SUMMER TRAINING PROJECT REPORT

Full Stack Web Development

Project Topic:

Ai Based TIC TAC TOE Game with Multiplayer Mode

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ACKNOWLEDGEMENT

This is to express my earnest gratitude and extreme joy at being bestowed with an opportunity to get an opportunity to get an interesting and informative project on

“AI Based TIC TAC TOE”.

I would like to thank all the people who have helped me in completion of project. I would avail this opportunity to express my profound gratitude and indebtness to all those people. I am extremely grateful to my trainer for the summer training course.

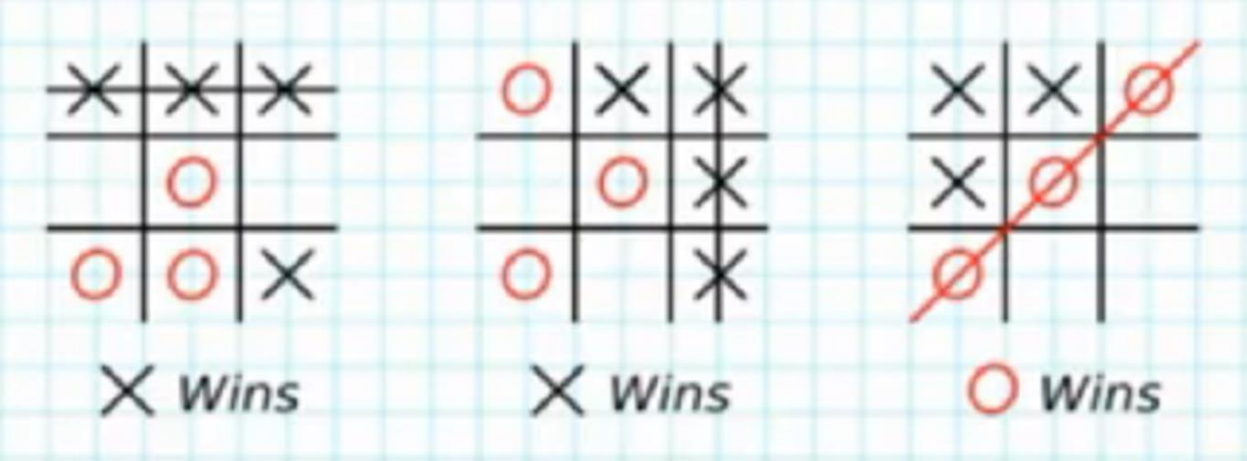
Mr. Ravi, who has given me an opportunity to work on such an interesting project. Credit also goes to my friends whose constant encouragement and help kept me in a good stead.

Lastly, I would like to thank my parents for supporting me in my career and without whose support all these would never have been possible.

INTRODUCTION

Tic Tac Toe, a classic and deceptively simple game, has entertained generations with its engaging gameplay and strategic possibilities. It's a paper and pencil game of two players X and O, who choose to mark a space on a grid of 3×3.

The game is won by the player who succeeds in putting three of their marks in a horizontal line, vertical line, or diagonal line.



This game is played by two players – One is a **human** and the other is a **computer**.
The objective is to write a computer program in such a way that the computer wins most of the time.

Three approaches are presented to play this game which increases in,

The complexity of the approach

Use of generalization of the approach

While it may seem straightforward at first glance, those who delve deeper into the world of Tic Tac Toe soon discover a fascinating strategy known as the "Magic Square Algorithm." This intriguing technique harnesses the power of a mathematical pattern, the magic square, to guide AI in their quest for victory. In this exploration, AI will unravel the secrets of the magic square algorithm and delve into how it can be employed to gain a competitive edge over opponents in the timeless game of Tic Tac Toe.

WORKING OF THE ALGORITHM:

AI can utilize the magic square algorithm to play Tic Tac Toe by incorporating the predefined pattern of the magic square into its decision-making process. The algorithm helps the AI determine the best moves based on the current state of the game and its assigned role (X or O).

Here's a step-by-step explanation of how AI can use the magic square algorithm to play Tic Tac Toe:

1. **Initialize the Magic Square**: The AI starts by creating or referencing the magic square, a 3x3 grid filled with specific values in a pattern that ensures the sum of each row, column, and diagonal is the same.

2. **Board Evaluation:** At each turn, the AI evaluates the current state of the Tic Tac Toe board to determine the available empty cells and their corresponding numbers on the magic square.

3. **AI's Turn:** If it's the AI's turn, the algorithm will select the best move based on the magic square's values associated with the available empty cells. The AI aims to maximize its chances of winning or achieving a draw.

