME 10 AT SEED 7 AS PLAYER 2

Successfully beat monteCarloAI for 10 times

Question 4:

Alpha-Beta pruning function implemented.

Successor function logic explanation:

```
def successor(self, state):  
    Return an array of (moves, state) pairs reachable from current state.  
    result = self.problem.successor(state)  
    self.succs += 1; self.states += len(result)  
    return result
```

We can create an array ordered 3,2,4,1,5,0,6 and call the moves like above.

Question 5:

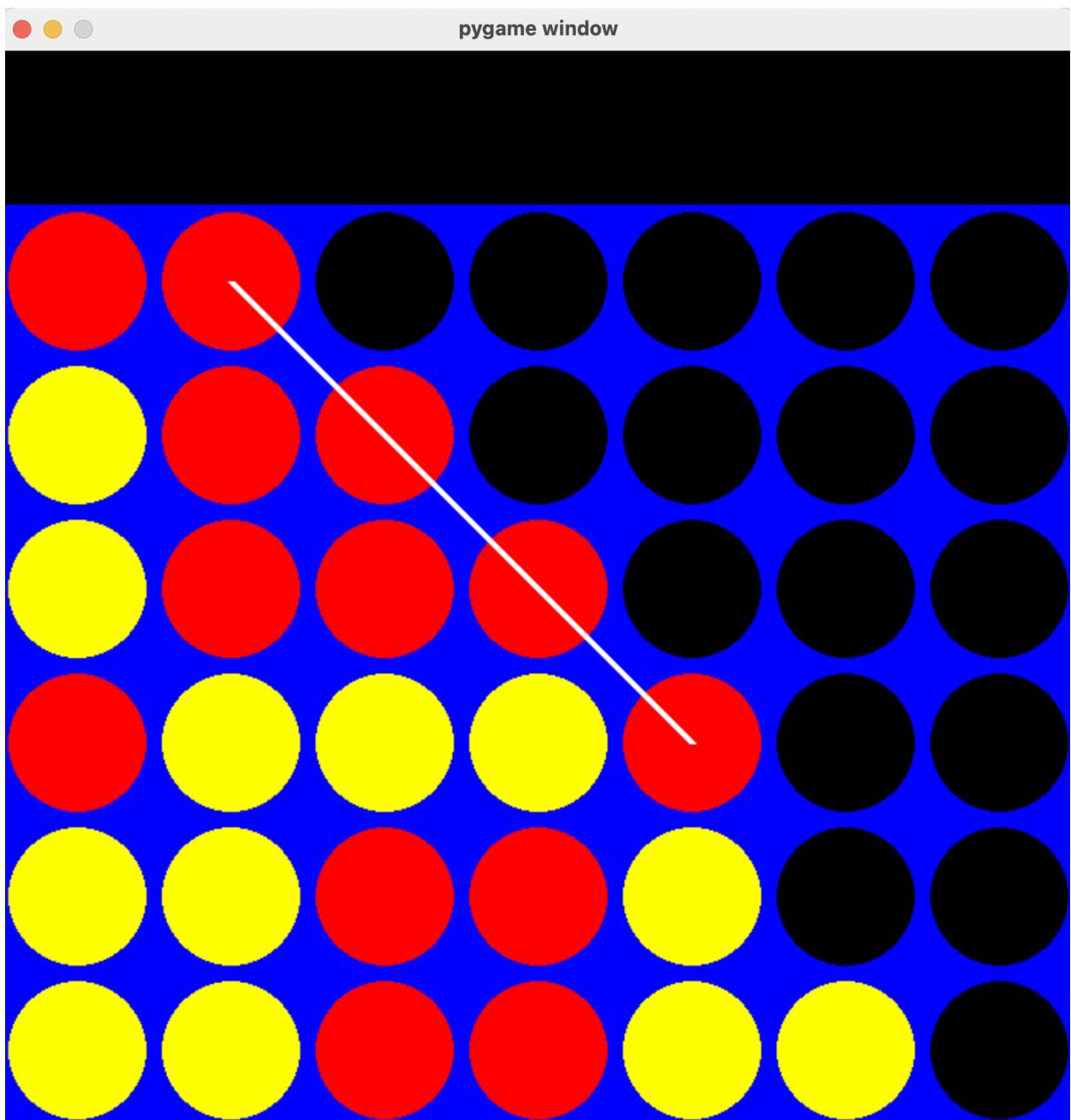
Beats monteCarlo AI all 20 times:

alphaBetaAI as Player1 VS monteCarloAI:

GAME 1:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 1
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
 [[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 2 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 2 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 2 0 1 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 2 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 2 0 1 0 0 0]
[0 2 0 1 0 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 2 0 1 0 0 0]
[0 2 1 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 2 0 2 0 0 0]
[0 2 0 1 0 0 0]
```

```
[0 2 1 1 0 0 0]]  
[-inf, 23, -inf, -inf, -inf, -inf, -inf]  
[1] 23  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 1 0 1 0 0 0]  
[0 2 0 2 0 0 0]  
[0 2 0 1 0 0 0]  
[0 2 1 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 1 0 1 0 0 0]  
[0 2 0 2 0 0 0]  
[0 2 0 1 0 0 0]  
[0 2 1 1 2 0 0]]  
[23, 23, 26, 26, 26, 23, 23]  
[2] 26  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 1 0 1 0 0 0]  
[0 2 0 2 0 0 0]  
[0 2 1 1 0 0 0]  
[0 2 1 1 2 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 1 0 1 0 0 0]  
[0 2 2 2 0 0 0]  
[0 2 1 1 0 0 0]  
[0 2 1 1 2 0 0]]  
[26, 26, 29, 29, -inf, 26, 26]  
[2] 29  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 1 1 1 0 0 0]  
[0 2 2 2 0 0 0]  
[0 2 1 1 0 0 0]  
[0 2 1 1 2 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 1 1 1 0 0 0]  
[0 2 2 2 0 0 0]  
[0 2 1 1 0 0 0]  
[2 2 1 1 2 0 0]]  
[-inf, 29, 32, 32, -inf, 29, 29]
```

```
[2] 32
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 1 1 1 0 0]
 [0 2 2 2 0 0]
 [0 2 1 1 0 0]
 [2 2 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 1 1 1 0 0]
 [0 2 2 2 0 0]
 [0 2 1 1 2 0]
 [2 2 1 1 2 0]]
[-inf, -inf, -inf, -inf, 35, -inf, -inf]
[4] 35
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 1 1 1 0 0]
 [0 2 2 2 1 0]
 [0 2 1 1 2 0]
 [2 2 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 1 1 1 0 0]
 [0 2 2 2 1 0]
 [2 2 1 1 2 0]
 [2 2 1 1 2 0]]
[inf, -inf, -inf, -inf, inf, -inf, -inf]
[0] inf
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 1 1 1 0 0]
 [1 2 2 2 1 0]
 [2 2 1 1 2 0]
 [2 2 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [2 1 1 1 0 0]
 [1 2 2 2 1 0]
 [2 2 1 1 2 0]
 [2 2 1 1 2 0]]
[35, inf, 38, inf, inf, inf, 35]
[1] inf
[[0 0 0 0 0 0]]
```

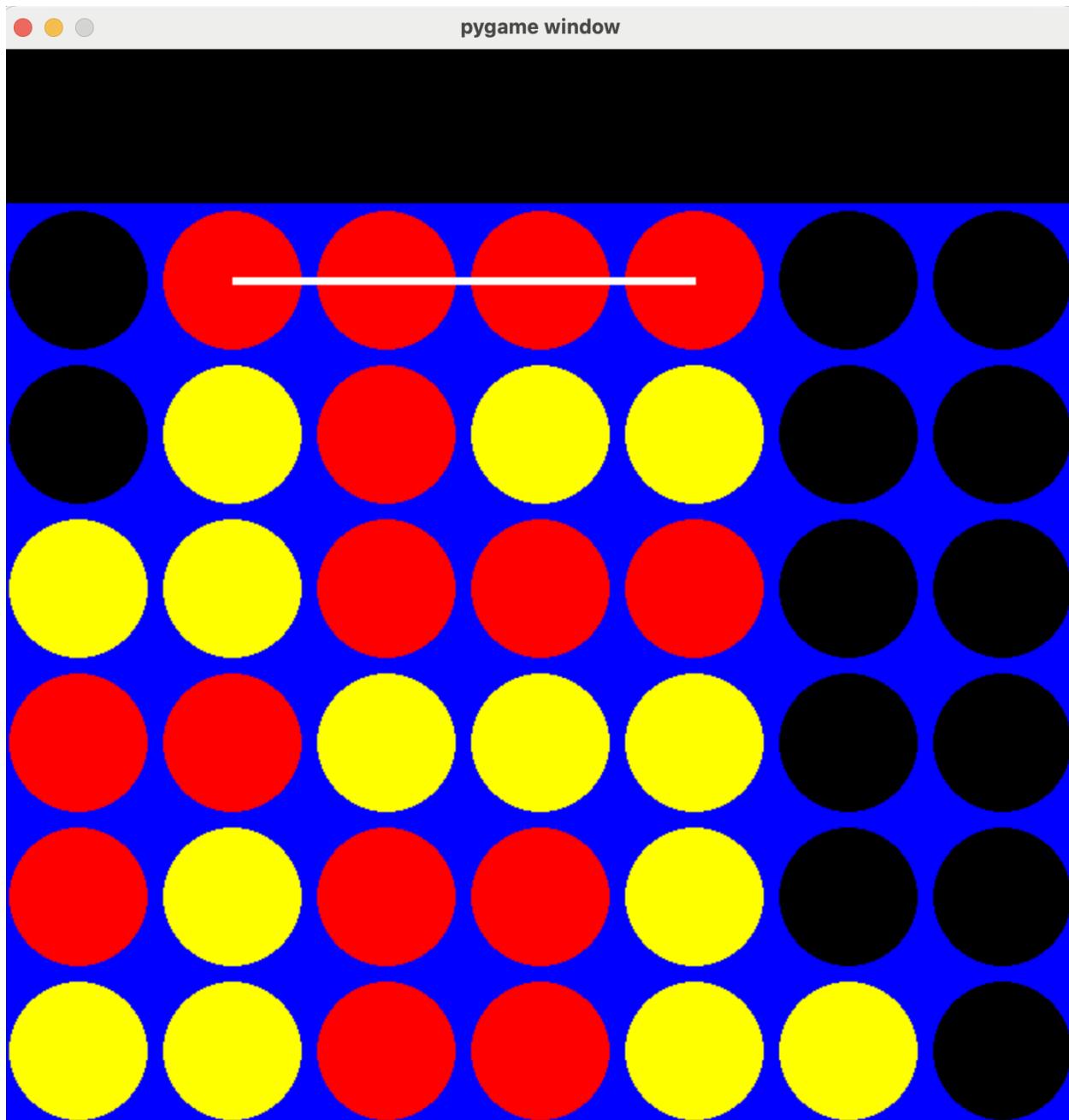
```
[0 1 1 0 0 0 0]
[2 1 1 1 0 0 0]
[1 2 2 2 1 0 0]
[2 2 1 1 2 0 0]
[2 2 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[2 1 1 0 0 0 0]
[2 1 1 1 0 0 0]
[1 2 2 2 1 0 0]
[2 2 1 1 2 0 0]
[2 2 1 1 2 0 0]]
[inf, inf, inf, inf, inf, inf, inf]
[0] inf
[[1 0 0 0 0 0 0]
[2 1 1 0 0 0 0]
[2 1 1 1 0 0 0]
[1 2 2 2 1 0 0]
[2 2 1 1 2 0 0]
[2 2 1 1 2 0 0]]
[[1 0 0 0 0 0 0]
[2 1 1 0 0 0 0]
[2 1 1 1 0 0 0]
[1 2 2 2 1 0 0]
[2 2 1 1 2 0 0]
[2 2 1 1 2 2 0]]
[-inf, inf, inf, inf, inf, inf, inf]
[1] inf
[[1 1 0 0 0 0 0]
[2 1 1 0 0 0 0]
[2 1 1 1 0 0 0]
[1 2 2 2 1 0 0]
[2 2 1 1 2 0 0]
[2 2 1 1 2 2 0]]
Player 1 has won
```

WON GAME ONE

GAME 2:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 2
```



```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 2 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 2 0 0]
[0 0 0 1 2 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 2 0 0]]
```

[0 0 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 2 0 0]
[0 0 0 1 2 0 0]
[0 0 1 1 2 0 0]]
[-inf, -inf, -inf, -inf, 26, -inf, -inf]

[4] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 1 0 0]
[0 0 0 2 2 0 0]
[0 0 0 1 2 0 0]
[0 0 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 1 0 0]
[0 0 0 2 2 0 0]
[0 0 0 1 2 0 0]
[0 2 1 1 2 0 0]]

[26, 26, 29, 29, 29, 26, 26]

[2] 29
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 1 0 0]
[0 0 0 2 2 0 0]
[0 0 1 1 2 0 0]
[0 2 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 1 0 0]
[0 0 2 2 2 0 0]
[0 0 1 1 2 0 0]
[0 2 1 1 2 0 0]]

[29, -inf, 32, 32, 32, 29, 29]

[2] 32
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 1 1 0 0]
[0 0 2 2 2 0 0]
[0 0 1 1 2 0 0]
[0 2 1 1 2 0 0]]
[[0 0 0 0 0 0 0]]

```
[0 0 0 0 0 0]
[0 0 1 1 1 0]
[0 0 2 2 2 0]
[0 0 1 1 2 0]
[0 2 1 1 2 2]
[32, -inf, 35, 35, 35, -inf, 32]
[2] 35
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [0 0 1 1 2 0]
 [0 2 1 1 2 2]
[[0 0 0 0 0 0]
 [0 0 1 2 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [0 0 1 1 2 0]
 [0 2 1 1 2 2]
[33, -inf, 36, 38, 36, -inf, 33]
[3] 38
[[0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [0 0 1 1 2 0]
 [0 2 1 1 2 2]
[[0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [0 2 1 1 2 0]
 [0 2 1 1 2 2]
[-inf, 38, -inf, -inf, -inf, -inf, -inf]
[1] 38
[[0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 0 1 1 1 0]
 [0 1 2 2 2 0]
 [0 2 1 1 2 0]
 [0 2 1 1 2 2]
[[0 0 0 1 0 0]
 [0 0 1 2 0 0]
 [0 2 1 1 1 0]
```

```
[0 1 2 2 2 0 0]
[0 2 1 1 2 0 0]
[0 2 1 1 2 2 0]]
[38, 38, 41, -inf, 41, -inf, 38]
[2] 41
[[0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 2 1 1 1 0 0]
 [0 1 2 2 2 0 0]
 [0 2 1 1 2 0 0]
 [0 2 1 1 2 2 0]]
[[0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 2 1 1 1 0 0]
 [0 1 2 2 2 0 0]
 [0 2 1 1 2 0 0]
 [2 2 1 1 2 2 0]]
[41, 41, -inf, -inf, 41, -inf, 41]
[0] 41
[[0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 2 1 1 1 0 0]
 [0 1 2 2 2 0 0]
 [1 2 1 1 2 0 0]
 [2 2 1 1 2 2 0]]
[[0 0 1 1 0 0 0]
 [0 0 1 2 2 0 0]
 [0 2 1 1 1 0 0]
 [0 1 2 2 2 0 0]
 [1 2 1 1 2 0 0]
 [2 2 1 1 2 2 0]]
[41, 38, -inf, -inf, 41, -inf, 38]
[0] 41
[[0 0 1 1 0 0 0]
 [0 0 1 2 2 0 0]
 [0 2 1 1 1 0 0]
 [1 1 2 2 2 0 0]
 [1 2 1 1 2 0 0]
 [2 2 1 1 2 2 0]]
[[0 0 1 1 0 0 0]
 [0 0 1 2 2 0 0]
 [2 2 1 1 1 0 0]
 [1 1 2 2 2 0 0]
 [1 2 1 1 2 0 0]
 [1 2 1 1 2 2 0]]
```

