Project 1
Simple strategies for turn based games

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Overview

- Probabilistic Strategy for Tic-Tac-Toe.
- Heuristic Strategy for Tic-Tac-Toe.
- Game Mechanics of Connect 4.
- GUI for Connect 4.

Tic Tac Toe:Probabilistic Strategy

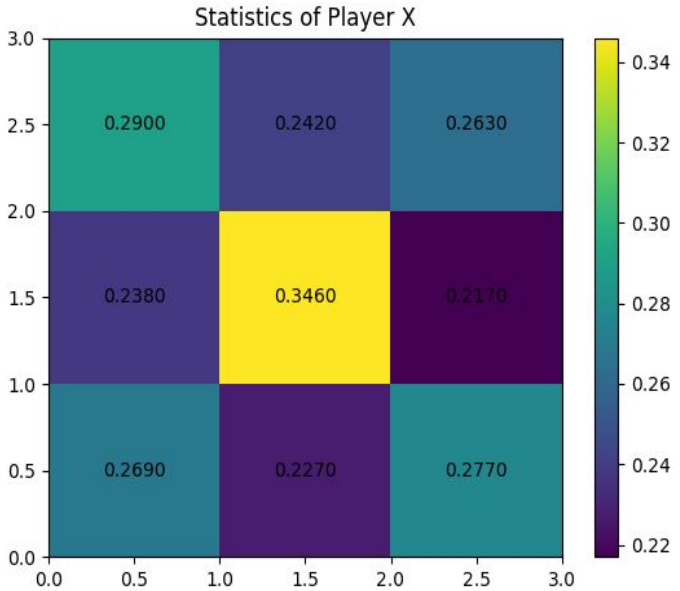
Step 1: Play a tournament of 1000 games where **'X'** and **'O'** moves randomly.

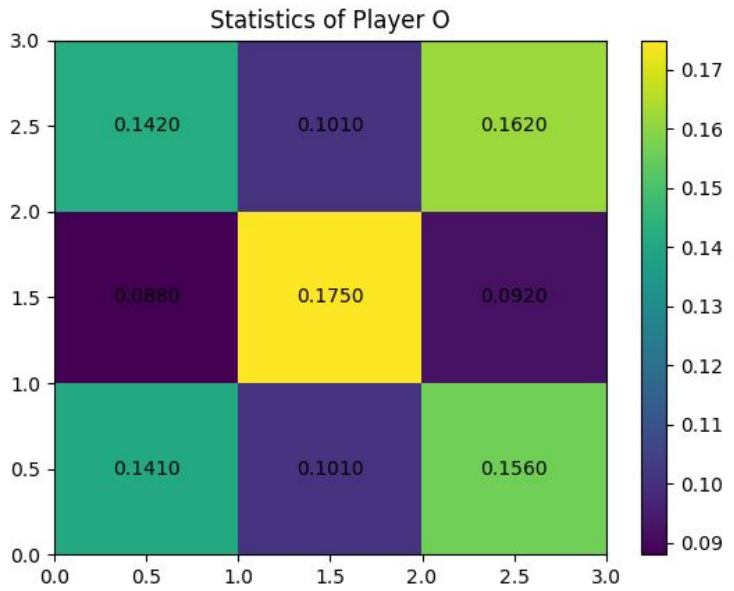
Step 2: Determine count of winning field of **'X'** and **'O'**.

Step 3: Normalize count to obtain probabilities.

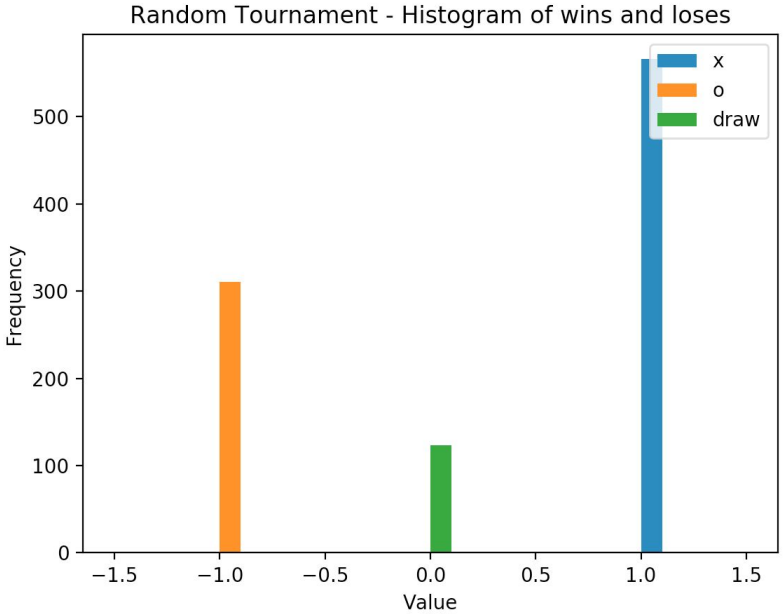
Step 4: Move **'X'** with probabilities obtain in Step-3 and **'O'** uniformly at randomly.

