



## Faculty of Engineering and Technology

### Computer Science Department

#### COMP338 – ARTIFICIAL INTELLIGENCE

	Students Name	Students Number
1	Yousef Sharbi	1202057
2	Anas karakra	1200467

### Project 2 : Solving Problem by Minimax (Tic Tac Toe)

## background on the minimax algorithm and how to construct a game tree?

- **Minimax Algorithm:**

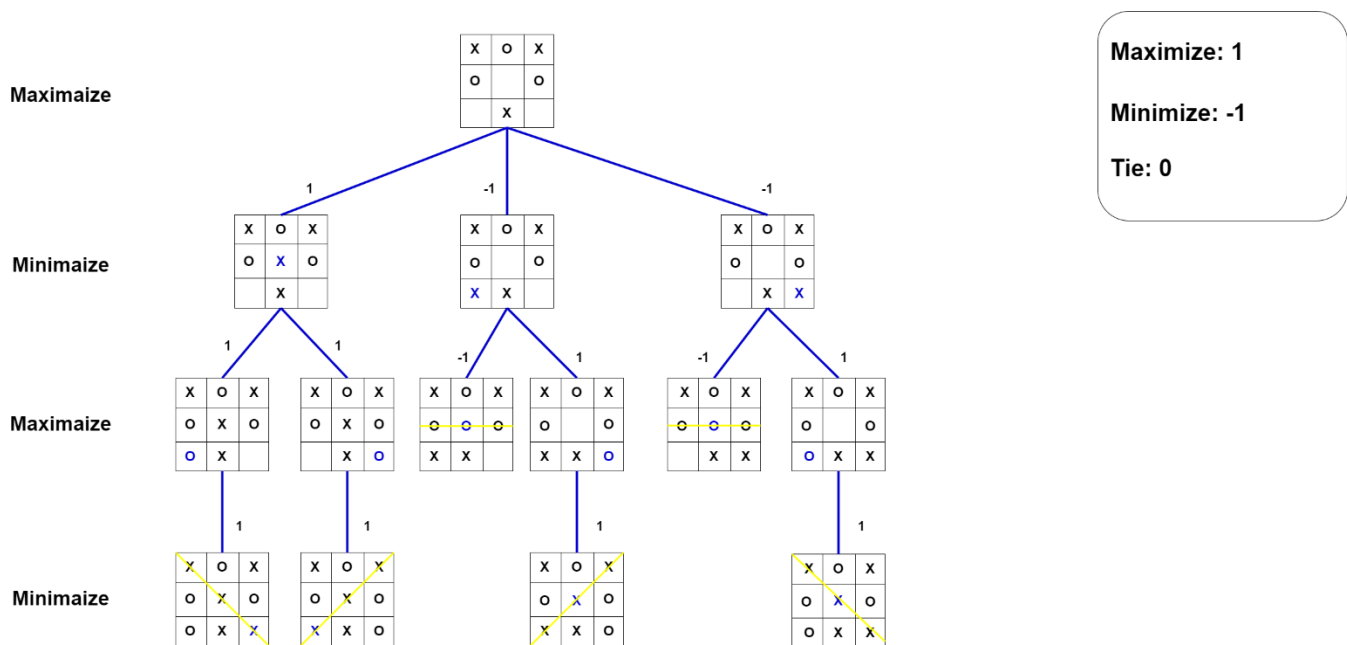
The minimax algorithm is a recursive or backtracking algorithm uses recursion to search through the game-tree, it's commonly used in two-player turn-based games to determine the optimal move for a player. It used in games like chess, tic-tac-toe and other games. It helps a player make the best moves by thinking ahead and considering what the opponent might do. this algorithm have two players play the game, one is called MAX and other is called MIN, and each one trying to get the most points or benefits for themselves and also trying to minimize the other's gains. The algorithm explores the game step by step, thinking about all possible moves and outcomes. It's like a smart player that looks at the whole game and decides on the best move by considering both winning and losing possibilities.

The minimax algorithm constructs a game tree to analyze potential moves. Each node in the tree represents a game state, with players MAX and MIN taking turns. The root node reflects the current state, and subsequent nodes represent possible moves and their outcomes. Players alternate at each level, and terminal nodes evaluate the game's end, assigning scores based on a heuristic function. The algorithm explores the tree recursively, considering all possible moves and outcomes, ultimately aiding the player in deciding the best move by weighing potential gains and losses.