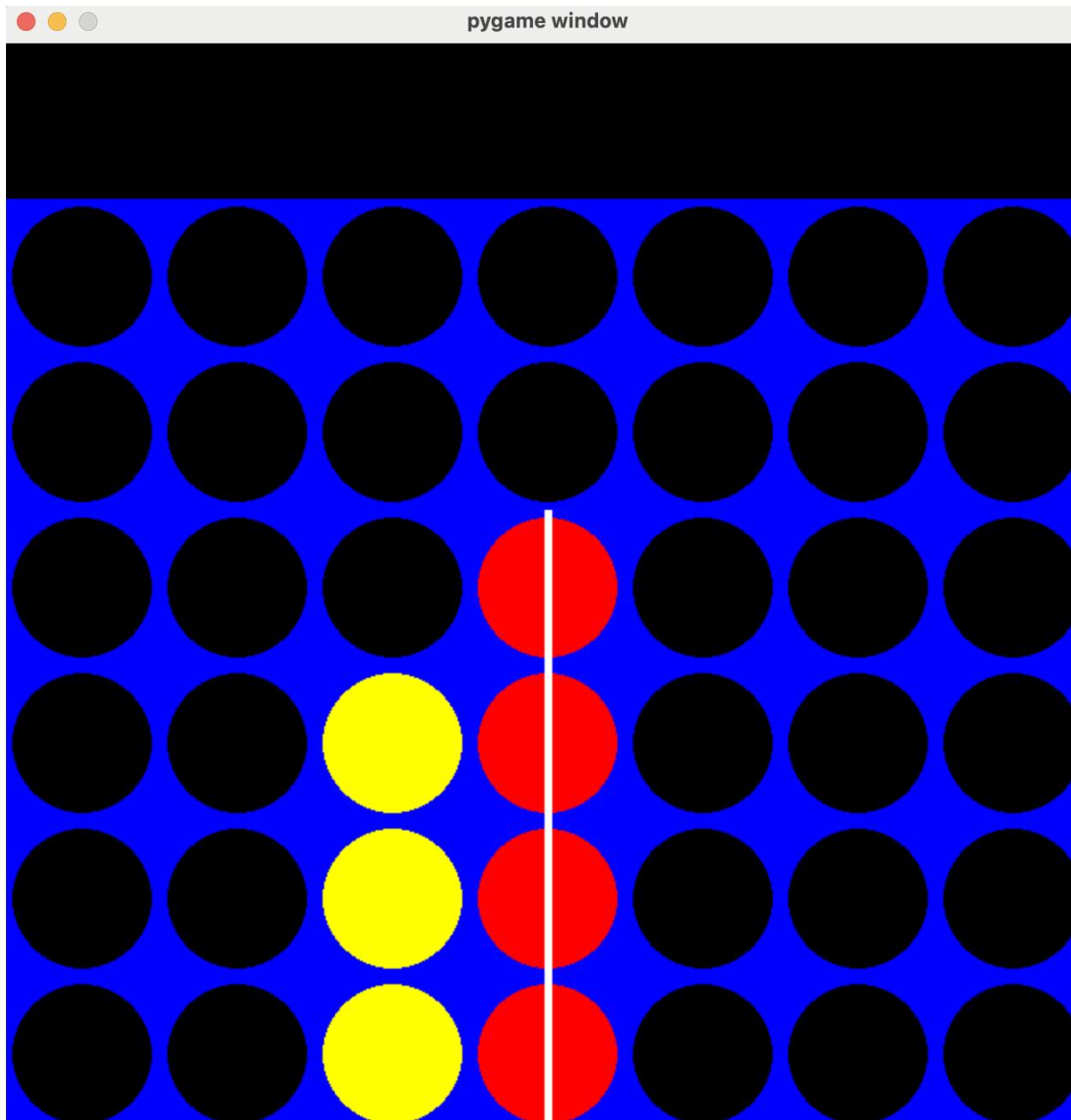
```
[2 2 1 1 2 2 0]]  
[38, 38, -inf, -inf, 41, -inf, 38]  
[4] 41  
[[0 0 1 1 1 0 0]  
[0 0 1 2 2 0 0]  
[2 2 1 1 1 0 0]  
[1 1 2 2 2 0 0]  
[1 2 1 1 2 0 0]  
[2 2 1 1 2 2 0]]  
[[0 0 1 1 1 0 0]  
[0 2 1 2 2 0 0]  
[2 2 1 1 1 0 0]  
[1 1 2 2 2 0 0]  
[1 2 1 1 2 0 0]  
[2 2 1 1 2 2 0]]  
[41, inf, -inf, -inf, -inf, -inf, 41]  
[1] inf  
[[0 1 1 1 1 0 0]  
[0 2 1 2 2 0 0]  
[2 2 1 1 1 0 0]  
[1 1 2 2 2 0 0]  
[1 2 1 1 2 0 0]  
[2 2 1 1 2 2 0]]
```

WON GAME TWO

GAME 3:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 3
```



Terminal result:

```
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 2 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 2 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 2 1 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 1 0 0 0]]
[-inf, -inf, 23, inf, -inf, -inf, -inf]
[3] inf
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 1 0 0 0]]
```

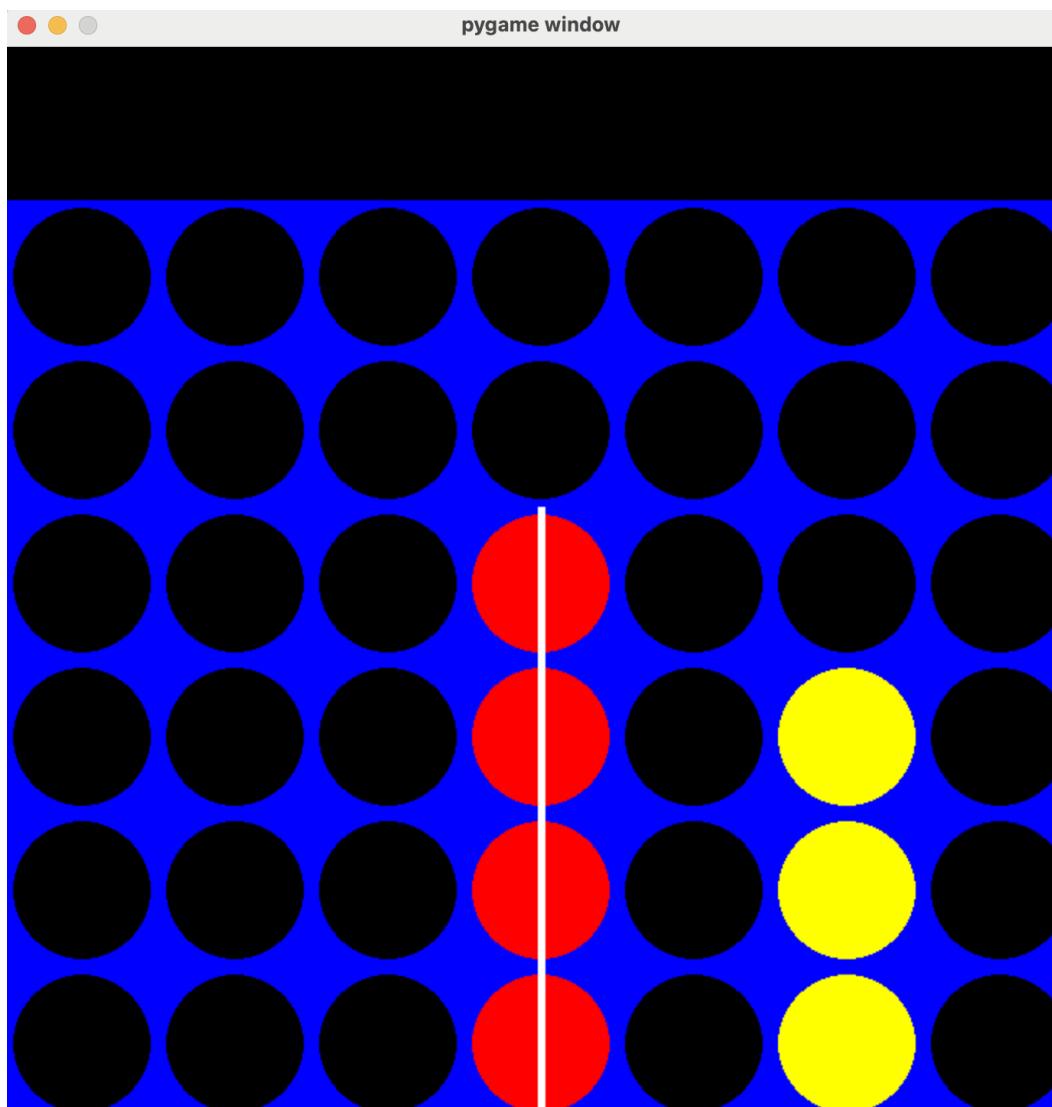
[0 0 2 1 0 0 0]
Player 1 has won

WON GAME THREE

GAME 4:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 2 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 2 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 2 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 2 0]
[0 0 0 1 0 2 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 2 0]
[0 0 0 1 0 2 0]
[0 0 0 1 0 2 0]]
[-inf, -inf, -inf, inf, -inf, 20, -inf]
[3] inf
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 0 2 0]
[0 0 0 1 0 2 0]]
```

[0 0 0 1 0 2 0]]

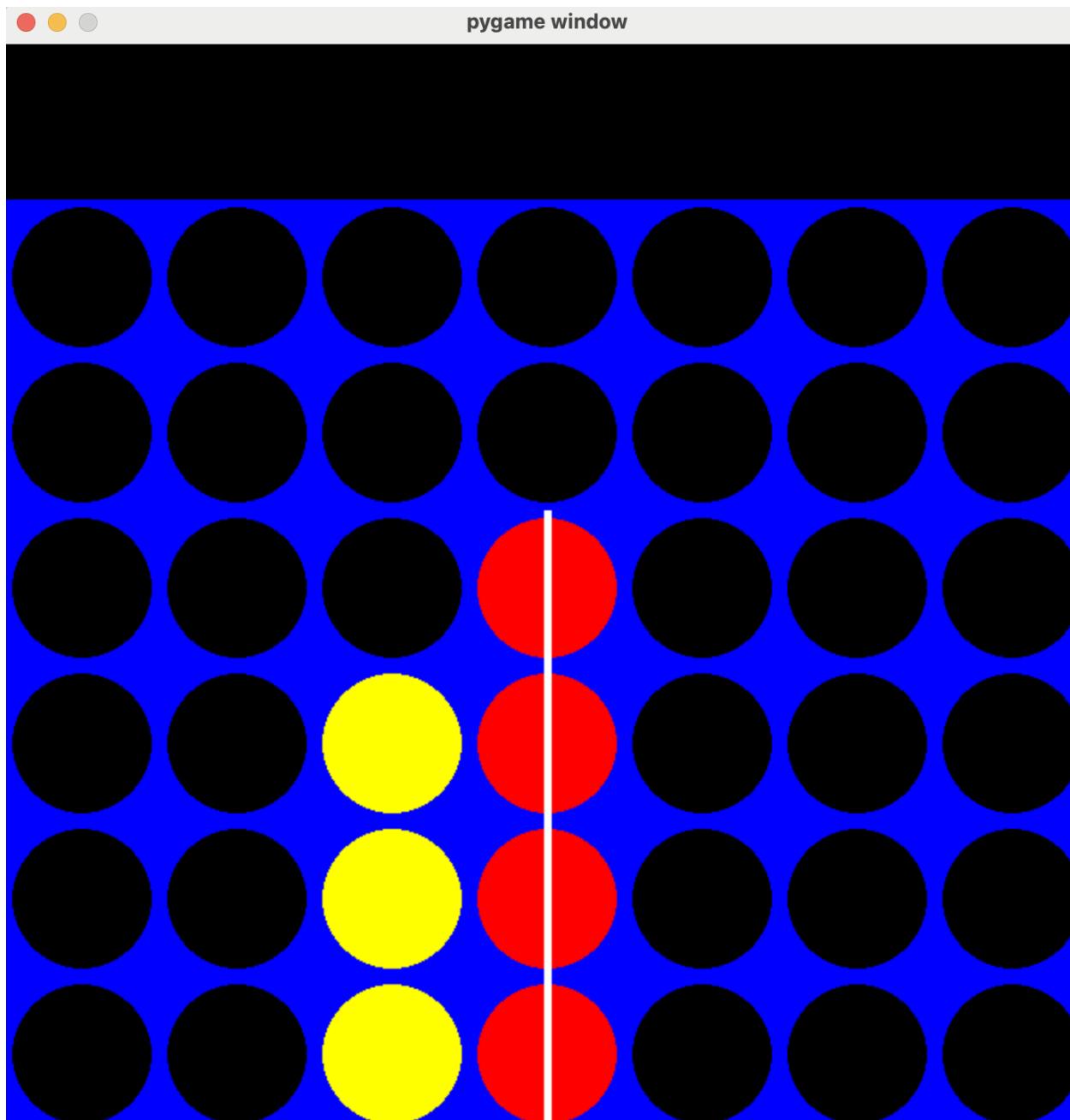
Player 1 has won

WON GAME FOUR

GAME 5:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 5
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 2 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 1 0 0 0]]
[-inf, -inf, 23, inf, -inf, -inf, -inf]
[3] inf
[[0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]  
[0 0 0 1 0 0]  
[0 0 2 1 0 0]  
[0 0 2 1 0 0]  
[0 0 2 1 0 0]]
```

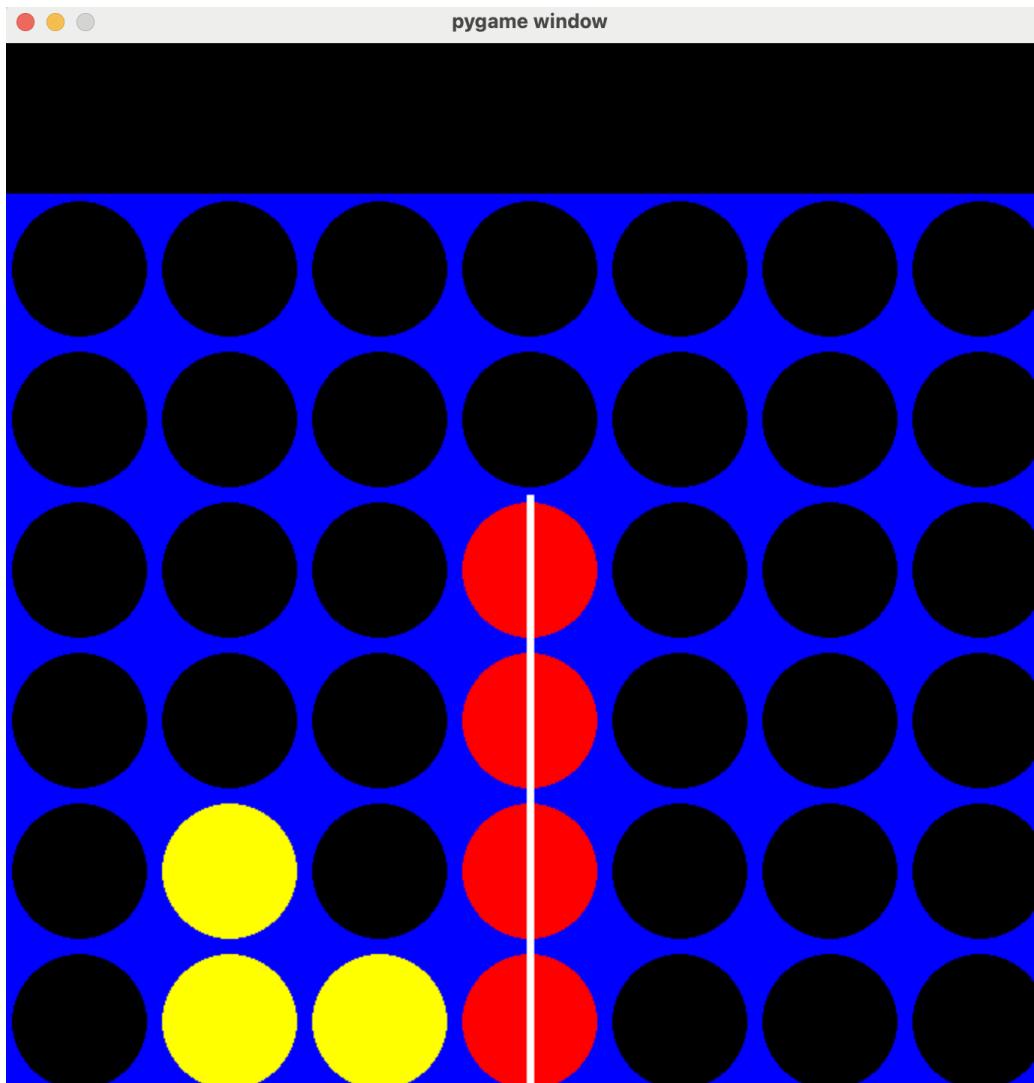
Player 1 has won

WON GAME FIVE

GAME 6:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 6
```



Terminal result:

```
[[0 0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[[0 0 0 0 0 0]]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 2 0 1 0 0]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 2 1 0 0]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 0 0 1 0 0]
[0 2 2 1 0 0]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[0 2 2 1 0 0]
[20, 20, 23, inf, 23, 20, 20]
[3] inf
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]]
```