Tic Tac Toe:
Field Statistics of Winning Scenario

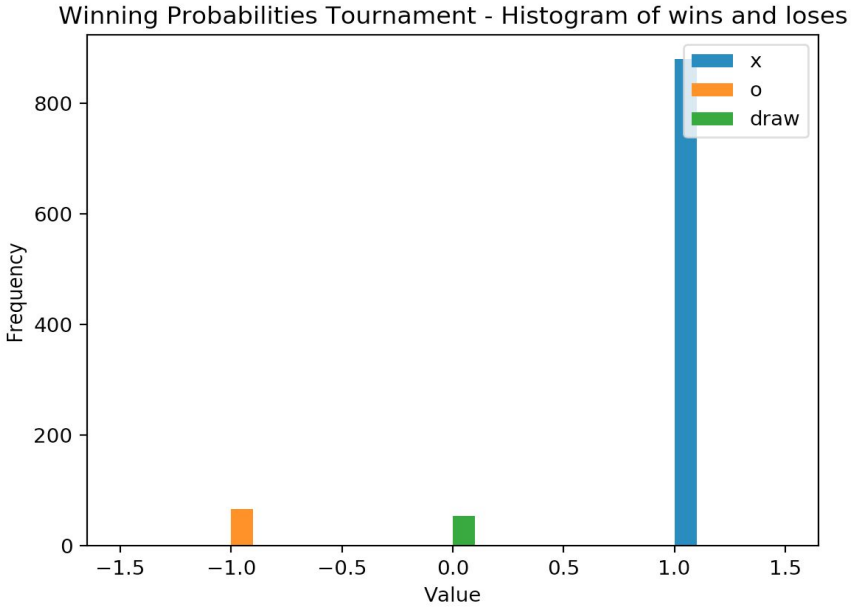




Probabilistic Strategy



Random Tournament for calculating winning probabilities



Probabilistic Tournament using winning probabilities

Heuristic Strategy

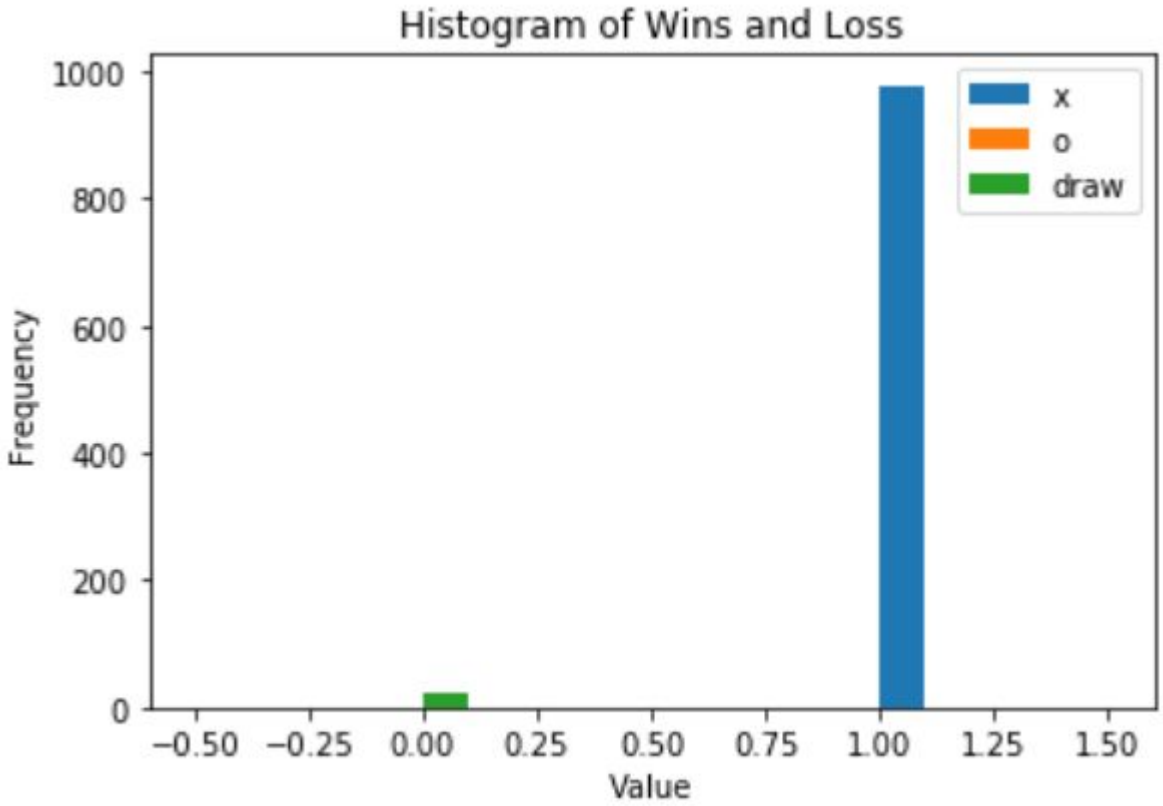
- **Reward**: Consecutive 1's either row, column or diagonal wise.
- **Winning Situation**: Reward of ‘3’.
- **Steps to find auspicious move for player ‘X’.**
- **Step 1**: For every empty field check if it can result in a ***winning situation of player ‘X’***.