## Explains the Tic-Tac-Toe game and its rule?

Tic-tac-toe is a classic two-player game played on a 3x3 grid. The objective is for each player, alternately marking squares with their respective symbols (X or O), to form a line of three of their symbols either horizontally, vertically, or diagonally. Players take turns strategically placing their marks in an attempt to block their opponent and create a winning line. If the entire grid is filled without a winner, the game ends in a draw.

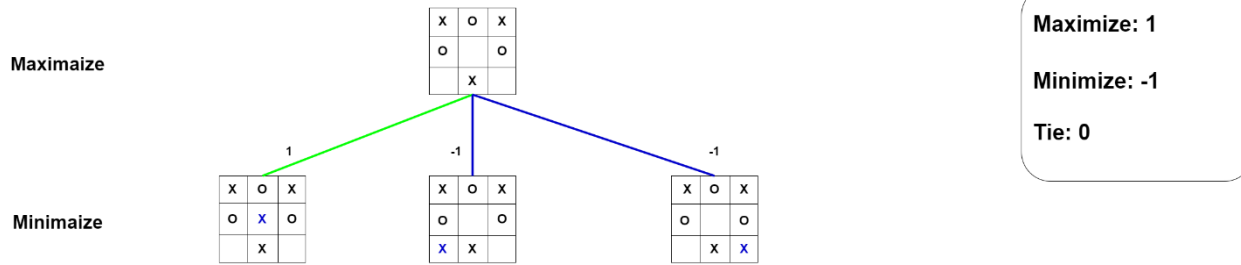
## Drawing the Tic-Tac-Toe game Tree as a AI start:



Made By: Yousef Sharbi  
Anas Karakra

The Ai is a Maximize and the Human is a Minimize in this game, and in the case that shown in the tree, the Ai will create all possible game with what human will chose and according to it will continue create possible till the game end and will return recursively with the result of this move and according to previous moves it will choose the max result to AI and the minimum result to human till raise up to root to make the best descion.

So now in this case the Ai will choose this path cause it return the max result:



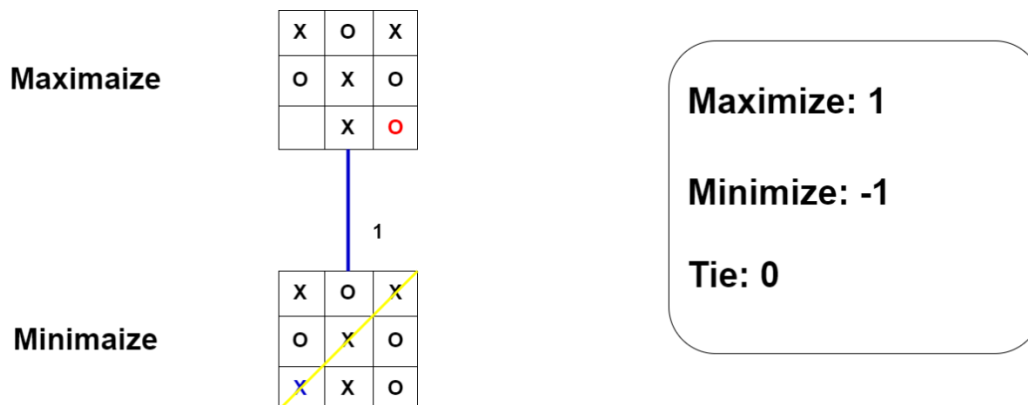
And it will repeat every step (create new tree) till the game end.

Suppose the human play here:



Then the AI will **Win**.