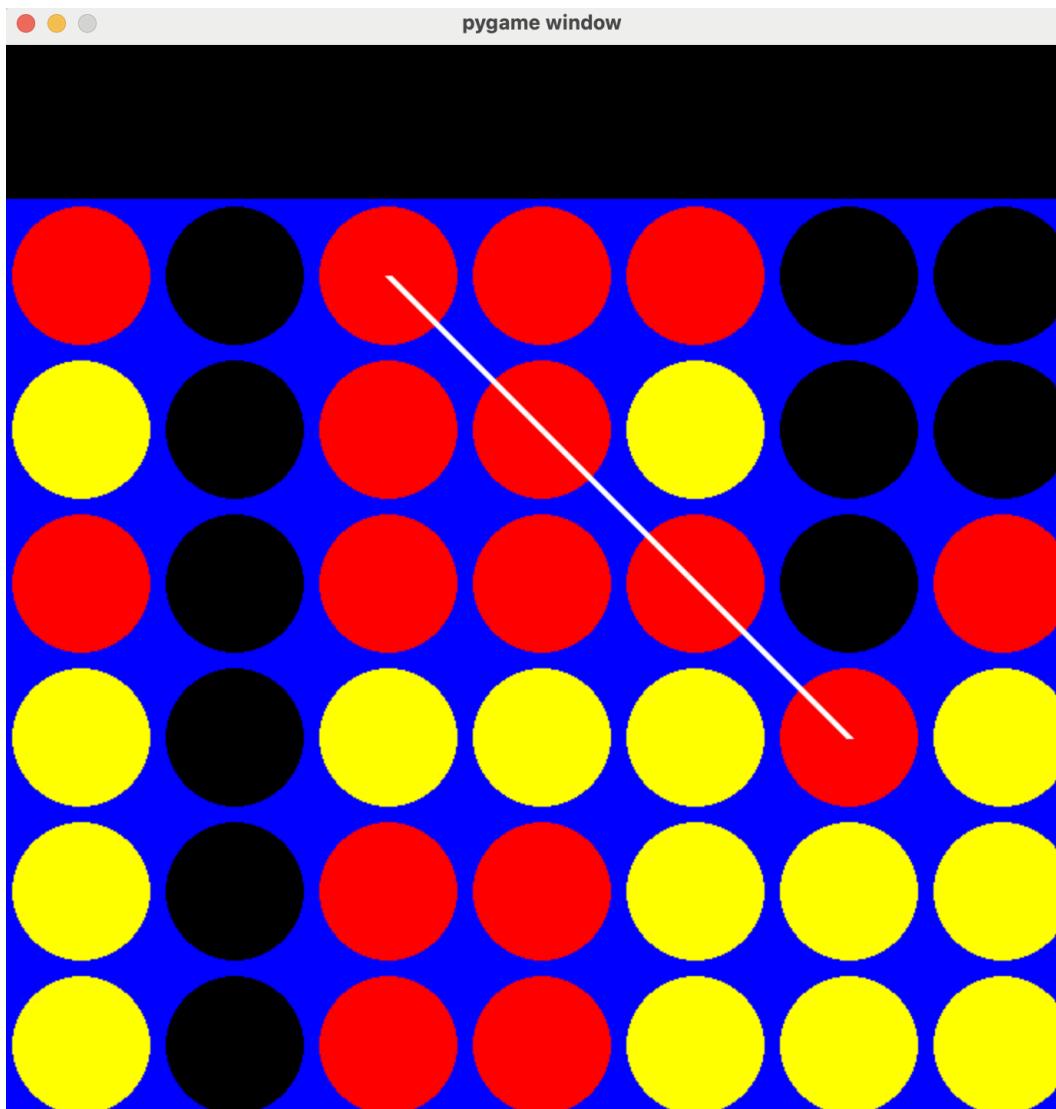
```
[0 0 0 1 0 0 0]  
[0 2 0 1 0 0 0]  
[0 2 2 1 0 0 0]]  
Player 1 has won
```

WON GAME SIX

GAME 7:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 7
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 2 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 1 2 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 2 0 0]
[0 0 0 1 2 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
```

```
[0 0 0 1 2 0 0]
[0 0 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 2 0 0]
[2 0 1 1 2 0 0]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 2 0 0]
[2 0 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 2 0 0]
[0 0 1 1 2 0 0]
[2 0 1 1 2 0 0]]
[-inf, -inf, -inf, -inf, 29, -inf, -inf]
[4] 29
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 1 0 0]
[0 0 0 2 2 0 0]
[0 0 1 1 2 0 0]
[2 0 1 1 2 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 1 0 0]
[0 0 2 2 2 0 0]
[0 0 1 1 2 0 0]
[2 0 1 1 2 0 0]]
[29, 29, 32, 32, 32, 29, 29]
[2] 32
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 1 1 0 0]
[0 0 2 2 2 0 0]
[0 0 1 1 2 0 0]
[2 0 1 1 2 0 0]]
```

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [2 0 1 1 2 0]
 [2 0 1 1 2 0]]
[32, 32, 35, 35, 35, 32, 32]
[2] 35
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [2 0 1 1 2 0]
 [2 0 1 1 2 0]]
[[0 0 0 0 0 0]
 [0 0 1 0 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [2 0 1 1 2 0]
 [2 0 1 1 2 0]]
[35, 35, 38, 38, 38, 35, 35]
[2] 38
[[0 0 1 0 0 0]
 [0 0 1 0 0 0]
 [0 0 1 1 1 0]
 [0 0 2 2 2 0]
 [2 0 1 1 2 0]
 [2 0 1 1 2 0]]
[[0 0 1 0 0 0]
 [0 0 1 0 0 0]
 [0 0 1 1 1 0]
 [2 0 2 2 2 0]
 [2 0 1 1 2 0]
 [2 0 1 1 2 0]]
[38, -inf, -inf, -inf, -inf, -inf, -inf]
[0] 38
[[0 0 1 0 0 0]
 [0 0 1 0 0 0]
 [1 0 1 1 1 0]
 [2 0 2 2 2 0]
 [2 0 1 1 2 0]
 [2 0 1 1 2 0]]
[[0 0 1 0 0 0]
 [0 0 1 0 0 0]
```

```
[1 0 1 1 1 0 0]
[2 0 2 2 2 0 0]
[2 0 1 1 2 0 2]
[2 0 1 1 2 0 2]]
[38, 38, -inf, 41, 41, 38, 38]
[3] 41
[[0 0 1 0 0 0 0]
 [0 0 1 1 0 0 0]
 [1 0 1 1 1 0 0]
 [2 0 2 2 2 0 0]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 0 2]]
[[0 0 1 0 0 0 0]
 [2 0 1 1 0 0 0]
 [1 0 1 1 1 0 0]
 [2 0 2 2 2 0 0]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 0 2]]
[41, 41, -inf, 46, 44, 41, 41]
[3] 46
[[0 0 1 1 0 0 0]
 [2 0 1 1 0 0 0]
 [1 0 1 1 1 0 0]
 [2 0 2 2 2 0 0]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 0 2]]
[[0 0 1 1 0 0 0]
 [2 0 1 1 0 0 0]
 [1 0 1 1 1 0 0]
 [2 0 2 2 2 0 2]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 0 2]]
[-inf, -inf, -inf, -inf, -inf, -inf, 46]
[6] 46
[[0 0 1 1 0 0 0]
 [2 0 1 1 0 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 0 2]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 0 2]]
[[0 0 1 1 0 0 0]
 [2 0 1 1 0 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 0 2]
```

```
[2 0 1 1 2 0 2]
[2 0 1 1 2 2 2]]
[46, 46, -inf, -inf, 46, -inf, 46]
[0] 46
[[1 0 1 1 0 0 0]
 [2 0 1 1 0 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 0 2]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 2 2]]
[[1 0 1 1 0 0 0]
 [2 0 1 1 2 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 0 2]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 2 2]]
[-inf, 43, -inf, -inf, 46, -inf, 43]
[4] 46
[[1 0 1 1 1 0 0]
 [2 0 1 1 2 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 0 2]
 [2 0 1 1 2 0 2]
 [2 0 1 1 2 2 2]]
[[1 0 1 1 1 0 0]
 [2 0 1 1 2 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 0 2]
 [2 0 1 1 2 2 2]
 [2 0 1 1 2 2 2]]
[-inf, -inf, -inf, -inf, -inf, inf, -inf]
[5] inf
[[1 0 1 1 1 0 0]
 [2 0 1 1 2 0 0]
 [1 0 1 1 1 0 1]
 [2 0 2 2 2 1 2]
 [2 0 1 1 2 2 2]
 [2 0 1 1 2 2 2]]
```

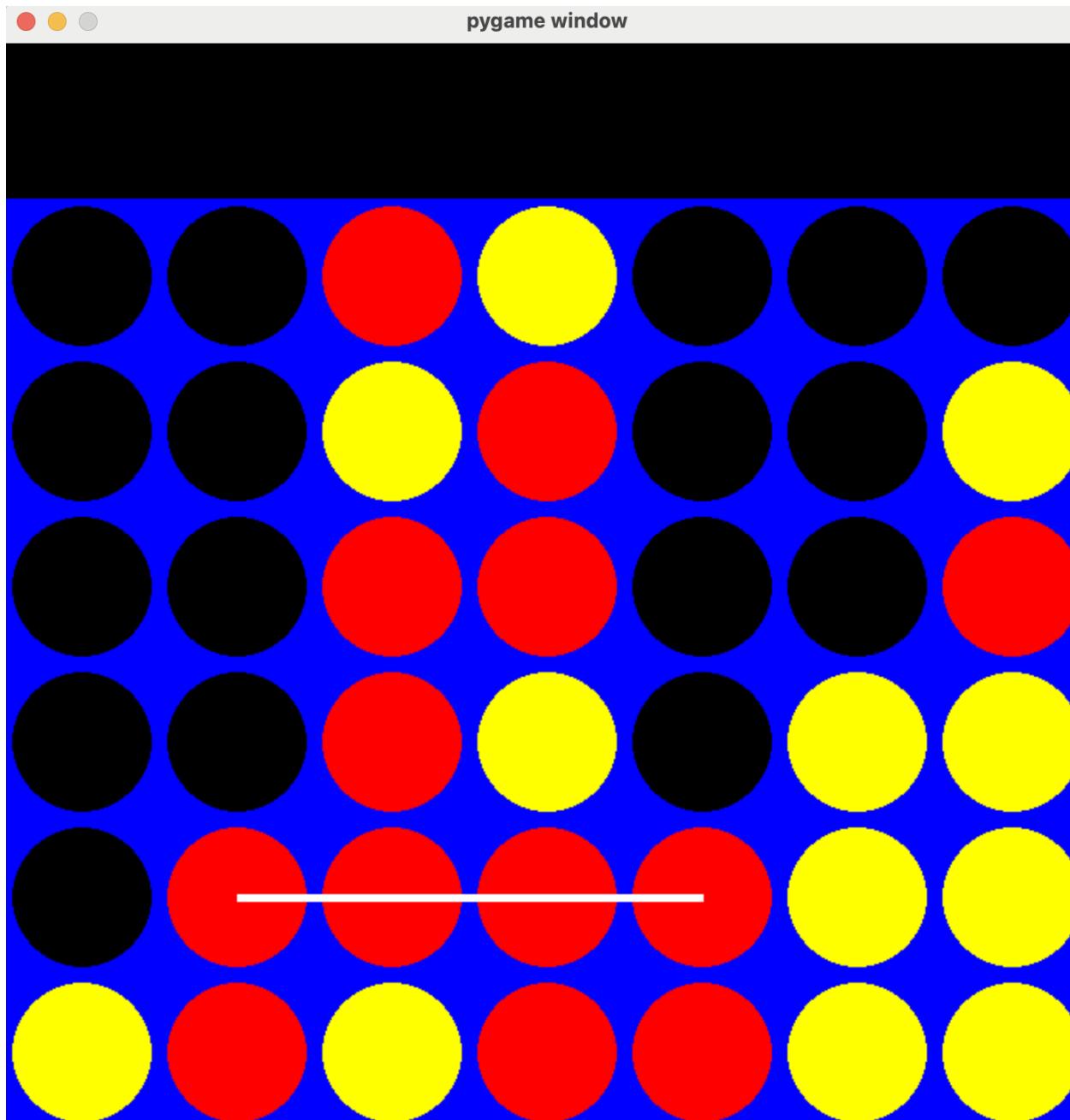
Player 1 has won

WON GAME SEVEN

GAME 8:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 8
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 2]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 1 0 0 2]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 1 0 0 2]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 0 1 0 0 2]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 0 1 0 0]
 [0 0 2 1 0 0 2]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0]
 [0 0 0 2 0 0]
 [0 0 1 1 0 0]]
```

[0 0 2 1 0 0 2]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 0 2]]

[23, 23, 26, 26, 26, 23, 23]

[2] 26

[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 0 2]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 2 2]]

[26, 26, 29, 29, 29, 26, 26]

[2] 29

[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 2 2]
[[0 0 0 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 2 2]]

[29, 29, 32, 32, 32, 29, 29]

[2] 32

[[0 0 1 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 2 2]
[[0 0 1 0 0 0 0]

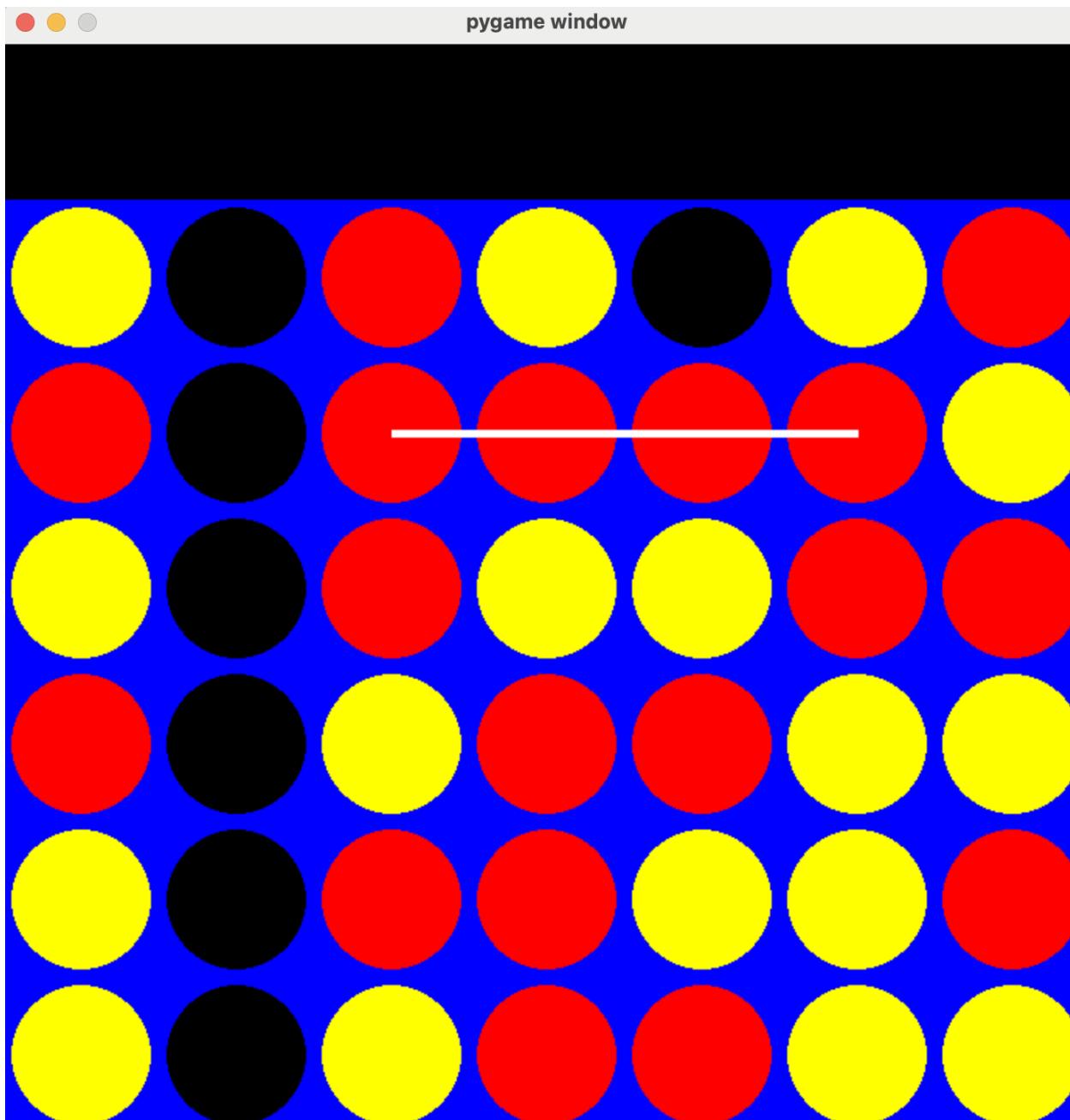
```
[0 0 2 0 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 2]
[2 0 2 1 0 2 2]]
[32, 32, -inf, 35, 35, 32, 32]
[3] 35
[[0 0 1 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 2]
[2 0 2 1 0 2 2]]
[[0 0 1 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 2]
[0 0 1 1 0 0 2]
[2 0 2 1 0 2 2]]
[-inf, -inf, -inf, -inf, -inf, -inf, 35]
[6] 35
[[0 0 1 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 1]
[0 0 1 2 0 0 2]
[0 0 1 1 0 0 2]
[2 0 2 1 0 2 2]]
[[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 1]
[0 0 1 2 0 0 2]
[0 0 1 1 0 0 2]
[2 0 2 1 0 2 2]]
[35, 35, -inf, -inf, 38, 35, 35]
[4] 38
[[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 1]
[0 0 1 2 0 0 2]
[0 0 1 1 0 0 2]
[2 0 2 1 1 2 2]]
[[0 0 1 2 0 0 0]
[0 0 2 1 0 0 2]
[0 0 1 1 0 0 1]]
```