  IF True, location of field is an auspicious move. Break! **ELSE,** Continue to Step 2.
- **Step 2**: For every empty field check if it can result in a ***winning situation of player ‘O’***.

  IF True, location of field is an auspicious move. Break! **ELSE,** Continue to Step 3.
- **Step 3**: Find empty field which can result in a ***maximum reward of player ‘X’.***

  IF more than 1, Field where reward of ‘X’ is greater than ‘O’ is an auspicious move.

  ELSE, Location of field is an auspicious move.

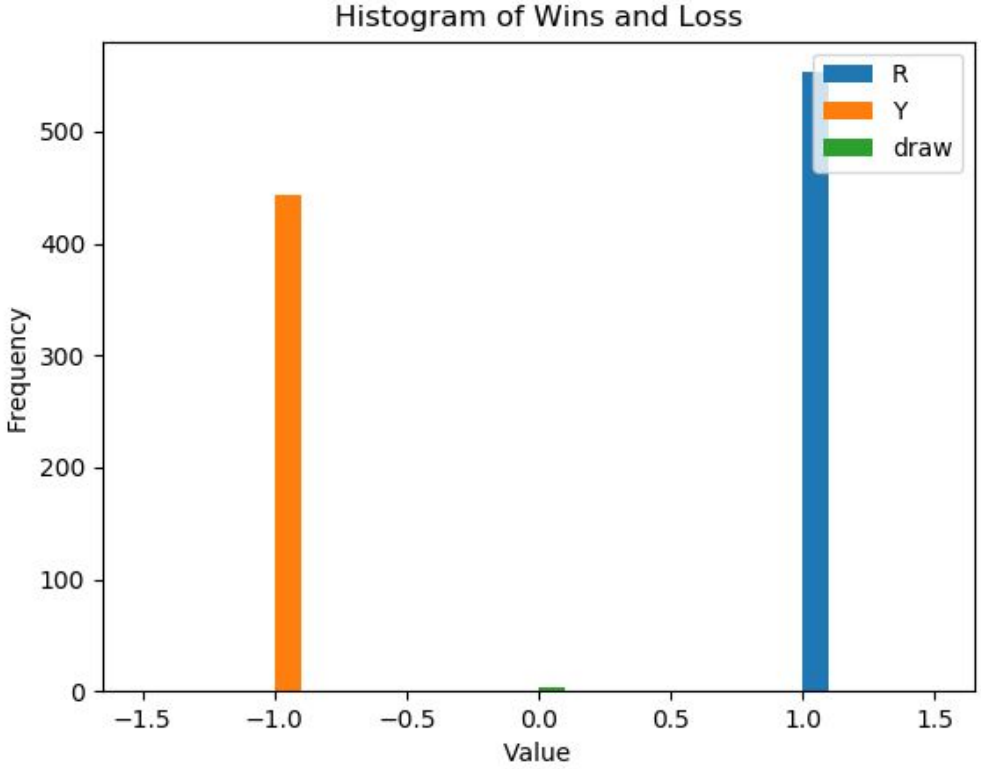

Histogram of Wins and Loss
1000
800
600
400
200
0
Frequency
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
1.25
1.50
Value
x
o
draw