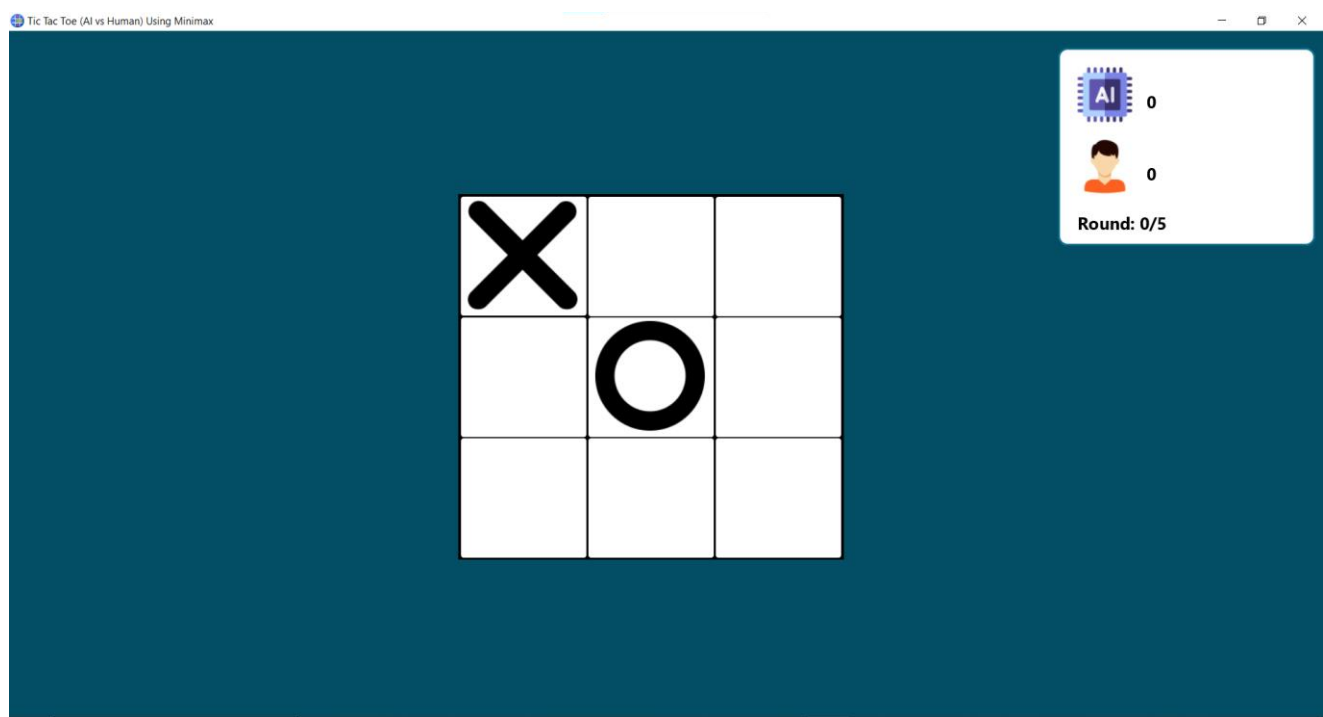
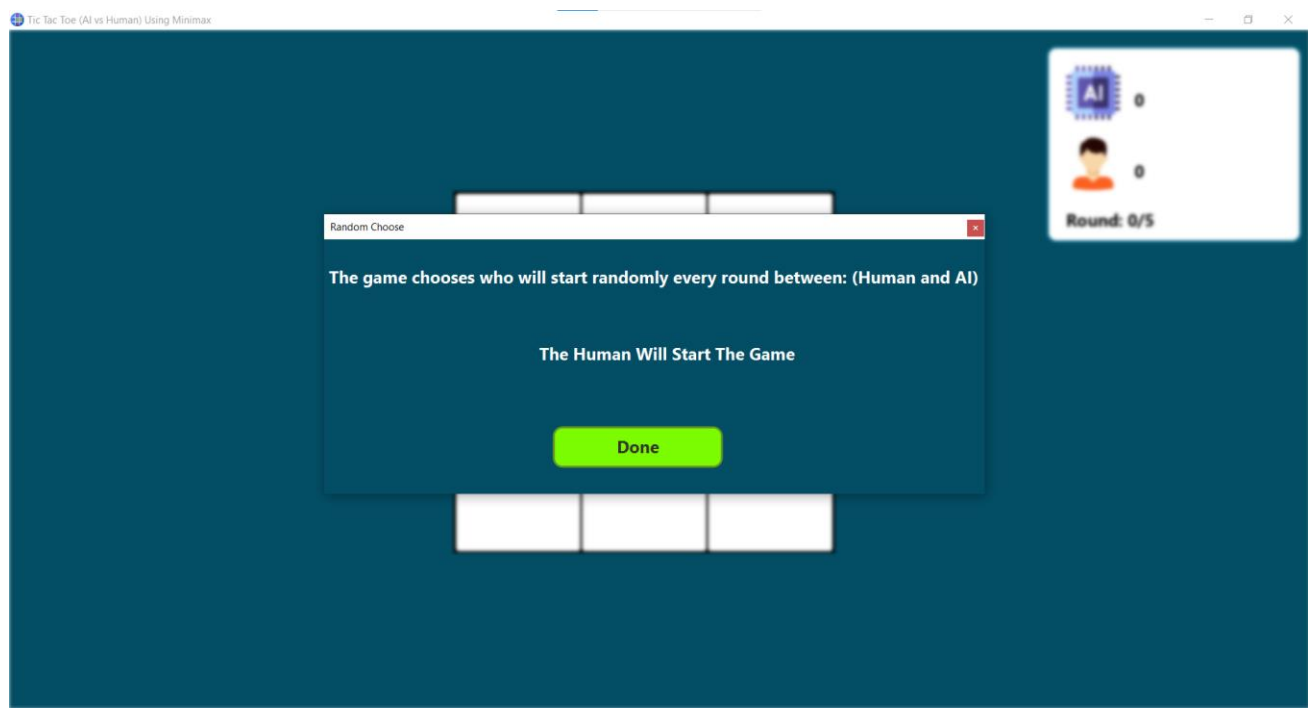
Or the human play here:

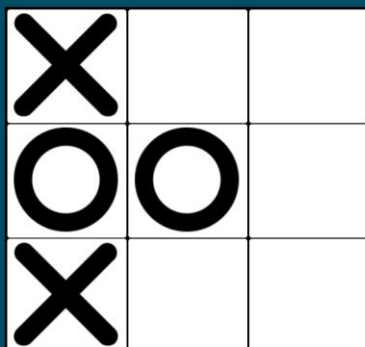



Then also the AI will **Win**.


Screen shot of our work:

- Human Turn:

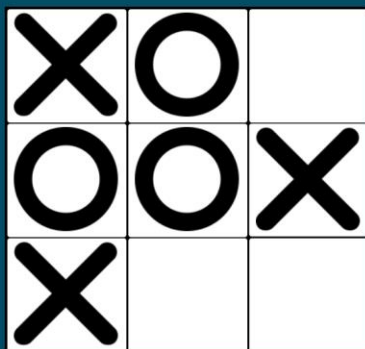






 0

 0

Round: 0/5



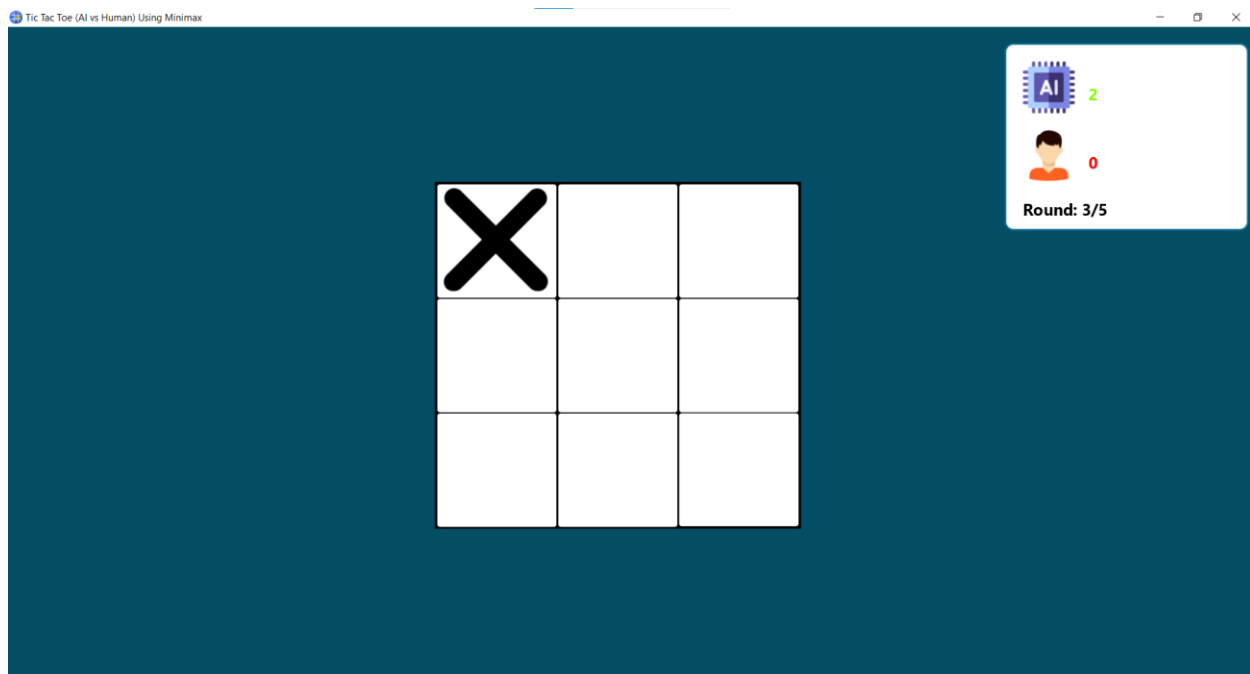
 0