```
[0 0 1 2 0 0 2]
[0 0 1 1 0 0 2]
[2 0 2 1 1 2 2]]
[38, 38, -inf, -inf, inf, 38, 38]
[4] inf
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 2]
 [0 0 1 1 0 0 1]
 [0 0 1 2 0 0 2]
 [0 0 1 1 1 0 2]
 [2 0 2 1 1 2 2]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 2]
 [0 0 1 1 0 0 1]
 [0 0 1 2 0 0 2]
 [0 0 1 1 1 2 2]
 [2 0 2 1 1 2 2]]
[41, inf, -inf, -inf, inf, inf, 41]
[1] inf
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 2]
 [0 0 1 1 0 0 1]
 [0 0 1 2 0 0 2]
 [0 0 1 1 1 2 2]
 [2 1 2 1 1 2 2]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 2]
 [0 0 1 1 0 0 1]
 [0 0 1 2 0 2 2]
 [0 0 1 1 1 2 2]
 [2 1 2 1 1 2 2]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 2]
 [0 0 1 1 0 0 1]
 [0 0 1 2 0 2 2]
 [0 1 1 1 1 2 2]
 [2 1 2 1 1 2 2]]
Player 1 has won
```

WON GAME EIGHT

GAME 9:**Terminal command:**

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 9
```

**Terminal result:**

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 1 0 0 0]]  
[[0 0 0 0 0 0 0]]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 2 1 0 0 0]]  
[10, 10, 13, 15, 13, 10, 10]  
[3] 15  
[[0 0 0 0 0 0 0]]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 1 0 0 0]]  
[15, 15, 18, 20, 18, 15, 15]  
[3] 20  
[[0 0 0 0 0 0 0]]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 1 0 0 0]  
[2 0 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 1 0 0 0]  
[2 0 2 1 0 0 0]]  
[20, 20, 23, 23, 23, 20, 20]  
[2] 23  
[[0 0 0 0 0 0 0]]  
[0 0 0 0 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 1 1 0 0 0]  
[2 0 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 0 0]]
[23, -inf, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 0 2]]
[26, -inf, 29, 29, 29, 26, 26]
[2] 29
[[0 0 0 0 0 0 0]
[0 0 1 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 0 2]]
[[0 0 0 0 0 0 0]
[0 0 1 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 2 2]]
[29, -inf, 32, 32, 32, 29, 29]
[2] 32
[[0 0 1 0 0 0 0]
[0 0 1 0 0 0 0]
[0 0 1 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 1 1 0 0 0]
[2 0 2 1 0 2 2]]
[[0 0 1 0 0 0 0]
[0 0 1 0 0 0 0]
[0 0 1 2 0 0 0]
```

```
[0 0 2 1 0 0 0]
[0 0 1 1 0 2 0]
[2 0 2 1 0 2 2]]
[32, -inf, -inf, 35, 35, 32, 32]
[3] 35
[[0 0 1 0 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 1 1 0 2 0]
 [2 0 2 1 0 2 2]]
[[0 0 1 0 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 2 1 0 2 0]
 [0 0 1 1 0 2 0]
 [2 0 2 1 0 2 2]]
[-inf, -inf, -inf, -inf, -inf, 35, -inf]
[5] 35
[[0 0 1 0 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 1 0]
 [0 0 2 1 0 2 0]
 [0 0 1 1 0 2 0]
 [2 0 2 1 0 2 2]]
[[0 0 1 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 1 0]
 [0 0 2 1 0 2 0]
 [0 0 1 1 0 2 0]
 [2 0 2 1 0 2 2]]
[35, -inf, -inf, -inf, 38, 35, 35]
[4] 38
[[0 0 1 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 1 0]
 [0 0 2 1 0 2 0]
 [0 0 1 1 0 2 0]
 [2 0 2 1 1 2 2]]
[[0 0 1 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 1 0]
 [0 0 2 1 0 2 0]
 [2 0 1 1 0 2 0]
```

```
[2 0 2 1 1 2 2]]  
[38, -inf, -inf, -inf, -inf, 38, 38]  
[0] 38  
[[0 0 1 2 0 0 0]  
[0 0 1 1 0 0 0]  
[0 0 1 2 0 1 0]  
[1 0 2 1 0 2 0]  
[2 0 1 1 0 2 0]  
[2 0 2 1 1 2 2]]  
[[0 0 1 2 0 0 0]  
[0 0 1 1 0 0 0]  
[2 0 1 2 0 1 0]  
[1 0 2 1 0 2 0]  
[2 0 1 1 0 2 0]  
[2 0 2 1 1 2 2]]  
[38, -inf, -inf, -inf, -inf, 38, 38]  
[0] 38  
[[0 0 1 2 0 0 0]  
[1 0 1 1 0 0 0]  
[2 0 1 2 0 1 0]  
[1 0 2 1 0 2 0]  
[2 0 1 1 0 2 0]  
[2 0 2 1 1 2 2]]  
[[2 0 1 2 0 0 0]  
[1 0 1 1 0 0 0]  
[2 0 1 2 0 1 0]  
[1 0 2 1 0 2 0]  
[2 0 1 1 0 2 0]  
[2 0 2 1 1 2 2]]  
[-inf, -inf, -inf, -inf, -inf, 38, 38]  
[5] 38  
[[2 0 1 2 0 0 0]  
[1 0 1 1 0 1 0]  
[2 0 1 2 0 1 0]  
[1 0 2 1 0 2 0]  
[2 0 1 1 0 2 0]  
[2 0 2 1 1 2 2]]  
[[2 0 1 2 0 2 0]  
[1 0 1 1 0 1 0]  
[2 0 1 2 0 1 0]  
[1 0 2 1 0 2 0]  
[2 0 1 1 0 2 0]  
[2 0 2 1 1 2 2]]  
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
```

```
[6] 38
[[2 0 1 2 0 2 0]
 [1 0 1 1 0 1 0]
 [2 0 1 2 0 1 0]
 [1 0 2 1 0 2 0]
 [2 0 1 1 0 2 1]
 [2 0 2 1 1 2 2]]
[[2 0 1 2 0 2 0]
 [1 0 1 1 0 1 0]
 [2 0 1 2 0 1 0]
 [1 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 2 1 1 2 2]]
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
[6] 38
[[2 0 1 2 0 2 0]
 [1 0 1 1 0 1 0]
 [2 0 1 2 0 1 1]
 [1 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 2 1 1 2 2]]
[[2 0 1 2 0 2 0]
 [1 0 1 1 0 1 2]
 [2 0 1 2 0 1 1]
 [1 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 2 1 1 2 2]]
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
[6] 38
[[2 0 1 2 0 2 1]
 [1 0 1 1 0 1 2]
 [2 0 1 2 0 1 1]
 [1 0 2 1 0 2 2]
 [2 0 1 1 0 2 1]
 [2 0 2 1 1 2 2]]
[[2 0 1 2 0 2 1]
 [1 0 1 1 0 1 2]
 [2 0 1 2 0 1 1]
 [1 0 2 1 0 2 2]
 [2 0 1 1 2 2 1]
 [2 0 2 1 1 2 2]]
[-inf, -inf, -inf, -inf, inf, -inf, -inf]
[4] inf
[[2 0 1 2 0 2 1]]
```

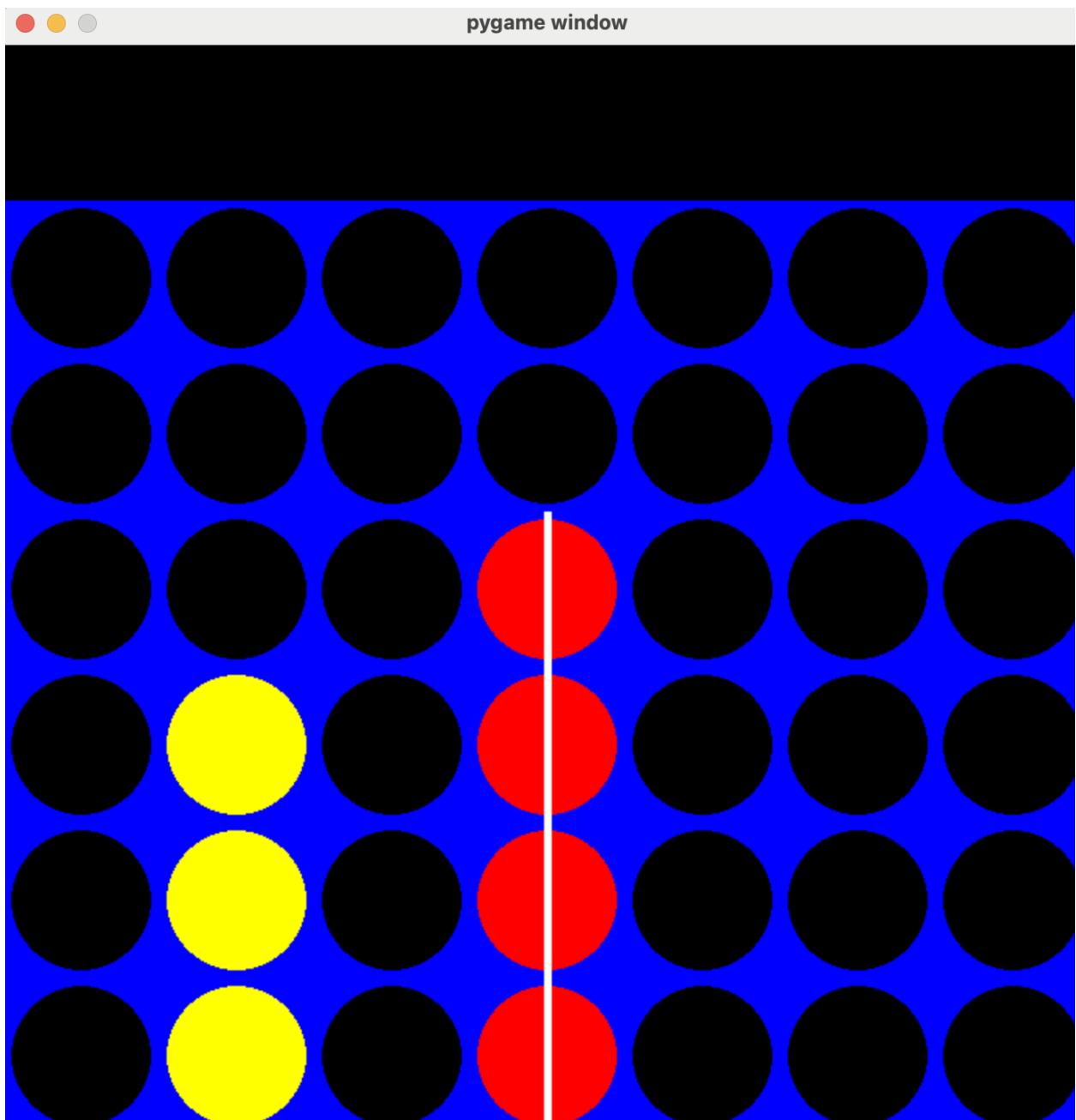
```
[1 0 1 1 0 1 2]
[2 0 1 2 0 1 1]
[1 0 2 1 1 2 2]
[2 0 1 1 2 2 1]
[2 0 2 1 1 2 2]]
[[2 0 1 2 0 2 1]
[1 0 1 1 0 1 2]
[2 0 1 2 2 1 1]
[1 0 2 1 1 2 2]
[2 0 1 1 2 2 1]
[2 0 2 1 1 2 2]]
[-inf, -inf, -inf, -inf, inf, -inf, -inf]
[4] inf
[[2 0 1 2 0 2 1]
[1 0 1 1 1 1 2]
[2 0 1 2 2 1 1]
[1 0 2 1 1 2 2]
[2 0 1 1 2 2 1]
[2 0 2 1 1 2 2]]
Player 1 has won
```

WON GAME NINE

GAME 10:

Terminal command:

```
python3 main.py -p2 monteCarloAI -p1 alphaBetaAI -limit_players 1,2
-visualize True -verbose True -seed 10
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
 [[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 2 0 1 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 2 0 1 0 0]
[0 2 0 1 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[0 2 0 1 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 2 0 1 0 0]
[0 2 0 1 0 0]]
[-inf, 20, -inf, inf, -inf, -inf, -inf]
[3] inf
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0]
[0 2 0 1 0 0]
[0 2 0 1 0 0]
[0 2 0 1 0 0]]
Player 1 has won
```

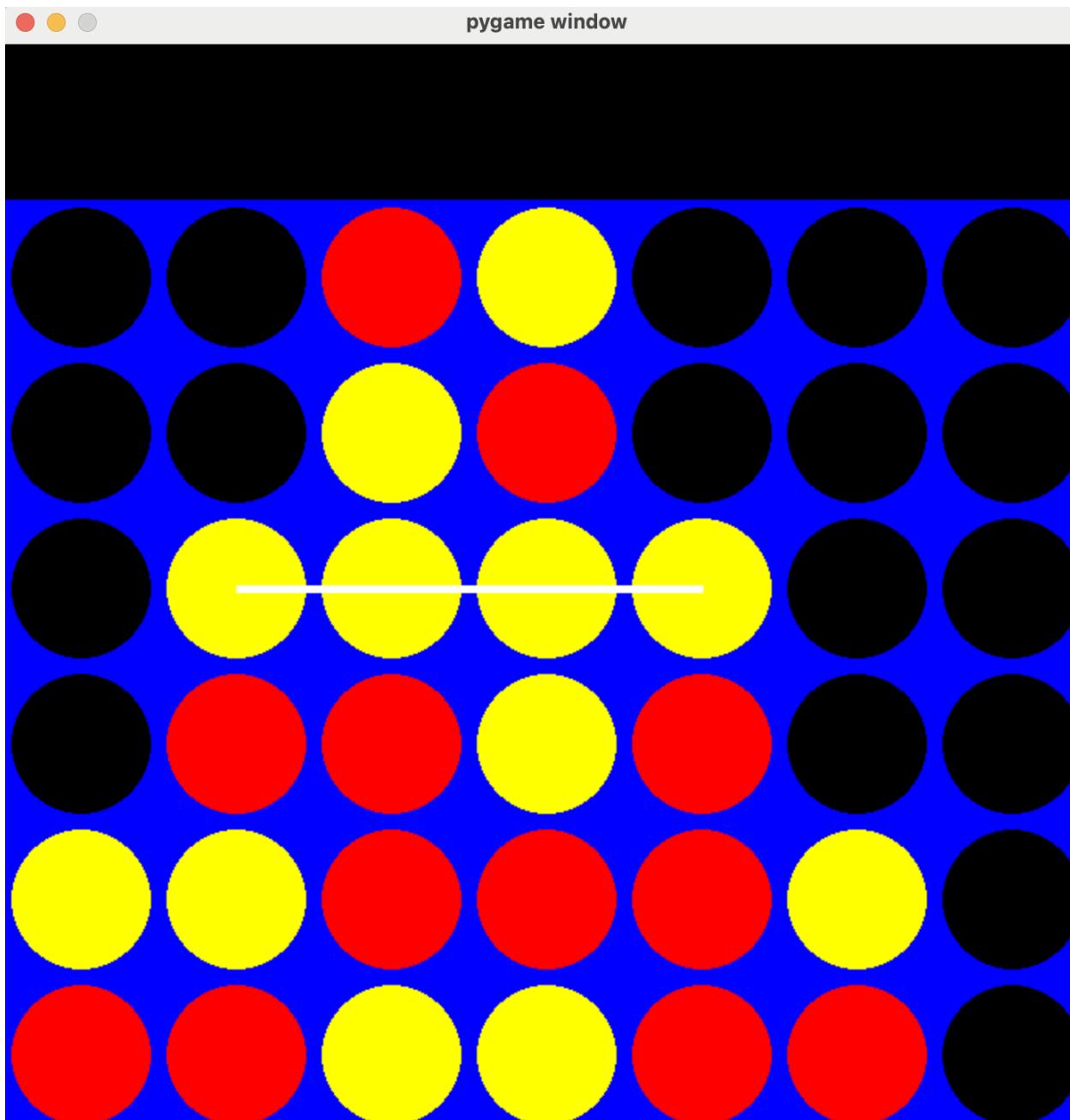
WON GAME TEN

alphaBetaAI as Player2 VS monteCarloAI:

GAME 11:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 1
```