Connect 4

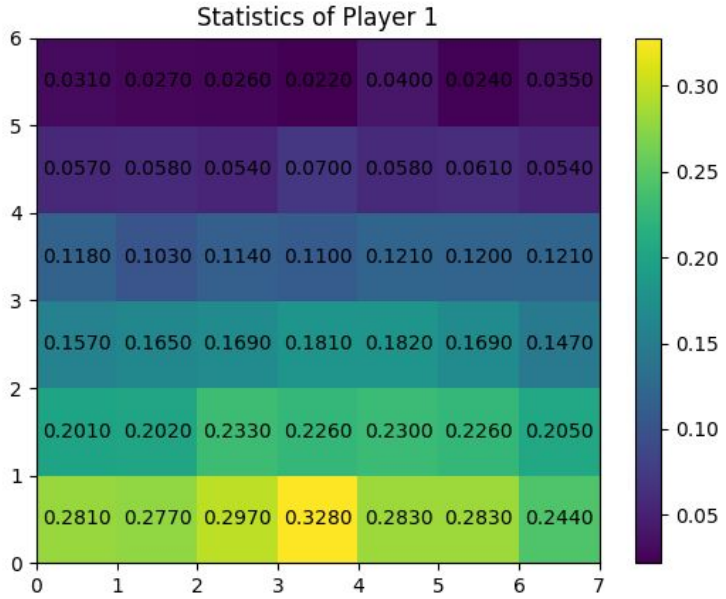
Game Mechanics:

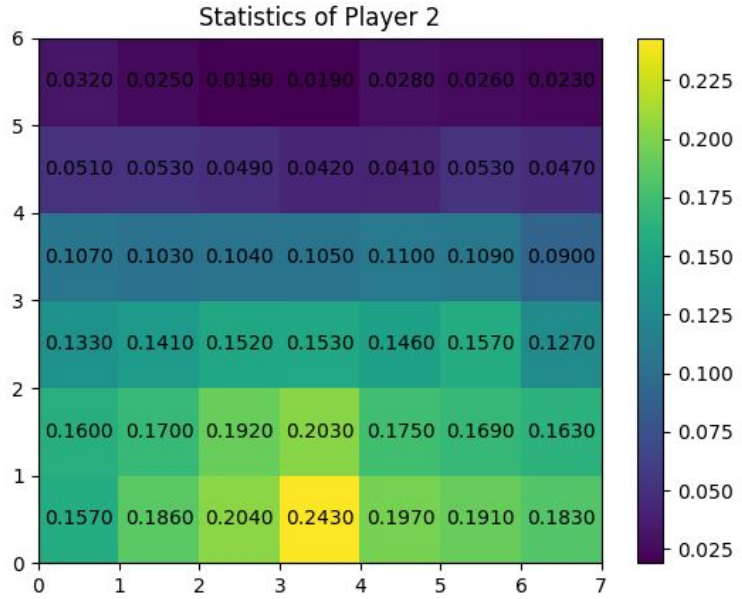
- Red always starts first.
- A counter is kept to keep track of number of dices filled in every column.
- The player in turn chooses a unfilled column randomly.
- Winning condition:
    - Whether the horizontal rows have similar consecutive dices > 4.
    - Whether the vertical columns have similar consecutive dices > 4.
    - Whether the diagonals with size > 4 have similar consecutive dices > 4.