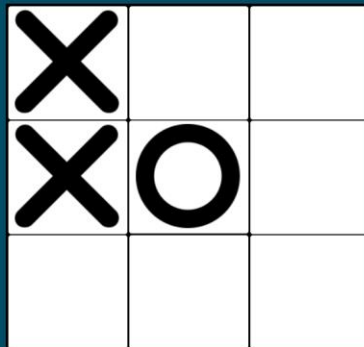
 0

Round: 0/5

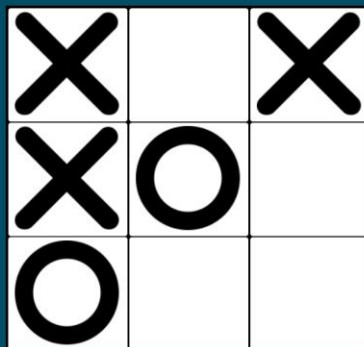


- **AI Turn:**

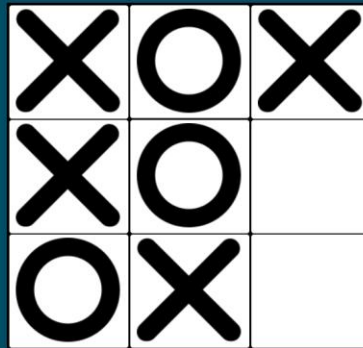




AI 2  
Human 0  
Round: 3/5



AI 2  
Human 0  
Round: 3/5

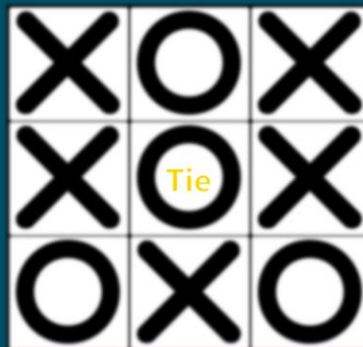