Terminal result:

```
[[0 0 0 0 0 0]  
 [0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 1 0 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 1 0 2 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 1 0 2 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 1 0 2 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 1 0 2 1 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 1 0 2 1 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
```

```
[0 0 0 1 1 0 0]
[0 1 0 2 1 0 0]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 1 0 0]
[0 1 2 2 1 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 1 0 0]
[0 1 2 2 1 0 0]]
[-inf, 23, -inf, -inf, -inf, -inf, -inf]
[1] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 1 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 1 0 0]]
[23, -inf, 26, 26, 26, -inf, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 1 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 1 0 0]
[0 2 1 1 1 0 0]
[0 1 2 2 1 0 0]]
```

$[-\infty, -\infty, -\infty, -\infty, 29, -\infty, -\infty]$

[4] 29

$[[0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]]$

$[0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]$

$[0 \ 0 \ 2 \ 2 \ 2 \ 0 \ 0]$

$[0 \ 0 \ 1 \ 2 \ 1 \ 0 \ 0]$

$[0 \ 2 \ 1 \ 1 \ 1 \ 0 \ 0]$

$[0 \ 1 \ 2 \ 2 \ 1 \ 0 \ 0]]$

$[[0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]]$

$[0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0]$

$[0 \ 0 \ 2 \ 2 \ 2 \ 0 \ 0]$

$[0 \ 0 \ 1 \ 2 \ 1 \ 0 \ 0]$

$[0 \ 2 \ 1 \ 1 \ 1 \ 0 \ 0]$

$[0 \ 1 \ 2 \ 2 \ 1 \ 0 \ 0]]$

$[27, -\infty, 30, 32, 30, -\infty, 27]$

[3] 32

$[[0 \ 0 \ 0 \ 2 \ 0 \ 0 \ 0]]$

$[0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0]$

$[0 \ 0 \ 2 \ 2 \ 2 \ 0 \ 0]$

$[0 \ 0 \ 1 \ 2 \ 1 \ 0 \ 0]$

$[0 \ 2 \ 1 \ 1 \ 1 \ 0 \ 0]$

$[0 \ 1 \ 2 \ 2 \ 1 \ 0 \ 0]]$

$[[0 \ 0 \ 0 \ 2 \ 0 \ 0 \ 0]]$

$[0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0]$

$[0 \ 0 \ 2 \ 2 \ 2 \ 0 \ 0]$

$[0 \ 0 \ 1 \ 2 \ 1 \ 0 \ 0]$

$[0 \ 2 \ 1 \ 1 \ 1 \ 0 \ 0]$

$[0 \ 1 \ 2 \ 2 \ 1 \ 1 \ 0]]$

$[-\infty, -\infty, -\infty, -\infty, -\infty, 32, -\infty]$

[5] 32

$[[0 \ 0 \ 0 \ 2 \ 0 \ 0 \ 0]]$

$[0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0]$

$[0 \ 0 \ 2 \ 2 \ 2 \ 0 \ 0]$

$[0 \ 0 \ 1 \ 2 \ 1 \ 0 \ 0]$

$[0 \ 2 \ 1 \ 1 \ 1 \ 2 \ 0]$

$[0 \ 1 \ 2 \ 2 \ 1 \ 1 \ 0]]$

$[[0 \ 0 \ 0 \ 2 \ 0 \ 0 \ 0]]$

$[0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0]$

$[0 \ 0 \ 2 \ 2 \ 2 \ 0 \ 0]$

$[0 \ 0 \ 1 \ 2 \ 1 \ 0 \ 0]$

$[0 \ 2 \ 1 \ 1 \ 1 \ 2 \ 0]$

$[1 \ 1 \ 2 \ 2 \ 1 \ 1 \ 0]]$

$[32, -\infty, 35, -\infty, 35, 32, 32]$

[2] 35

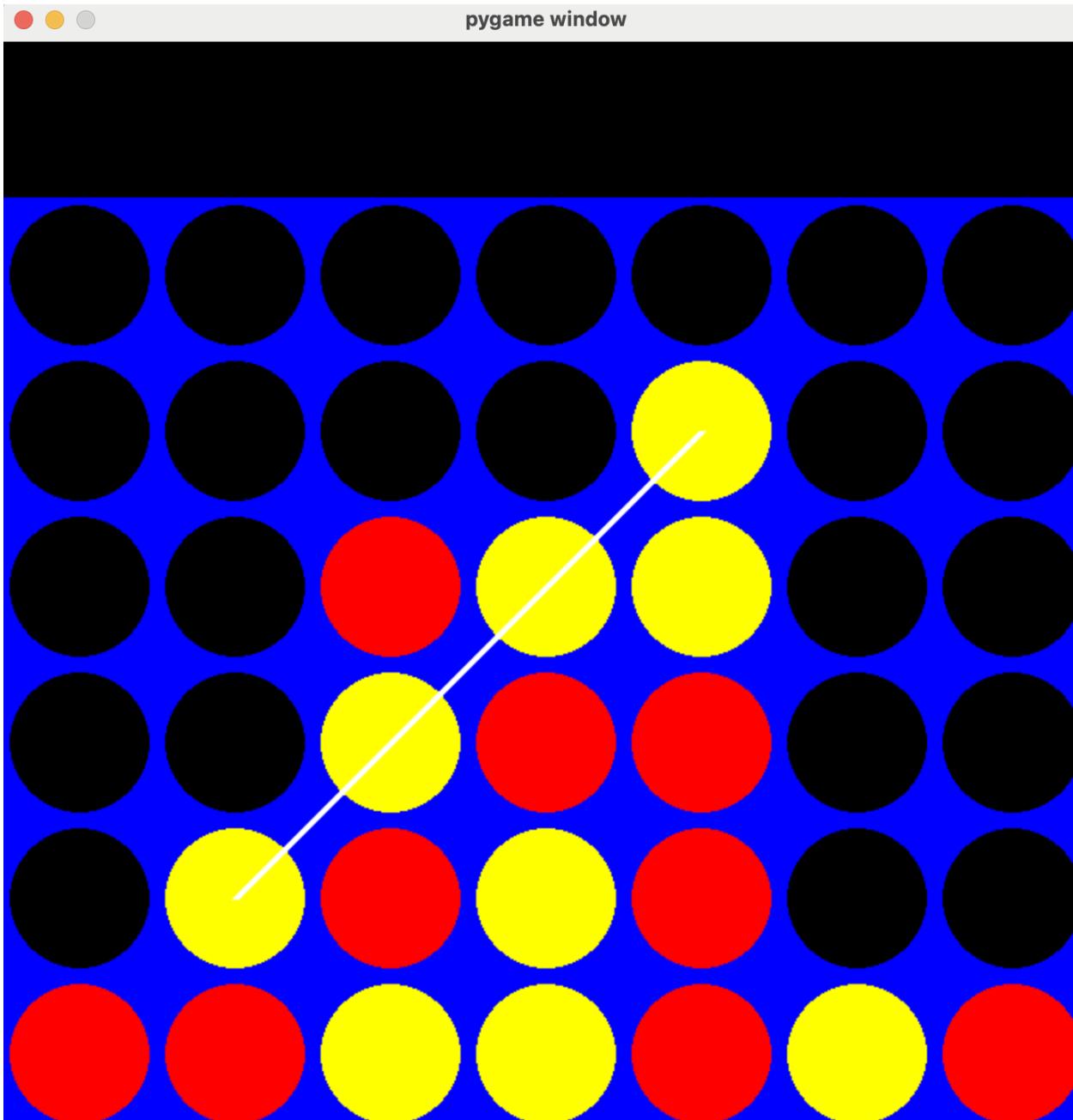
```
[[0 0 0 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 2 1 0 0]
 [0 2 1 1 1 2 0]
 [1 1 2 2 1 1 0]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 2 1 0 0]
 [0 2 1 1 1 2 0]
 [1 1 2 2 1 1 0]]
[35, -inf, -inf, -inf, 35, 35, 35]
[0] 35
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 2 1 0 0]
 [2 2 1 1 1 2 0]
 [1 1 2 2 1 1 0]]
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 2 0 0]
 [0 1 1 2 1 0 0]
 [2 2 1 1 1 2 0]
 [1 1 2 2 1 1 0]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[0 0 1 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 2 2 2 2 0 0]
 [0 1 1 2 1 0 0]
 [2 2 1 1 1 2 0]
 [1 1 2 2 1 1 0]]
Player 2 has won
```

WON GAME ELEVEN

GAME 12:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 2
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 1]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 1]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 1 0 1]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 1 0 1]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 1 0 1]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 1 0 1]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 1 0 0]
 [0 0 0 2 1 0 1]]
```

[20, 20, 23, 23, 23, 20, 20]

[2] 23

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 1 0 0]

[0 0 2 2 1 0 1]]

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 1 1 0 0]

[0 0 0 2 1 0 0]

[0 0 2 2 1 0 1]]

[-inf, -inf, -inf, -inf, 26, -inf, -inf]

[4] 26

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[0 0 0 2 1 0 0]

[0 0 2 2 1 0 1]]

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[0 0 1 2 1 0 0]

[0 0 2 2 1 0 1]]

[26, 26, 29, 29, 29, 26, 26]

[2] 29

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 2 1 1 0 0]

[0 0 1 2 1 0 0]

[0 0 2 2 1 0 1]]

[[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 1 2 2 0 0]

[0 0 2 1 1 0 0]

[0 0 1 2 1 0 0]

[0 0 2 2 1 0 1]]

[-inf, -inf, -inf, -inf, -inf, 29, -inf]

[5] 29

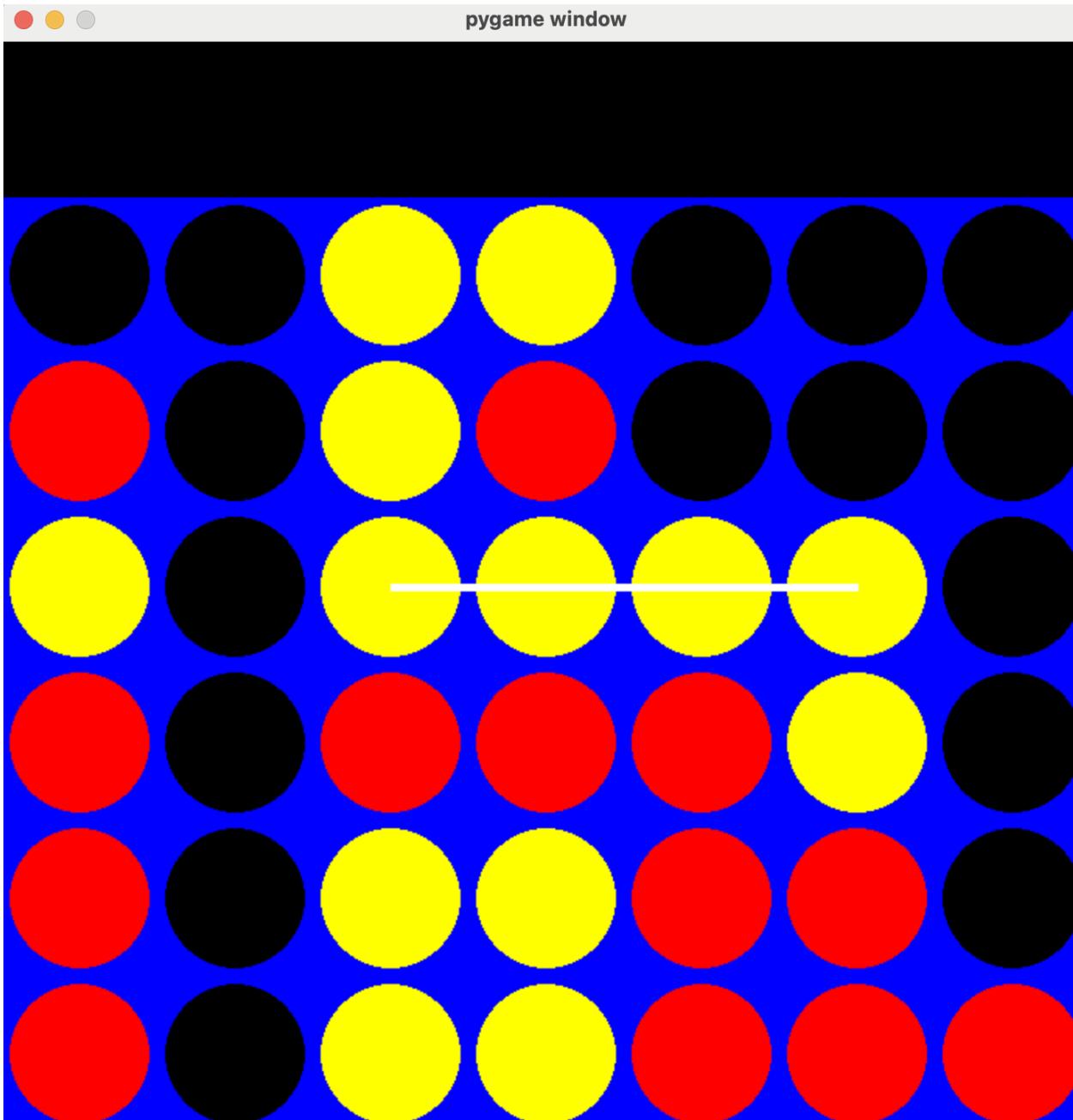
```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 1 2 2 0 0]
 [0 0 2 1 1 0 0]
 [0 0 1 2 1 0 0]
 [0 0 2 2 1 2 1]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 1 2 2 0 0]
 [0 0 2 1 1 0 0]
 [0 0 1 2 1 0 0]
 [0 1 2 2 1 2 1]]
[29, inf, 32, 32, 32, 29, 29]
[1] inf
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 1 2 2 0 0]
 [0 0 2 1 1 0 0]
 [0 2 1 2 1 0 0]
 [0 1 2 2 1 2 1]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 1 2 2 0 0]
 [0 0 2 1 1 0 0]
 [0 2 1 2 1 0 0]
 [1 1 2 2 1 2 1]]
[29, 29, 32, 34, inf, 29, 29]
[4] inf
[[0 0 0 0 0 0 0]
 [0 0 0 0 2 0 0]
 [0 0 1 2 2 0 0]
 [0 0 2 1 1 0 0]
 [0 2 1 2 1 0 0]
 [1 1 2 2 1 2 1]]
Player 2 has won
```

WON GAME TWELVE

GAME 13:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 3
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 1 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 1 0 0]
 [0 0 0 2 1 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 1 0 0]
 [0 0 0 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 1 0 0]
 [0 0 0 2 1 0 0]
 [0 0 0 2 1 0 0]]
[-inf, -inf, -inf, -inf, 18, -inf, -inf]
[4] 18
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 2 0 0]
 [0 0 0 0 1 0 0]
 [0 0 0 2 1 0 0]
 [0 0 0 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 2 0 0]
 [0 0 0 1 1 0 0]
 [0 0 0 2 1 0 0]
 [0 0 0 2 1 0 0]]
```

[18, 18, 21, 23, 21, 18, 18]

[3] 23

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[0 0 0 2 1 0 0]

[0 0 0 2 1 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[0 0 0 2 1 0 0]

[1 0 0 2 1 0 0]]

[23, 23, 26, 26, 26, 23, 23]

[2] 26

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[0 0 0 2 1 0 0]

[1 0 2 2 1 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[1 0 0 2 1 0 0]

[1 0 2 2 1 0 0]]

[26, 26, 29, 29, 29, 26, 26]

[2] 29

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 0 1 1 0 0]

[1 0 2 2 1 0 0]

[1 0 2 2 1 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 2 0 0]

[0 0 1 1 1 0 0]

[1 0 2 2 1 0 0]

[1 0 2 2 1 0 0]]

[29, 29, 32, 32, 32, 29, 29]

[2] 32

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 1 1 0 0]
 [1 0 2 2 1 0 0]
 [1 0 2 2 1 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 1 1 0 0]
 [1 0 2 2 1 0 0]
 [1 0 2 2 1 0 0]]
[30, 30, 33, 35, 33, 30, 30]
[3] 35
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 2 2 0 0]
 [0 0 1 1 1 0 0]
 [1 0 2 2 1 0 0]
 [1 0 2 2 1 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 2 2 2 0 0]
 [1 0 1 1 1 0 0]
 [1 0 2 2 1 0 0]
 [1 0 2 2 1 0 0]]
[35, -inf, -inf, -inf, -inf, -inf, -inf]
[0] 35
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [2 0 2 2 2 0 0]
 [1 0 1 1 1 0 0]
 [1 0 2 2 1 0 0]
 [1 0 2 2 1 0 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [2 0 2 2 2 0 0]
 [1 0 1 1 1 0 0]
 [1 0 2 2 1 0 0]
 [1 0 2 2 1 1 0]]
[35, 35, 38, -inf, 38, -inf, 35]
[2] 38
[[0 0 0 2 0 0 0]
 [0 0 2 1 0 0 0]]
```