4. **Opponent's Turn:** When it's the opponent's turn (human player or another AI), the algorithm simulates the opponent's moves based on the magic square values and calculates the best response to counter potential winning moves.

5. **Winning and Blocking Moves:** The AI prioritizes moves that align with the magic square numbers to achieve winning configurations or block the opponent from forming a winning line.

6. **Strategy Adaptation:** As the game progresses, the AI continues to evaluate the board and update its strategy based on the changing state of the game and the opponent's moves.

7. **Depth and Minimax:** To further enhance its gameplay, the AI can implement the minimax algorithm with alpha-beta pruning. This approach explores potential future moves and outcomes, allowing the AI to make more informed decisions by looking several moves ahead.

8. **Endgame Analysis:** During the endgame, the AI becomes more focused on securing a win or ensuring a draw, using the magic square to guide its final moves.

By incorporating the magic square algorithm, the AI gains an advantage by following a predefined pattern of moves that enhance its chances of success. However, it's important to note that the magic square algorithm alone does not guarantee a win, especially against experienced human players or advanced AI algorithms. Strong Tic Tac Toe AI systems usually employ a combination of various strategies, heuristics, and game tree search algorithms to become formidable opponents on the Tic Tac Toe board.

Magic Square:

8	3	4
1	5	9
6	7	2

EXAMPLE:

Turn – Computer (C)

	C	

Turn – Computer (C)

H		C
	C	

Turn – Human (H)

H		
	C	

Turn – Human (H)

H		C
	C	
H		

Now, the computer will check its possibility of winning the game.

First, calculate the difference between the 15 and the sum of two positions.

Diff = 15 – (5+4) = 6

6 is not empty, hence Computer can't win the game.

Now, the computer checks the possibility of opponents winning the match. If the opponent is winning black it.

Diff = 15 – (8+6) = 1

1 is empty, hence the human can win the game.

Hence Computer Blocks it.

Computer – go to 1

Turn – Computer (C)

H		C
C	C	
H		

Now, it's Player Human Turn,

Turn – Human (H)

H		C
C	C	
H	H	

Now, the computer will check its possibility of winning the game.

Diff = 15 – (5+4) = 6

6 is not empty, hence Computer can't win the game.

Diff = 15 – (1+4) = 10

10 is greater than 9, hence Computer can't win the game.

Diff = 15 – (1+5) = 9

9 is empty, hence Computer can win the game. Computer – go to 9

Turn – Computer (C)

H		C
C	C	C
H	H	

Hence, Computer Wins the Game!

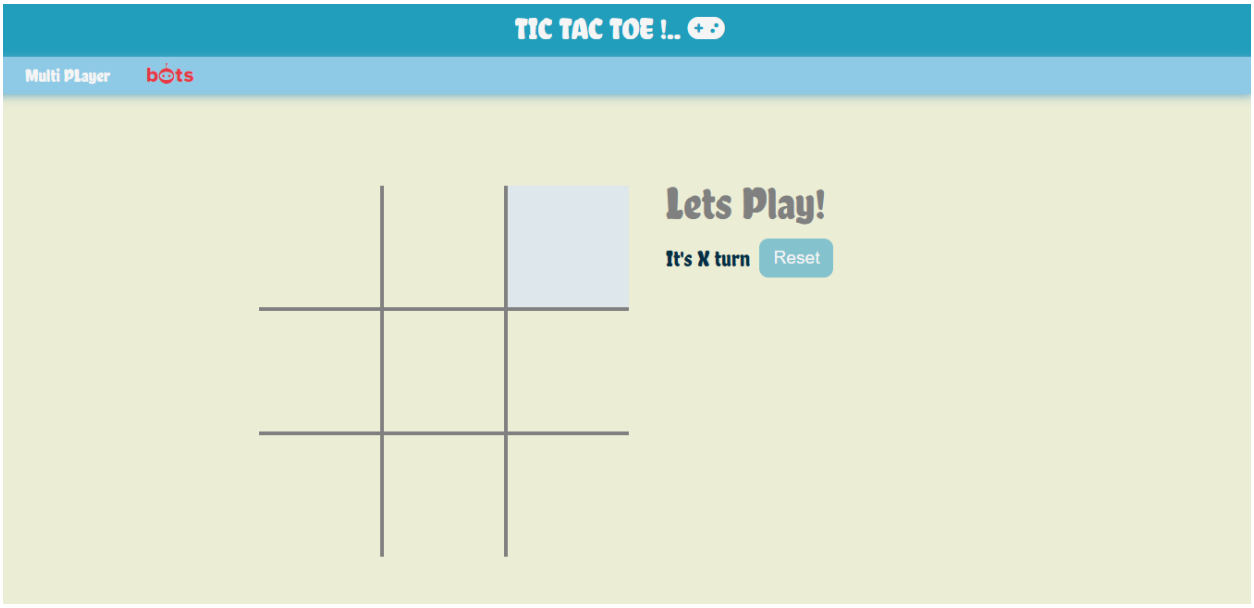
Screenshots and Working of Project:

On landing page, we have the multiplayer mode where the user can play with two players.