2



0

Round: 3/5



2

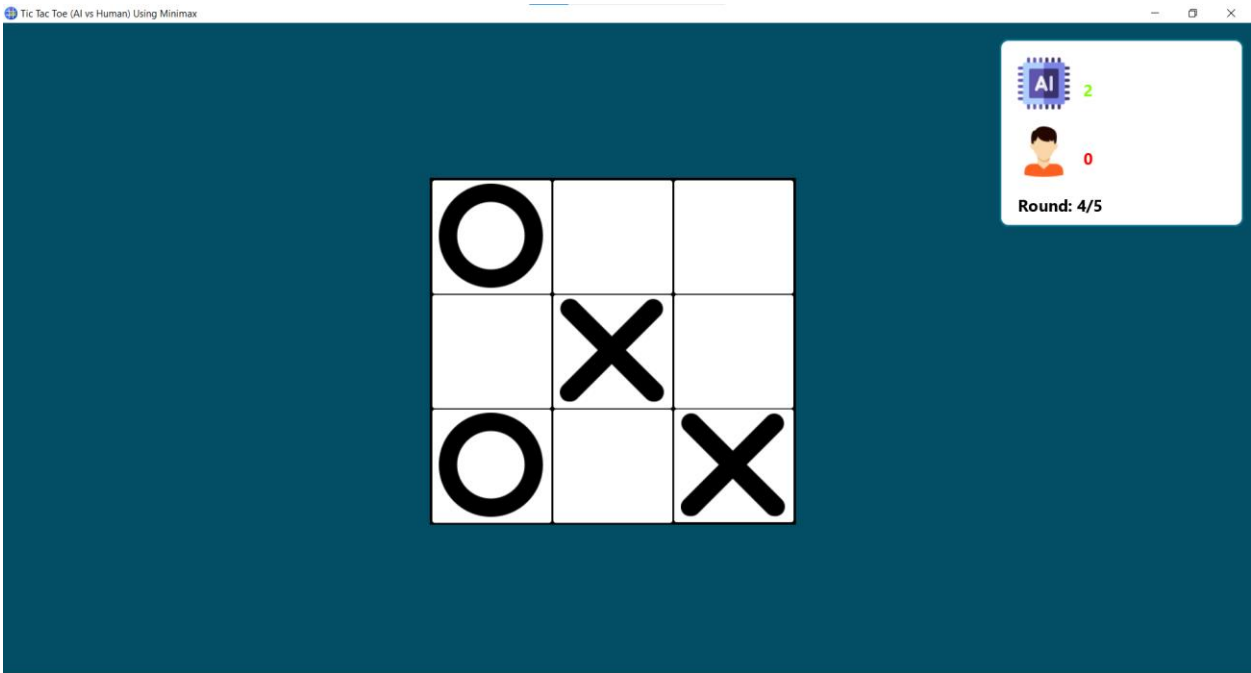
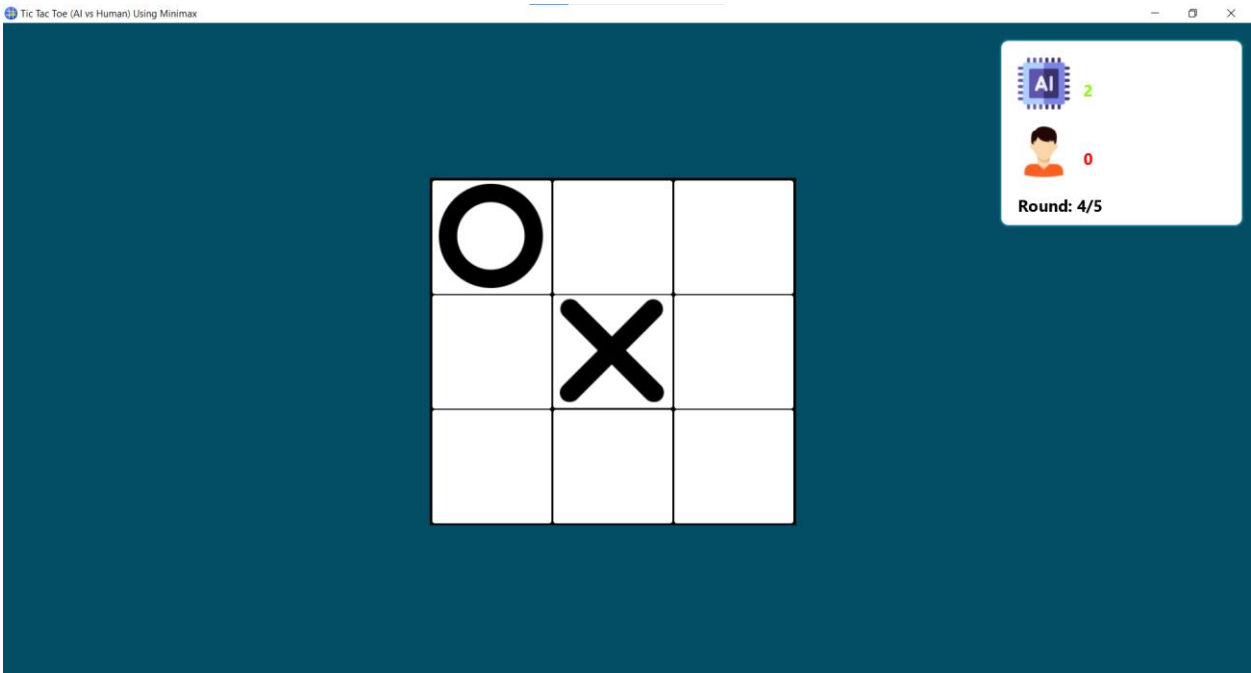


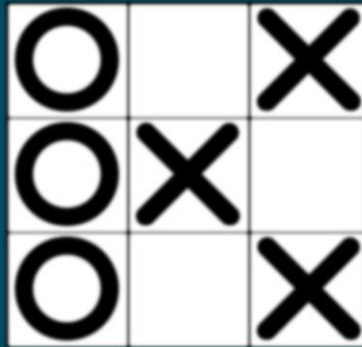
0

Round: 4/5



- Human Turn:





Game Over

The Game Result:



3



0

Restart Game