Connect 4: Random Moves

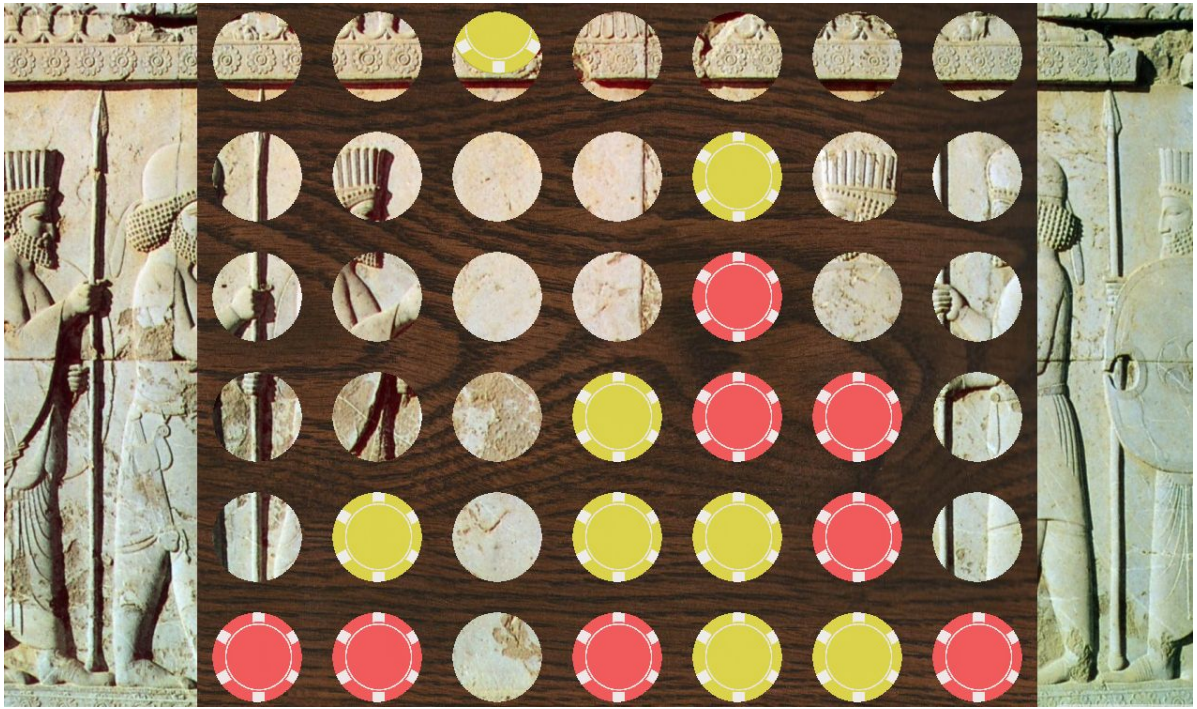


Connect 4:
Field Statistics of Winning Scenario

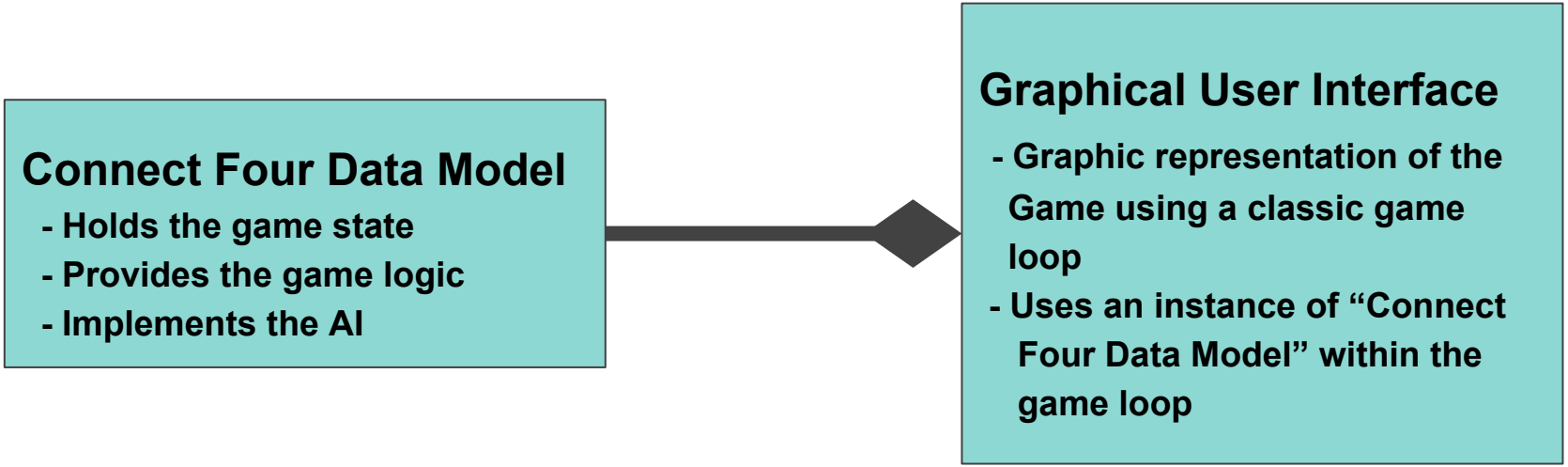




Graphical User Interface



Graphical User Interface



Questions

Thank You!