With "Reset" button. To reset the game.

On the top we have a menu bar with two options:

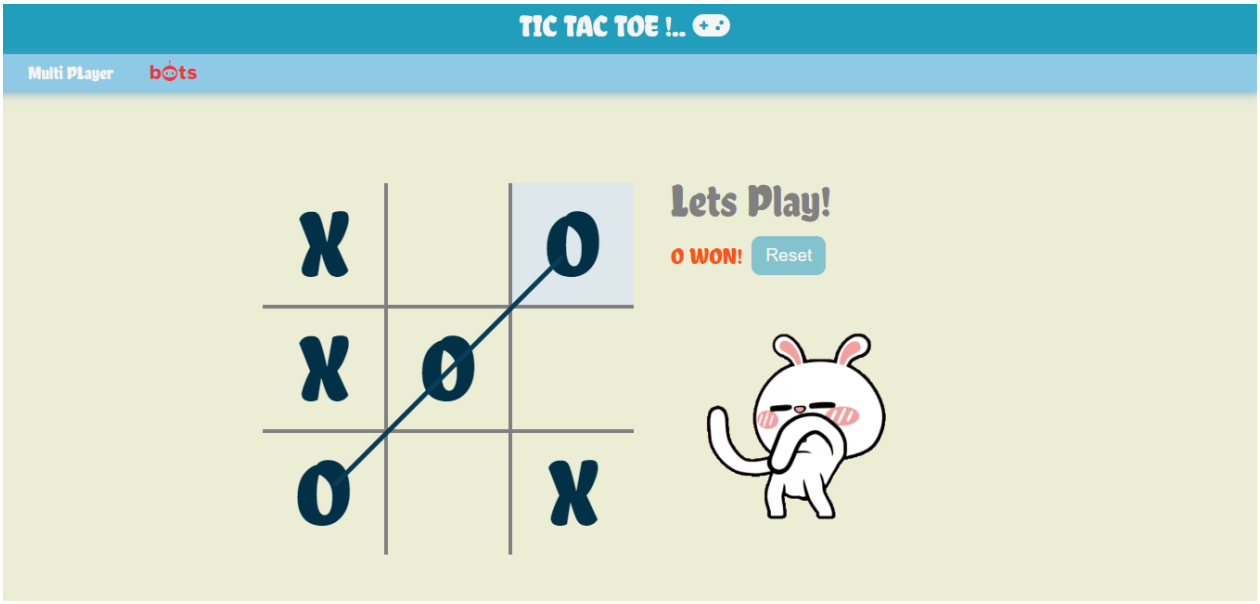
- Multiplayer
- Bots



On the left side of the reset button Whose turn is it now to play when the player puts its mark on the board the turn changes.

It automatically calculates who is the Winner and shows it to you.

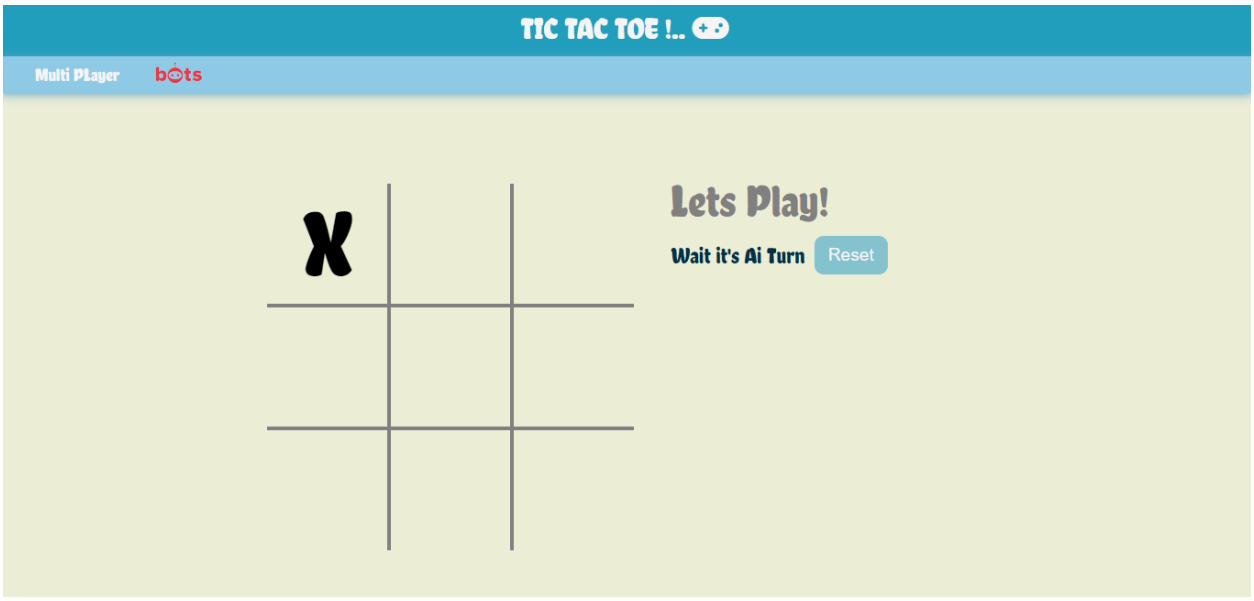
When a player wins it displays the result with a celebration music and a cartoon Dancing and celebrating players win.