```
[2 0 2 2 2 0 0]
[1 0 1 1 1 0 0]
[1 0 2 2 1 0 0]
[1 0 2 2 1 1 0]]
[[0 0 0 2 0 0 0]
[1 0 2 1 0 0 0]
[2 0 2 2 2 0 0]
[1 0 1 1 1 0 0]
[1 0 2 2 1 0 0]
[1 0 2 2 1 1 0]]
[38, 38, 41, -inf, 41, -inf, 38]
[2] 41
[[0 0 2 2 0 0 0]
[1 0 2 1 0 0 0]
[2 0 2 2 2 0 0]
[1 0 1 1 1 0 0]
[1 0 2 2 1 0 0]
[1 0 2 2 1 1 0]]
[[0 0 2 2 0 0 0]
[1 0 2 1 0 0 0]
[2 0 2 2 2 0 0]
[1 0 1 1 1 0 0]
[1 0 2 2 1 1 0]
[1 0 2 2 1 1 0]]
[-inf, -inf, -inf, -inf, -inf, 41, -inf]
[5] 41
[[0 0 2 2 0 0 0]
[1 0 2 1 0 0 0]
[2 0 2 2 2 0 0]
[1 0 1 1 1 2 0]
[1 0 2 2 1 1 0]
[1 0 2 2 1 1 0]]
[[0 0 2 2 0 0 0]
[1 0 2 1 0 0 0]
[2 0 2 2 2 0 0]
[1 0 1 1 1 2 0]
[1 0 2 2 1 1 0]
[1 0 2 2 1 1 1]]
[41, 41, -inf, -inf, 44, inf, 41]
[5] inf
[[0 0 2 2 0 0 0]
[1 0 2 1 0 0 0]
[2 0 2 2 2 2 0]
[1 0 1 1 1 2 0]]
```

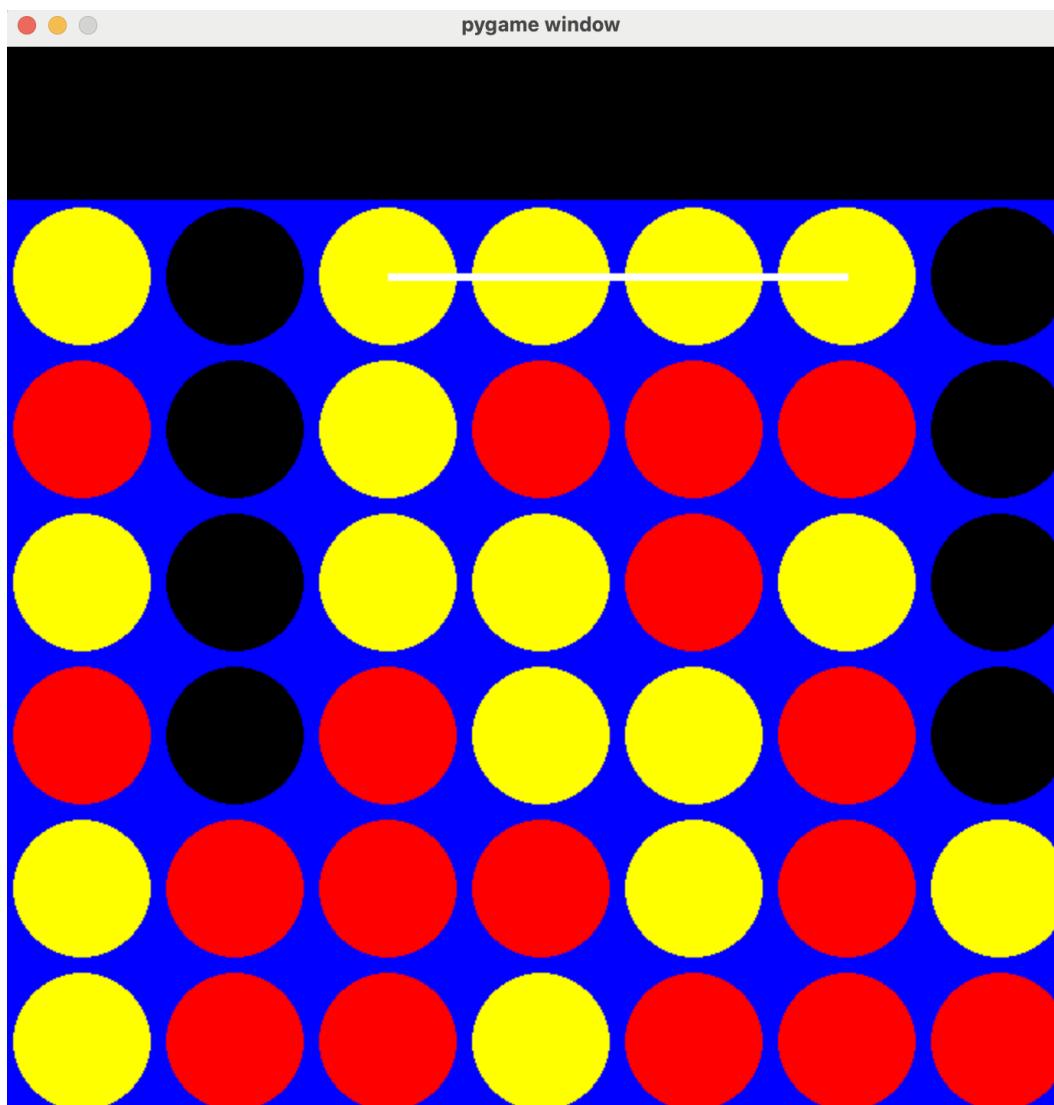
```
[1 0 2 2 1 1 0]  
[1 0 2 2 1 1 1]]  
Player 2 has won
```

WON GAME THIRTEEN

GAME 14:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 4
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 1 2 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 2 0 0 0]
```

```
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]]
[-inf, -inf, 23, -inf, -inf, -inf, -inf]
[2] 23
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 1 0]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
 [0 0 2 0 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 1 0]]
[[0 0 0 0 0 0 0]
 [0 0 2 0 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 0 1 0]
 [0 0 1 2 0 1 0]]
[26, 26, 29, 29, -inf, 26, 26]
[2] 29
[[0 0 2 0 0 0 0]
 [0 0 2 0 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 0 1 0]
 [0 0 1 2 0 1 0]]
[[0 0 2 0 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 1 2 0 0 0]
 [0 0 1 1 0 1 0]
 [0 0 1 2 0 1 0]]
```

[27, 27, -inf, 32, -inf, 27, 27]

[3] 32

[[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 2 0 0 0]

[0 0 1 1 0 1 0]

[0 0 1 2 0 1 0]]

[[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 2 2 0 0 0]

[0 0 1 2 0 1 0]

[0 0 1 1 0 1 0]

[0 0 1 2 0 1 0]]

[-inf, -inf, -inf, -inf, -inf, 32, -inf]

[5] 32

[[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 2 2 0 2 0]

[0 0 1 2 0 1 0]

[0 0 1 1 0 1 0]

[0 0 1 2 0 1 0]]

[[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 2 2 0 2 0]

[0 0 1 2 0 1 0]

[0 0 1 1 0 1 0]

[0 1 1 2 0 1 0]]

[32, 32, -inf, -inf, -inf, 32, 32]

[0] 32

[[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 2 2 0 2 0]

[0 0 1 2 0 1 0]

[0 0 1 1 0 1 0]

[2 1 1 2 0 1 0]]

[[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 2 2 0 2 0]

[0 0 1 2 0 1 0]

[0 1 1 1 0 1 0]

[2 1 1 2 0 1 0]]

[32, -inf, -inf, -inf, -inf, -inf, -inf]

[0] 32

```
[[0 0 2 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 2 0]
 [0 0 1 2 0 1 0]
 [2 1 1 1 0 1 0]
 [2 1 1 2 0 1 0]]
[[0 0 2 2 0 0 0]
 [0 0 2 1 0 0 0]
 [0 0 2 2 0 2 0]
 [1 0 1 2 0 1 0]
 [2 1 1 1 0 1 0]
 [2 1 1 2 0 1 0]]
[32, 32, -inf, -inf, -inf, 32, 32]
[0] 32
[[0 0 2 2 0 0 0]
 [0 0 2 1 0 0 0]
 [2 0 2 2 0 2 0]
 [1 0 1 2 0 1 0]
 [2 1 1 1 0 1 0]
 [2 1 1 2 0 1 0]]
[[0 0 2 2 0 0 0]
 [0 0 2 1 0 0 0]
 [2 0 2 2 0 2 0]
 [1 0 1 2 0 1 0]
 [2 1 1 1 0 1 0]
 [2 1 1 2 1 1 0]]
[-inf, -inf, -inf, -inf, 35, -inf, -inf]
[4] 35
[[0 0 2 2 0 0 0]
 [0 0 2 1 0 0 0]
 [2 0 2 2 0 2 0]
 [1 0 1 2 0 1 0]
 [2 1 1 1 2 1 0]
 [2 1 1 2 1 1 0]]
[[0 0 2 2 0 0 0]
 [1 0 2 1 0 0 0]
 [2 0 2 2 0 2 0]
 [1 0 1 2 0 1 0]
 [2 1 1 1 2 1 0]
 [2 1 1 2 1 1 0]]
[35, -inf, -inf, -inf, 38, 35, 35]
[4] 38
[[0 0 2 2 0 0 0]
 [1 0 2 1 0 0 0]]
```

```
[2 0 2 2 0 2 0]
[1 0 1 2 2 1 0]
[2 1 1 1 2 1 0]
[2 1 1 2 1 1 0]]
[[0 0 2 2 0 0 0]
 [1 0 2 1 0 0 0]
 [2 0 2 2 1 2 0]
 [1 0 1 2 2 1 0]
 [2 1 1 1 2 1 0]
 [2 1 1 2 1 1 0]]
[38, -inf, -inf, -inf, 38, 38, -inf]
[0] 38
[[2 0 2 2 0 0 0]
 [1 0 2 1 0 0 0]
 [2 0 2 2 1 2 0]
 [1 0 1 2 2 1 0]
 [2 1 1 1 2 1 0]
 [2 1 1 2 1 1 0]]
[[2 0 2 2 0 0 0]
 [1 0 2 1 0 0 0]
 [2 0 2 2 1 2 0]
 [1 0 1 2 2 1 0]
 [2 1 1 1 2 1 0]
 [2 1 1 2 1 1 0]]
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
[6] 38
[[2 0 2 2 0 0 0]
 [1 0 2 1 0 0 0]
 [2 0 2 2 1 2 0]
 [1 0 1 2 2 1 0]
 [2 1 1 1 2 1 2]
 [2 1 1 2 1 1 1]]
[[2 0 2 2 0 0 0]
 [1 0 2 1 1 0 0]
 [2 0 2 2 1 2 0]
 [1 0 1 2 2 1 0]
 [2 1 1 1 2 1 2]
 [2 1 1 2 1 1 1]]
[-inf, -inf, -inf, -inf, -inf, 38, 35, 35]
[4] 38
[[2 0 2 2 2 0 0]
 [1 0 2 1 1 0 0]
 [2 0 2 2 1 2 0]
 [1 0 1 2 2 1 0]]
```

```
[2 1 1 1 2 1 2]
[2 1 1 2 1 1 1]]
[[2 0 2 2 2 0 0]
[1 0 2 1 1 1 0]
[2 0 2 2 1 2 0]
[1 0 1 2 2 1 0]
[2 1 1 1 2 1 2]
[2 1 1 2 1 1 1]]
```

```
[-inf, -inf, -inf, -inf, -inf, inf, 38]
```

```
[5] inf
```

```
[[2 0 2 2 2 2 0]
[1 0 2 1 1 1 0]
[2 0 2 2 1 2 0]
[1 0 1 2 2 1 0]
[2 1 1 1 2 1 2]
[2 1 1 2 1 1 1]]
```

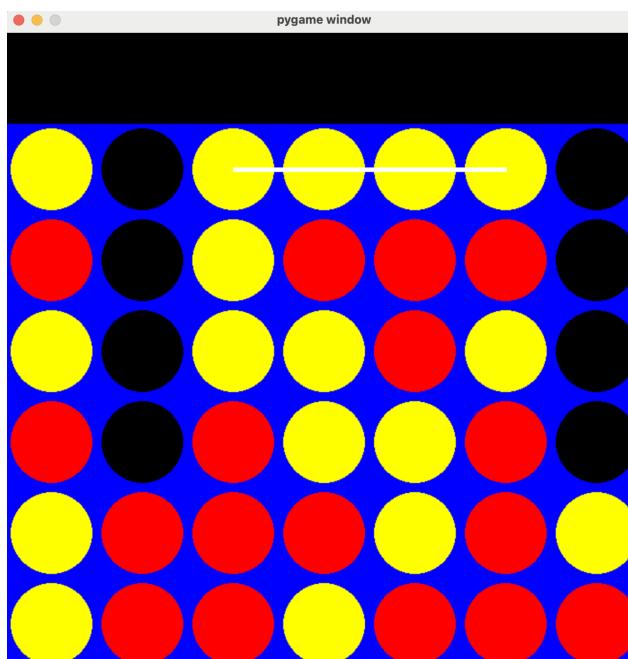
```
Player 2 has won
```

WON GAME FOURTEEN

GAME 15:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2
-visualize True -verbose True -seed 5
```



Terminal result:

`[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 0 0 0 0]]`

`[5, 5, 8, 10, 8, 5, 5]`

`[3] 10`

`[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 1 2 0 0 0]]`

`[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]]`

`[0 0 1 2 0 0 0]]`

`[10, 10, 13, 15, 13, 10, 10]`

`[3] 15`

`[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 0]]`

`[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]`

`[0 0 1 2 0 0 1]]`

`[15, 15, 18, 20, 18, 15, 15]`

`[3] 20`

`[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 1 2 0 0 1]]`

`[[0 0 0 0 0 0 0]]`

```
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 1]]
[20, 20, 23, 23, 23, 20, 20]
[2] 23
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 1]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[23, 23, 26, 26, 26, 23, 23]
[2] 26
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[1 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[26, -inf, 29, 29, 29, 26, 26]
[2] 29
[[0 0 0 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 0]
[1 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[[0 0 1 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 2 2 0 0 0]
```

```
[0 0 2 2 0 0 0]
[1 0 1 1 0 0 0]
[1 0 1 2 0 0 1]]
[29, -inf, -inf, 32, 32, 29, 29]
[3] 32
[[0 0 1 0 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 0 1 1 0 0 0]
 [1 0 1 2 0 0 1]]
[[0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 0 1 1 0 0 0]
 [1 0 1 2 0 0 1]]
[32, -inf, -inf, -inf, 35, 32, 32]
[4] 35
[[0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 0 1 1 0 0 0]
 [1 0 1 2 2 0 1]]
[[0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 0 1 1 1 0 0]
 [1 0 1 2 2 0 1]]
[35, -inf, -inf, -inf, 38, -inf, 35]
[4] 38
[[0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 2 0 0]
 [1 0 1 1 1 0 0]
 [1 0 1 2 2 0 1]]
[[0 0 1 1 0 0 0]
 [0 0 2 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 0 2 2 2 0 0]
 [1 0 1 1 1 0 0]
```

```
[1 0 1 2 2 0 1]]  
[38, -inf, -inf, -inf, -inf, -inf, -inf]  
[0] 38  
[[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[2 0 2 2 0 0 0]  
[1 0 2 2 2 0 0]  
[1 0 1 1 1 0 0]  
[1 0 1 2 2 0 1]]  
[[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[2 0 2 2 0 0 0]  
[1 0 2 2 2 0 0]  
[1 0 1 1 1 0 1]  
[1 0 1 2 2 0 1]]  
[38, -inf, -inf, -inf, 41, -inf, 38]  
[4] 41  
[[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[2 0 2 2 2 0 0]  
[1 0 2 2 2 0 0]  
[1 0 1 1 1 0 1]  
[1 0 1 2 2 0 1]]  
[[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[2 0 2 2 2 0 0]  
[1 0 2 2 2 0 1]  
[1 0 1 1 1 0 1]  
[1 0 1 2 2 0 1]]  
[-inf, -inf, -inf, -inf, -inf, -inf, 41]  
[6] 41  
[[0 0 1 1 0 0 0]  
[0 0 2 2 0 0 0]  
[2 0 2 2 2 0 2]  
[1 0 2 2 2 0 1]  
[1 0 1 1 1 0 1]  
[1 0 1 2 2 0 1]]  
[[0 0 1 1 0 0 0]  
[0 0 2 2 1 0 0]  
[2 0 2 2 2 0 2]  
[1 0 2 2 2 0 1]  
[1 0 1 1 1 0 1]  
[1 0 1 2 2 0 1]]  
[38, -inf, -inf, -inf, 41, -inf, 38]
```

