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**MASTER'S INTELLIGENT SYSTEMS ENGINEERING**

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**ARTIFICIAL INTELLIGENCE**

**REPORT**

**TIC TAC TOE GAME IMPLEMENTATION**

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**PYTHON GAME IMPLEMENTATION USING MIN-MAX ALGORITHM**

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## KEY WORDS :

XO , XO XO , TIC-TAC-TOE , USER-VS-MACHINE , PYTHON ,MINMAX ALGORITHM , TKINTER

## 1. Introduction

The Tic Tac Toe project is a Python implementation of the classic game using the Tkinter library for the graphical user interface. The primary goal was to create a functional game with a player-vs-Computer mode, featuring a basic AI like opponent that makes optimal moves using the minimax algorithm.

## 2. Project Overview

The project consists of a graphical user interface (GUI) built with Tkinter, a TicTacToe class to manage the game state, and a computer opponent capable of playing against the player. The game allows the player to choose their symbol (X or O) and features a reset button for restarting the game.

## 3. Implementation Details

### 3.1. 'TicTacToe' Class

The heart of the game is the `TicTacToe` class, which maintains the game state and logic. Here's an excerpt:

```
class TicTacToe:
    def __init__(self, player_symbol):
        # Initialization of the game board, current player, and game-over status
        # ...

    def apply_move(self, move):
        # Method to apply a move to the game board
        # ...

    def toggle_player(self):
        # Method to toggle the current player
        # ...

    def minimax(self, depth, maximizing_player):
        # Minimax algorithm for move calculations
        # ...
```

### 3.2 GUI Setup

The graphical user interface is set up using Tkinter. Here's a snippet showcasing the GUI layout:

```
def choose_symbol():
    # Method to choose the player's symbol , taking X as default
    # ...

def set_player_symbol():
    # Method to set the player's symbol
```

```

# ...
# Styling the radiobuttons for symbol choice
# GUI Setup
app = tk.Tk()
# Setting app title and configuration
# ...
game = TicTacToe(X)
# Create GUI labels for the Tic Tac Toe board and associate them with the
player_move function and adding buttons

```

### 3.3. Game Logic

#### a. The Player

Player moves are handled through the `player_move` function, which applies the move, updates the GUI labels, and checks for a winner or a tie.

```

def player_move(move):
    game.apply_move(move)
    update_board_labels()

    # Check for game outcome
    if game.is_winner():
        # Display winner/loser message and reset the game
        # ...
    elif game.is_board_full():
        # Display tie message and reset the game
        # ...
    else:
        # Computer makes a move
        make_computer_move(game)
        update_board_labels()
        # Check for game outcome after move
        # ...

```

#### b. The computer

```

def minimax(self, depth, maximizing_player):
    # Minimax algorithm implementation
    # ...
def make_computer_move(game):
    # AI move using minimax algorithm

```

## 4. Usage

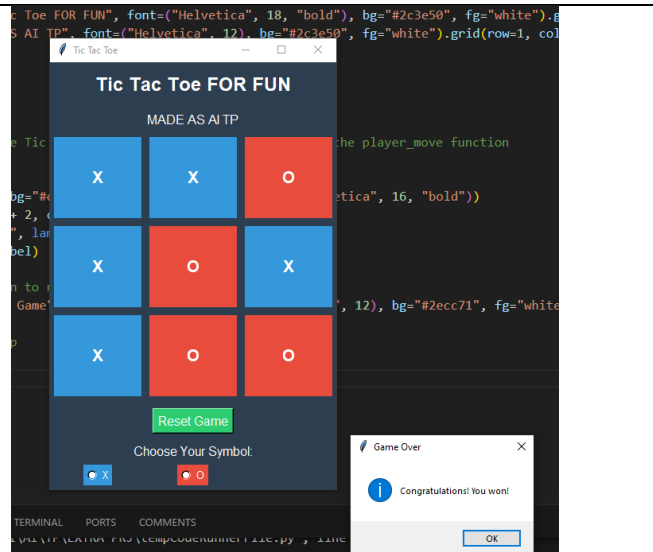
To use the TIC-TAC-TOE game :

- Clone the repository to your local machine.
- Open the project on VSC (for example) .
- Run the game : **python XOXO.py**

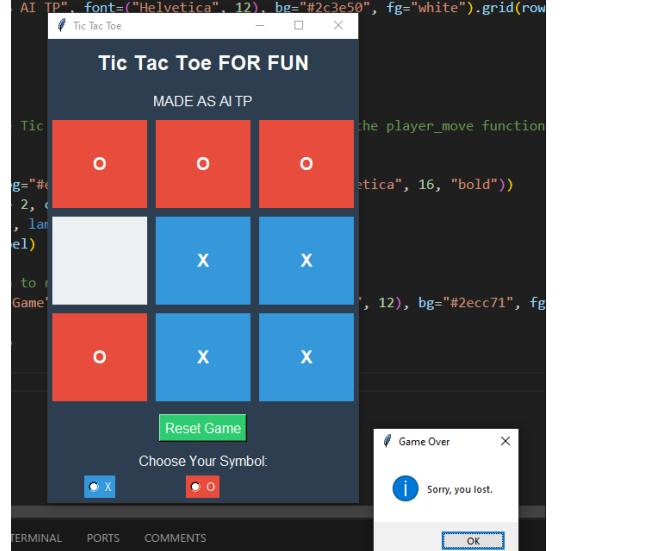
## 5. GUI example

Example of the User Interface Implimentd :

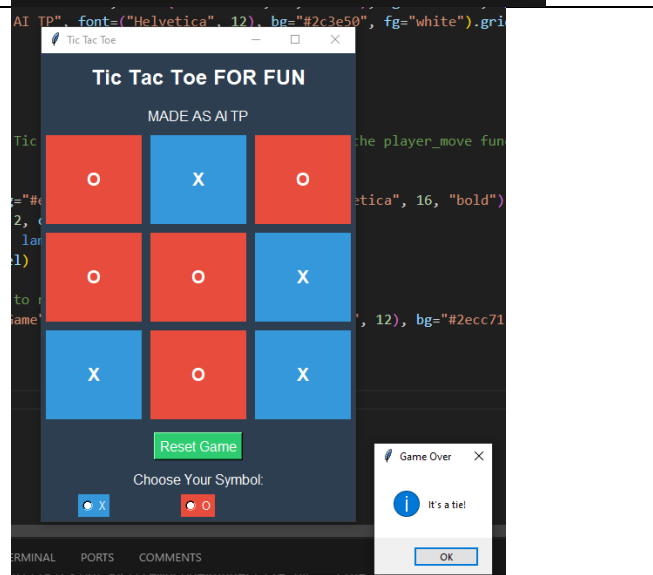
The Player Wins



The Player Loses



A Tie



## 6. Future Considerations

While the project meets its current goals, there are opportunities for improvement. Future enhancements could include

- Saving the player's score , which might help refine the algorithm,
- Adding additional features,
- Improving the overall user interface for a more polished gaming experience..

## 7. Conclusion

In conclusion, the Tic Tac Toe project successfully implements a functional game with a player-vs-Computer mode. The use of the minimax algorithm adds a challenging opponent. The GUI provides a user-friendly experience, allowing players to enjoy the classic game with an intuitive interface.