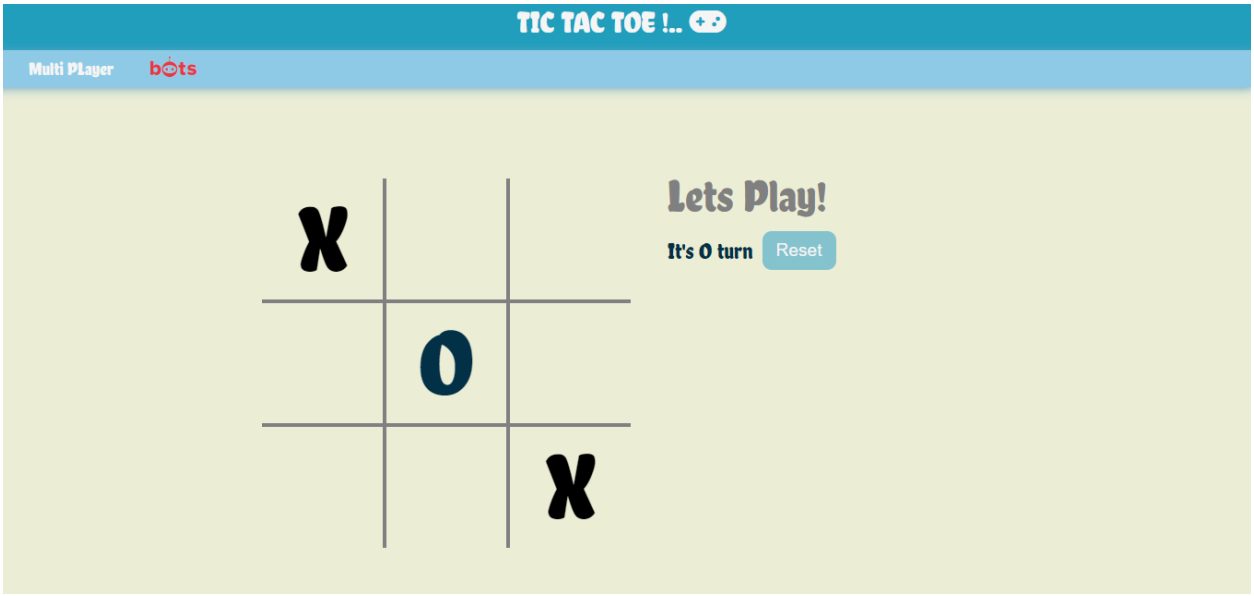
After that you can reset the game by clicking on “Reset” button.

We also have an AI mode where you can play TIC TAC TOE with Ai by clicking on “bots” from the menu bar.