```
[4] 41
[[0 0 1 1 2 0 0]
 [0 0 2 2 1 0 0]
 [2 0 2 2 2 0 2]
 [1 0 2 2 2 0 1]
 [1 0 1 1 1 0 1]
 [1 0 1 2 2 0 1]]
[[0 0 1 1 2 0 0]
 [0 0 2 2 1 0 1]
 [2 0 2 2 2 0 2]
 [1 0 2 2 2 0 1]
 [1 0 1 1 1 0 1]
 [1 0 1 2 2 0 1]]
[41, -inf, -inf, -inf, -inf, -inf, 41]
[0] 41
[[0 0 1 1 2 0 0]
 [2 0 2 2 1 0 1]
 [2 0 2 2 2 0 2]
 [1 0 2 2 2 0 1]
 [1 0 1 1 1 0 1]
 [1 0 1 2 2 0 1]]
[[0 0 1 1 2 0 1]
 [2 0 2 2 1 0 1]
 [2 0 2 2 2 0 2]
 [1 0 2 2 2 0 1]
 [1 0 1 1 1 0 1]
 [1 0 1 2 2 0 1]]
[41, -inf, -inf, -inf, -inf, -inf, -inf]
[0] 41
[[2 0 1 1 2 0 1]
 [2 0 2 2 1 0 1]
 [2 0 2 2 2 0 2]
 [1 0 2 2 2 0 1]
 [1 0 1 1 1 0 1]
 [1 0 1 2 2 0 1]]
[[2 0 1 1 2 0 1]
 [2 0 2 2 1 0 1]
 [2 0 2 2 2 0 2]
 [1 0 2 2 2 0 1]
 [1 0 1 1 1 0 1]
 [1 1 1 2 2 0 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[2 0 1 1 2 0 1]]
```

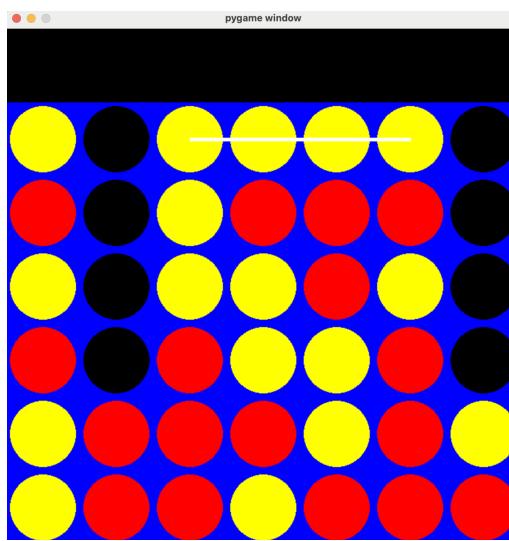
```
[2 0 2 2 1 0 1]
[2 0 2 2 2 0 2]
[1 0 2 2 2 0 1]
[1 2 1 1 1 0 1]
[1 1 1 2 2 0 1]]
[[2 0 1 1 2 0 1]
[2 0 2 2 1 0 1]
[2 0 2 2 2 0 2]
[1 0 2 2 2 0 1]
[1 2 1 1 1 0 1]
[1 1 1 2 2 1 1]]
[-inf, inf, -inf, -inf, -inf, inf, -inf]
[1] inf
[[2 0 1 1 2 0 1]
[2 0 2 2 1 0 1]
[2 0 2 2 2 0 2]
[1 2 2 2 2 0 1]
[1 2 1 1 1 0 1]
[1 1 1 2 2 1 1]]
Player 2 has won
```

WON GAME FIFTEEN

GAME 16:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2
-visualize True -verbose True -seed 6
```



Terminal result:

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 1 2 0 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 1 2 0 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]]
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
```

[0 0 0 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]]

[-inf, -inf, 23, -inf, -inf, -inf, -inf]

[2] 23

[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 1 0]]

[23, 23, 26, 26, 26, 23, 23]

[2] 26

[[0 0 0 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 0 0]
[0 0 1 2 0 1 0]]
[[0 0 0 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]

[26, 26, 29, 29, -inf, 26, 26]

[2] 29

[[0 0 2 0 0 0 0]
[0 0 2 0 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]
[[0 0 2 0 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]]

```
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]
[27, 27, -inf, 32, -inf, 27, 27]
[3] 32
[[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 0 0]
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]
[[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 2 0 0 0]
[0 0 1 2 0 1 0]
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]
[-inf, -inf, -inf, -inf, -inf, 32, -inf]
[5] 32
[[0 0 2 2 0 0 0]
[0 0 2 1 0 0 0]
[0 0 2 2 0 2 0]
[0 0 1 2 0 1 0]
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]
[[0 0 2 2 0 0 0]
[0 0 2 1 0 1 0]
[0 0 2 2 0 2 0]
[0 0 1 2 0 1 0]
[0 0 1 1 0 1 0]
[0 0 1 2 0 1 0]]
[32, 32, -inf, -inf, -inf, 32, 32]
[0] 32
[[0 0 2 2 0 0 0]
[0 0 2 1 0 1 0]
[0 0 2 2 0 2 0]
[0 0 1 2 0 1 0]
[0 0 1 1 0 1 0]
[2 0 1 2 0 1 0]]
[[0 0 2 2 0 0 0]
[0 0 2 1 0 1 0]
[0 0 2 2 0 2 0]
[0 0 1 2 0 1 0]
[1 0 1 1 0 1 0]
[2 0 1 2 0 1 0]]
```

[32, -inf, -inf, -inf, -inf, 32, 32]

[0] 32

[[0 0 2 2 0 0 0]

[0 0 2 1 0 1 0]

[0 0 2 2 0 2 0]

[2 0 1 2 0 1 0]

[1 0 1 1 0 1 0]

[2 0 1 2 0 1 0]]

[[0 0 2 2 0 0 0]

[0 0 2 1 0 1 0]

[1 0 2 2 0 2 0]

[2 0 1 2 0 1 0]

[1 0 1 1 0 1 0]

[2 0 1 2 0 1 0]]

[32, -inf, -inf, -inf, -inf, 32, 32]

[0] 32

[[0 0 2 2 0 0 0]

[2 0 2 1 0 1 0]

[1 0 2 2 0 2 0]

[2 0 1 2 0 1 0]

[1 0 1 1 0 1 0]

[2 0 1 2 0 1 0]]

[[0 0 2 2 0 1 0]

[2 0 2 1 0 1 0]

[1 0 2 2 0 2 0]

[2 0 1 2 0 1 0]

[1 0 1 1 0 1 0]

[2 0 1 2 0 1 0]]

[32, -inf, -inf, -inf, -inf, -inf, 32]

[0] 32

[[2 0 2 2 0 1 0]

[2 0 2 1 0 1 0]

[1 0 2 2 0 2 0]

[2 0 1 2 0 1 0]

[1 0 1 1 0 1 0]

[2 0 1 2 0 1 0]]

[[2 0 2 2 0 1 0]

[2 0 2 1 0 1 0]

[1 0 2 2 0 2 0]

[2 0 1 2 0 1 0]

[1 0 1 1 0 1 0]

[2 0 1 2 0 1 1]]

[-inf, -inf, -inf, -inf, -inf, -inf, 32]

[6] 32

```
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]
 [1 0 2 2 0 2 0]
 [2 0 1 2 0 1 0]
 [1 0 1 1 0 1 2]
 [2 0 1 2 0 1 1]]
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]
 [1 0 2 2 0 2 0]
 [2 0 1 2 0 1 1]
 [1 0 1 1 0 1 2]
 [2 0 1 2 0 1 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 32]
[6] 32
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]
 [1 0 2 2 0 2 2]
 [2 0 1 2 0 1 1]
 [1 0 1 1 0 1 2]
 [2 0 1 2 0 1 1]]
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]
 [1 0 2 2 0 2 2]
 [2 0 1 2 0 1 1]
 [1 0 1 1 0 1 2]
 [2 0 1 2 1 1 1]]
[-inf, -inf, -inf, -inf, 35, -inf, -inf]
[4] 35
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]
 [1 0 2 2 0 2 2]
 [2 0 1 2 0 1 1]
 [1 0 1 1 2 1 2]
 [2 0 1 2 1 1 1]]
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]
 [1 0 2 2 0 2 2]
 [2 0 1 2 0 1 1]
 [1 0 1 1 2 1 2]
 [2 1 1 2 1 1 1]]
[-inf, 35, -inf, -inf, -inf, -inf, -inf]
[1] 35
[[2 0 2 2 0 1 0]
 [2 0 2 1 0 1 0]]
```

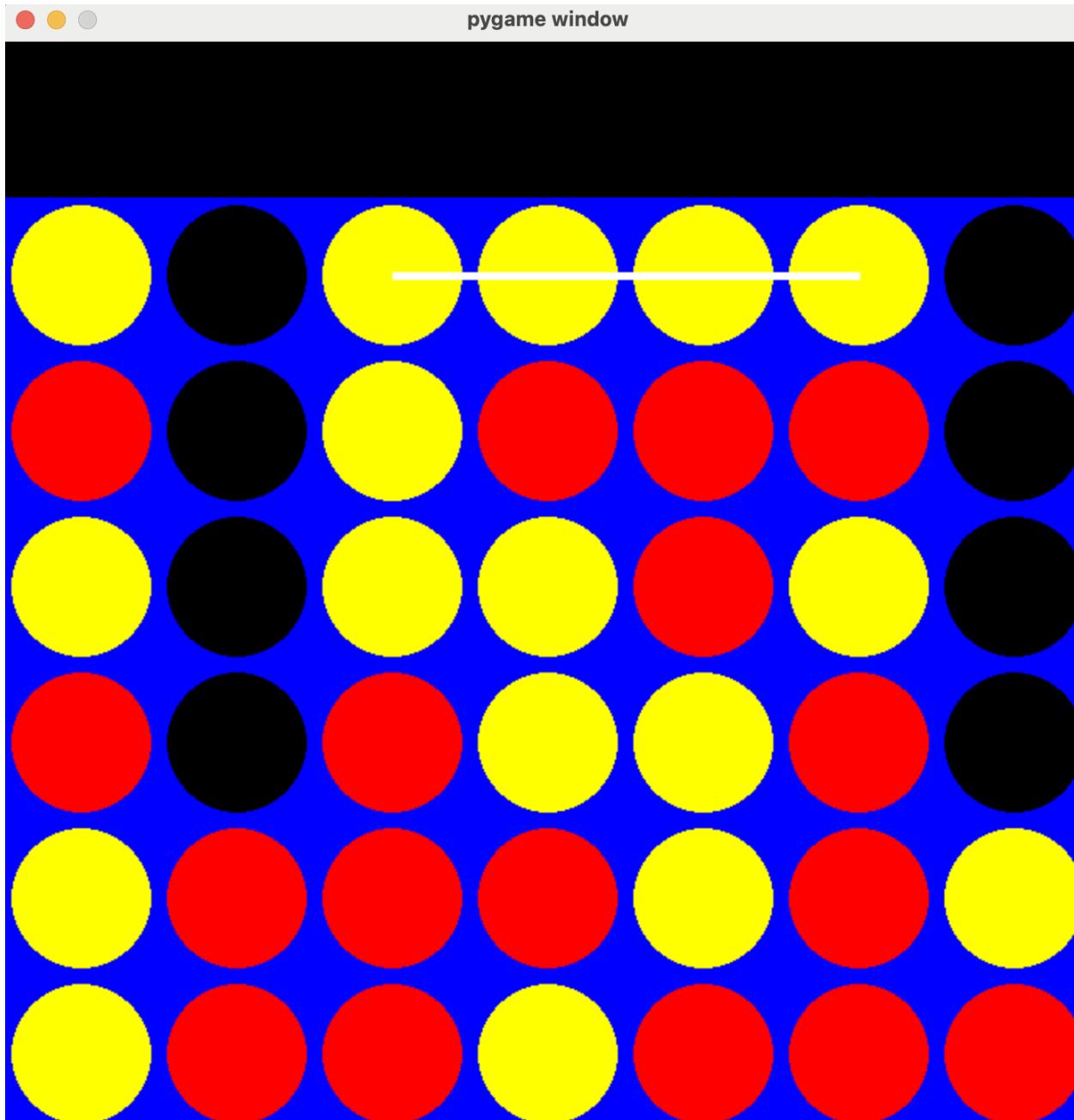
```
[1 0 2 2 0 2 2]
[2 0 1 2 0 1 1]
[1 2 1 1 2 1 2]
[2 1 1 2 1 1 1]]
[[2 0 2 2 0 1 0]
[2 0 2 1 0 1 1]
[1 0 2 2 0 2 2]
[2 0 1 2 0 1 1]
[1 2 1 1 2 1 2]
[2 1 1 2 1 1 1]]
[-inf, -inf, -inf, -inf, 38, -inf, inf]
[6] inf
[[2 0 2 2 0 1 2]
[2 0 2 1 0 1 1]
[1 0 2 2 0 2 2]
[2 0 1 2 0 1 1]
[1 2 1 1 2 1 2]
[2 1 1 2 1 1 1]]
[[2 0 2 2 0 1 2]
[2 0 2 1 0 1 1]
[1 0 2 2 0 2 2]
[2 1 1 2 0 1 1]
[1 2 1 1 2 1 2]
[2 1 1 2 1 1 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[2 0 2 2 0 1 2]
[2 0 2 1 0 1 1]
[1 2 2 2 0 2 2]
[2 1 1 2 0 1 1]
[1 2 1 1 2 1 2]
[2 1 1 2 1 1 1]]
Player 2 has won
```

WON GAME SIXTEEN

GAME 17:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 7
```



Terminal result:

```
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [1 0 0 1 0 0 0]]
[15, 15, 18, 18, 18, 15, 15]
[2] 18
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [1 0 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 1 2 0 0 0]
 [1 0 2 1 0 0 0]]
```

[18, 18, 21, 21, 21, 18, 18]

[2] 21

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 0]

[1 0 2 1 0 0 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 0]

[1 0 2 1 0 1 0]]

[21, 21, 24, 24, 24, 21, 21]

[2] 24

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 0]

[1 0 2 1 0 1 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 0]

[1 0 2 1 0 1 1]]

[-inf, -inf, -inf, -inf, 27, -inf, -inf]

[4] 27

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 0]

[1 0 2 1 2 1 1]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 2 2 0 0 0]

[0 0 2 1 0 0 0]

[0 0 1 2 0 0 1]

[1 0 2 1 2 1 1]]

[27, 27, 30, 30, 30, 27, 27]

[2] 30

```
[[0 0 0 0 0 0]
 [0 0 2 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 2 1]]
[[0 0 1 0 0 0]
 [0 0 2 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 2 1]]
[30, 30, -inf, 33, 33, 30, 30]
[3] 33
[[0 0 1 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 2 1]]
[[0 0 1 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 2 0 0]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 2 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 33]
[6] 33
[[0 0 1 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 2 0 2]
 [0 0 2 1 0 0]
 [0 0 1 2 0 0]
 [1 0 2 1 2 1]]
[[0 0 1 0 0 0]
 [0 0 2 2 0 0]
 [0 0 2 2 0 2]
 [0 0 2 1 0 0]
 [0 0 1 2 0 1]
 [1 0 2 1 2 1]]
[33, 33, -inf, 38, 36, 33, 33]
[3] 38
[[0 0 1 2 0 0]
 [0 0 2 2 0 0]]
```

```
[0 0 2 2 0 0 2]
[0 0 2 1 0 0 1]
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 0 2]
[0 0 2 1 0 1 1]
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, 38, -inf]
[5] 38
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 2 2]
[0 0 2 1 0 1 1]
[0 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 2 2]
[0 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[0 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[0 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[38, 38, -inf, -inf, -inf, 38, 38]
[0] 38
[[0 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
```

```
[1 0 1 2 0 1 1]
[1 0 2 1 2 1 1]]
[[0 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[38, -inf, -inf, -inf, -inf, 38, 38]
[0] 38
[[2 0 1 2 0 0 0]
[2 0 2 2 0 0 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[[2 0 1 2 0 0 0]
[2 0 2 2 0 1 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, 38, 38]
[5] 38
[[2 0 1 2 0 2 0]
[2 0 2 2 0 1 0]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[[2 0 1 2 0 2 0]
[2 0 2 2 0 1 1]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
[-inf, -inf, -inf, -inf, -inf, -inf, 38]
[6] 38
[[2 0 1 2 0 2 2]
[2 0 2 2 0 1 1]
[1 0 2 2 0 2 2]
[2 0 2 1 0 1 1]
[1 0 1 2 0 1 1]
[1 1 2 1 2 1 1]]
```

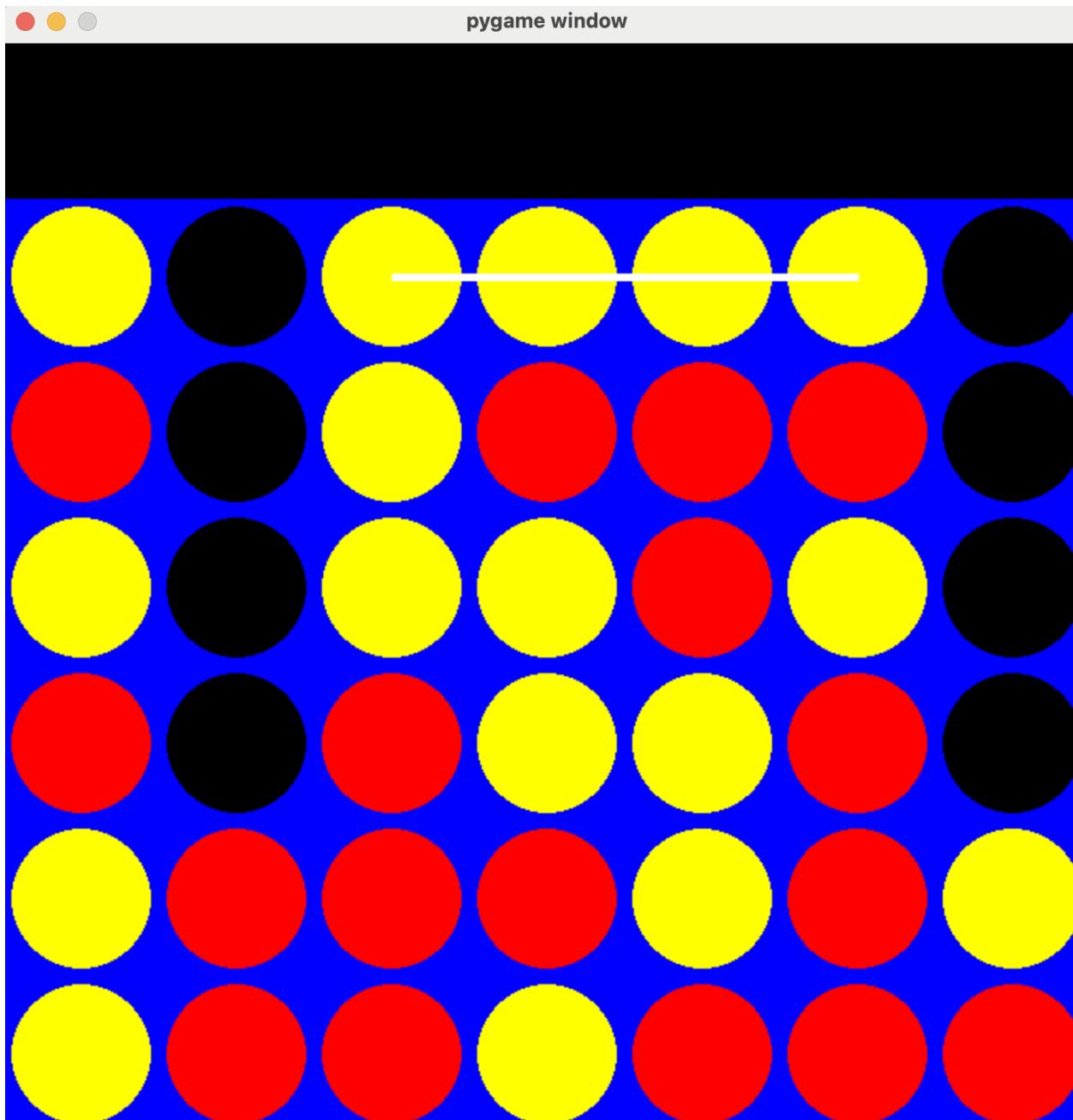
```
[[2 0 1 2 0 2 2]
 [2 0 2 2 0 1 1]
 [1 0 2 2 0 2 2]
 [2 0 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[2 0 1 2 0 2 2]
 [2 0 2 2 0 1 1]
 [1 0 2 2 0 2 2]
 [2 2 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[[2 0 1 2 0 2 2]
 [2 0 2 2 0 1 1]
 [1 1 2 2 0 2 2]
 [2 2 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[2 0 1 2 0 2 2]
 [2 2 2 2 0 1 1]
 [1 1 2 2 0 2 2]
 [2 2 2 1 0 1 1]
 [1 1 1 2 0 1 1]
 [1 1 2 1 2 1 1]]
Player 2 has won
```

WON GAME SEVENTEEN

GAME 18:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 8
```



Terminal result:

```
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[1 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[1 1 0 1 0 0 0]]
[-inf, -inf, 18, -inf, -inf, -inf, -inf]
[2] 18
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[1 1 2 1 0 0 0]]
[[0 0 0 0 0 0 0]
[0 0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
```

```
[1 1 2 1 0 0 0]]  
[18, 18, 21, 21, 21, 18, 18]  
[2] 21  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 0 2 2 0 0 0]  
[1 1 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 0 2 0 0 0]  
[0 1 2 2 0 0 0]  
[1 1 2 1 0 0 0]]  
[-inf, -inf, 24, -inf, -inf, -inf, -inf]  
[2] 24  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 0 2 2 0 0 0]  
[0 1 2 2 0 0 0]  
[1 1 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 0 0 1 0 0 0]  
[0 1 2 2 0 0 0]  
[0 1 2 2 0 0 0]  
[1 1 2 1 0 0 0]]  
[-inf, inf, inf, -inf, -inf, -inf, -inf]  
[1] inf  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 2 0 1 0 0 0]  
[0 1 2 2 0 0 0]  
[0 1 2 2 0 0 0]  
[1 1 2 1 0 0 0]]  
[[0 0 0 0 0 0 0]  
[0 0 0 0 0 0 0]  
[0 2 1 1 0 0 0]  
[0 1 2 2 0 0 0]  
[0 1 2 2 0 0 0]  
[1 1 2 1 0 0 0]]  
[24, 24, 27, 29, inf, 24, 24]
```

```
[4] inf
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 2 1 0 0 0]
 [0 1 2 2 0 0 0]
 [0 1 2 2 0 0 0]
 [1 1 2 1 2 0 0]]
```

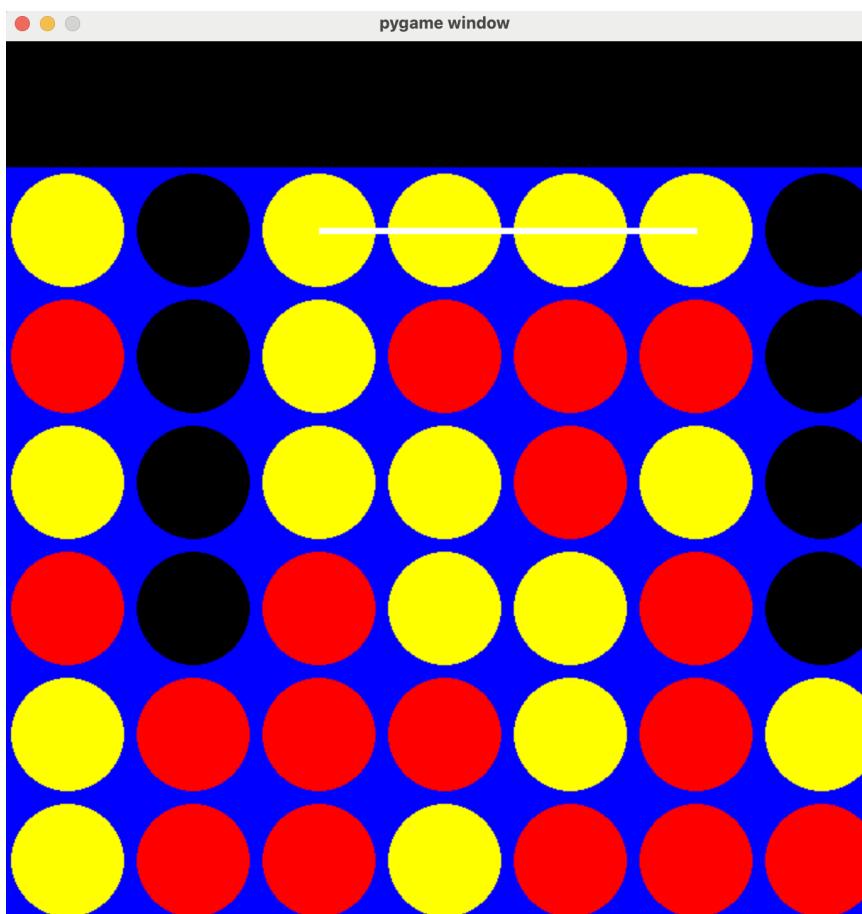
Player 2 has won

WON GAME EIGHTEEN

GAME 19:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2
-visualize True -verbose True -seed 9
```



Terminal result:

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 1 0 0 0]]
```

```
[5, 5, 8, 10, 8, 5, 5]
```

```
[3] 10
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [1 0 0 1 0 0 0]]
```

```
[10, 10, 13, 15, 13, 10, 10]
```

```
[3] 15
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [1 0 0 1 0 0 0]]
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [1 0 1 1 0 0 0]]
```

```
[-inf, 15, -inf, -inf, -inf, -inf, -inf]
```

```
[1] 15
```

```
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [1 2 1 1 0 0 0]]
```

```
[[0 0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 0]
[1 2 1 1 0 0 0]]
[15, 15, 18, 20, 18, 15, 15]
[3] 20
[[0 0 0 0 0 0]
[0 0 0 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 0]
[1 2 1 1 0 0 0]]
[[0 0 0 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 0]
[1 2 1 1 0 0 0]]
[18, 18, 21, 23, 21, 18, 18]
[3] 23
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 0]
[1 2 1 1 0 0 0]]
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 0]
[1 2 1 1 0 1 0]]
[-inf, -inf, -inf, -inf, 26, -inf, -inf]
[4] 26
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]
[0 0 0 2 0 0 0]
[0 1 0 2 0 0 0]
[1 2 1 1 2 1 0]]
[[0 0 0 2 0 0 0]
[0 0 0 1 0 0 0]
[0 0 0 2 0 0 0]]
```

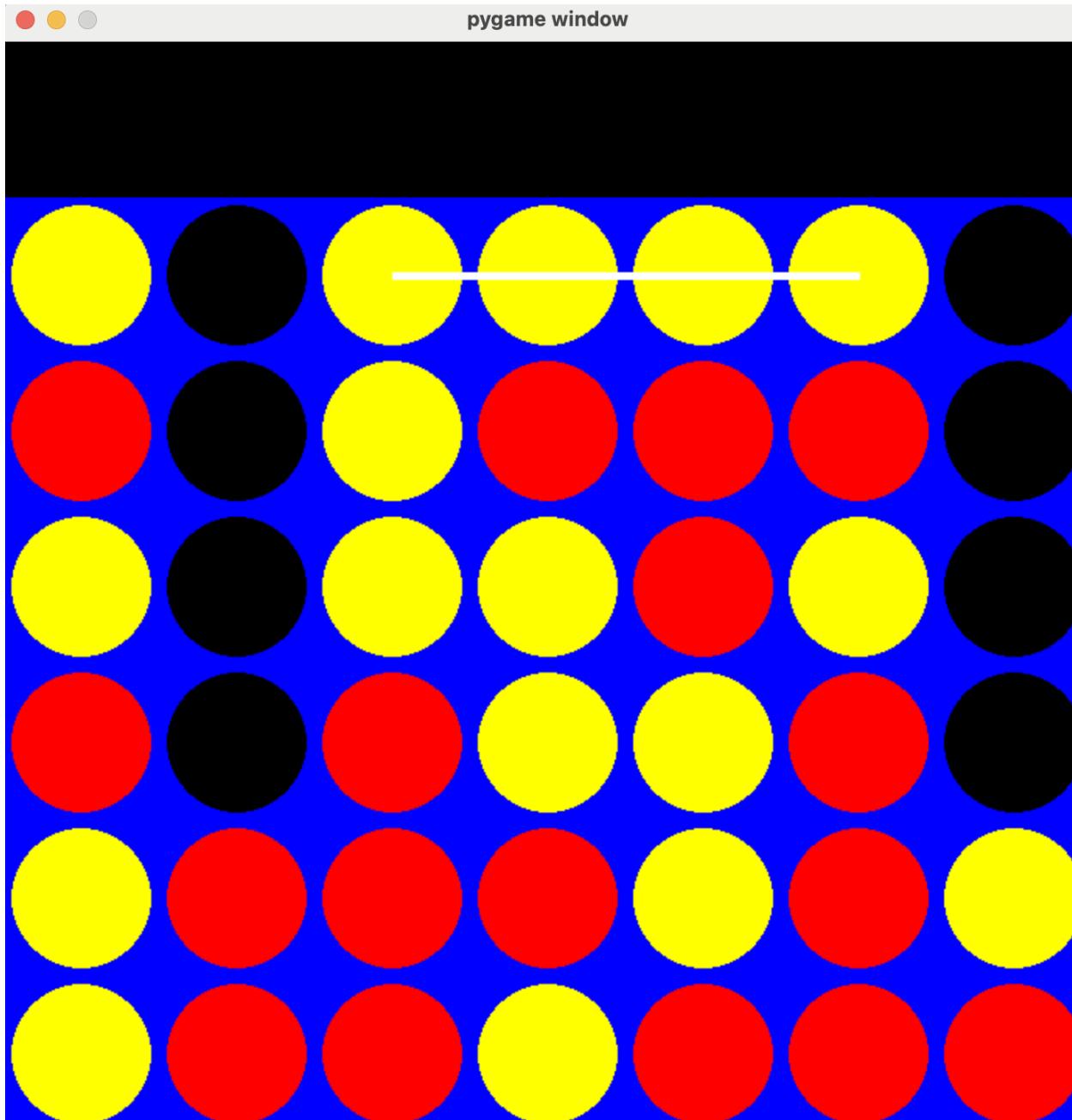
```
[0 0 0 2 0 0 0]
[0 1 1 2 0 0 0]
[1 2 1 1 2 1 0]]
[26, 26, 29, -inf, 29, 26, 26]
[2] 29
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 2 2 0 0 0]
 [0 1 1 2 0 0 0]
 [1 2 1 1 2 1 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 2 2 0 0 0]
 [1 1 1 2 0 0 0]
 [1 2 1 1 2 1 0]]
[inf, inf, 32, -inf, 32, 29, 29]
[0] inf
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [2 0 2 2 0 0 0]
 [1 1 1 2 0 0 0]
 [1 2 1 1 2 1 0]]
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 0 0 2 0 0 0]
 [2 1 2 2 0 0 0]
 [1 1 1 2 0 0 0]
 [1 2 1 1 2 1 0]]
[-inf, inf, -inf, -inf, -inf, -inf, -inf]
[1] inf
[[0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]
 [0 2 0 2 0 0 0]
 [2 1 2 2 0 0 0]
 [1 1 1 2 0 0 0]
 [1 2 1 1 2 1 0]]
Player 2 has won
```

WON GAME NINETEEN

GAME 20:

Terminal command:

```
python3 main.py -p1 monteCarloAI -p2 alphaBetaAI -limit_players 1,2  
-visualize True -verbose True -seed 10
```



Terminal result:

```
[[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]  
[0 0 0 0 0 0]]
```

```
[0 0 0 0 0 0]
[0 0 0 1 0 0 0]]
[5, 5, 8, 10, 8, 5, 5]
[3] 10
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]]
[10, 10, 13, 15, 13, 10, 10]
[3] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 1 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [1 0 1 1 0 0 0]]
[-inf, 15, -inf, -inf, -inf, -inf, -inf]
[1] 15
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [1 2 1 1 0 0 0]]
[[0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0]
 [0 0 0 2 0 0 0]
 [0 0 0 2 0 0 0]
 [1 2 1 1 0 1 0]]
```

[-inf, -inf, -inf, -inf, 18, -inf, -inf]

[4] 18

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 0 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 2 1 1 2 1 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 0 2 0 0 0]

[1 2 1 1 2 1 0]]

[18, 18, 21, 21, 21, 18, 18]

[2] 21

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 1 0 0 0]

[0 0 0 2 0 0 0]

[0 0 2 2 0 0 0]

[1 2 1 1 2 1 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 1 0 0 0]

[0 0 1 2 0 0 0]

[0 0 2 2 0 0 0]

[1 2 1 1 2 1 0]]

[-inf, inf, -inf, -inf, -inf, -inf, -inf]

[1] inf

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 0 1 0 0 0]

[0 0 1 2 0 0 0]

[0 2 2 2 0 0 0]

[1 2 1 1 2 1 0]]

[[0 0 0 0 0 0 0]]

[0 0 0 0 0 0 0]

[0 0 1 1 0 0 0]

[0 0 1 2 0 0 0]

[0 2 2 2 0 0 0]

[1 2 1 1 2 1 0]]

[inf, inf, inf, inf, inf, inf, inf]

[0] inf

```
[[0 0 0 0 0 0]
 [0 0 0 0 0 0]
 [0 0 1 1 0 0 0]
 [0 0 1 2 0 0 0]
 [2 2 2 2 0 0 0]
 [1 2 1 1 2 1 0]]
```

Player 2 has won

WON GAME TWENTY

Successfully won all 20 games against monteCarloAI with alphaBetaAI