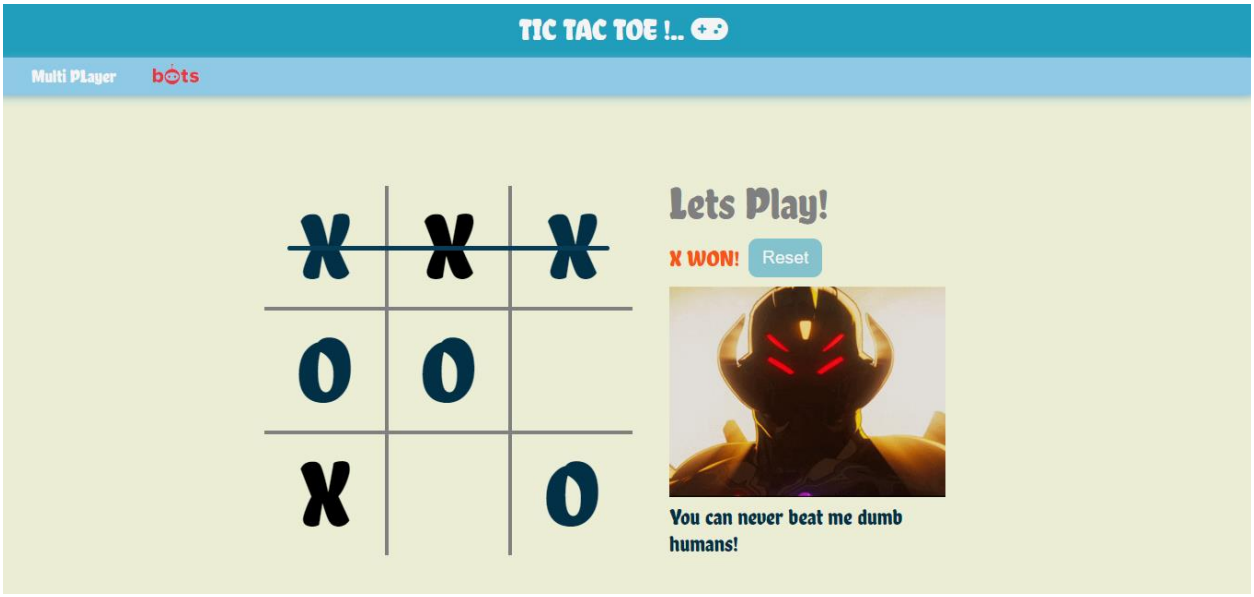
When you start the game AI marks its position on the Board:



Once you have marked your position the board Ai will mark its turn and will either try to Win the game or will try block from winning:



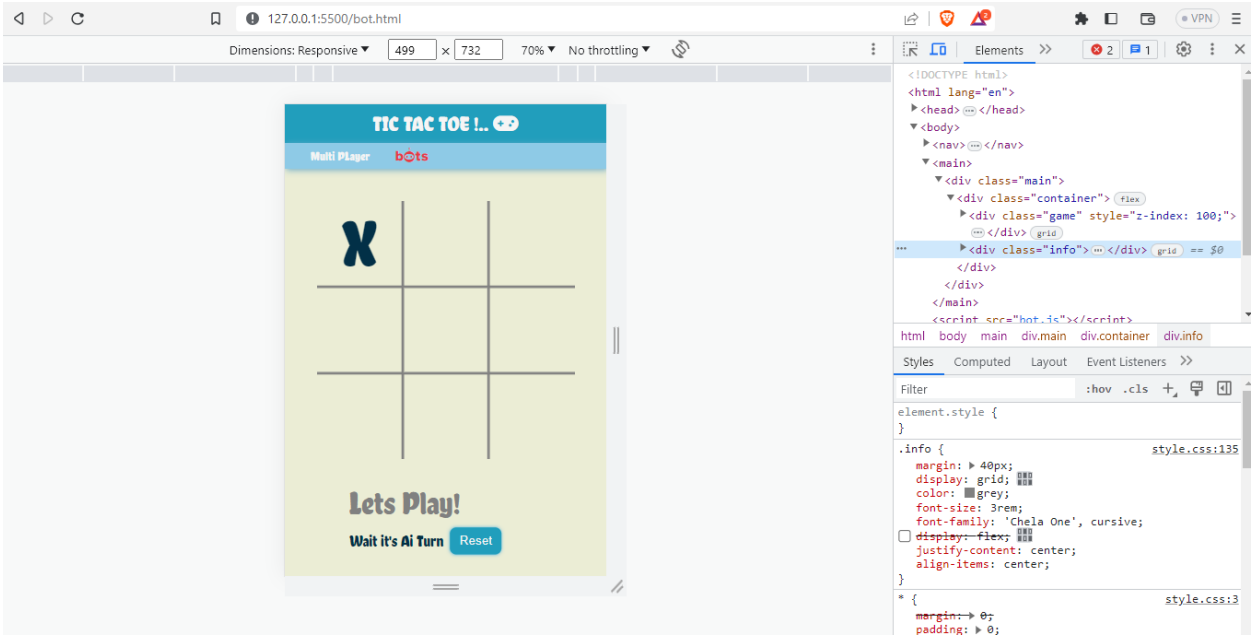
Once the AI wins the Game It shows the result with a message from the AI to you



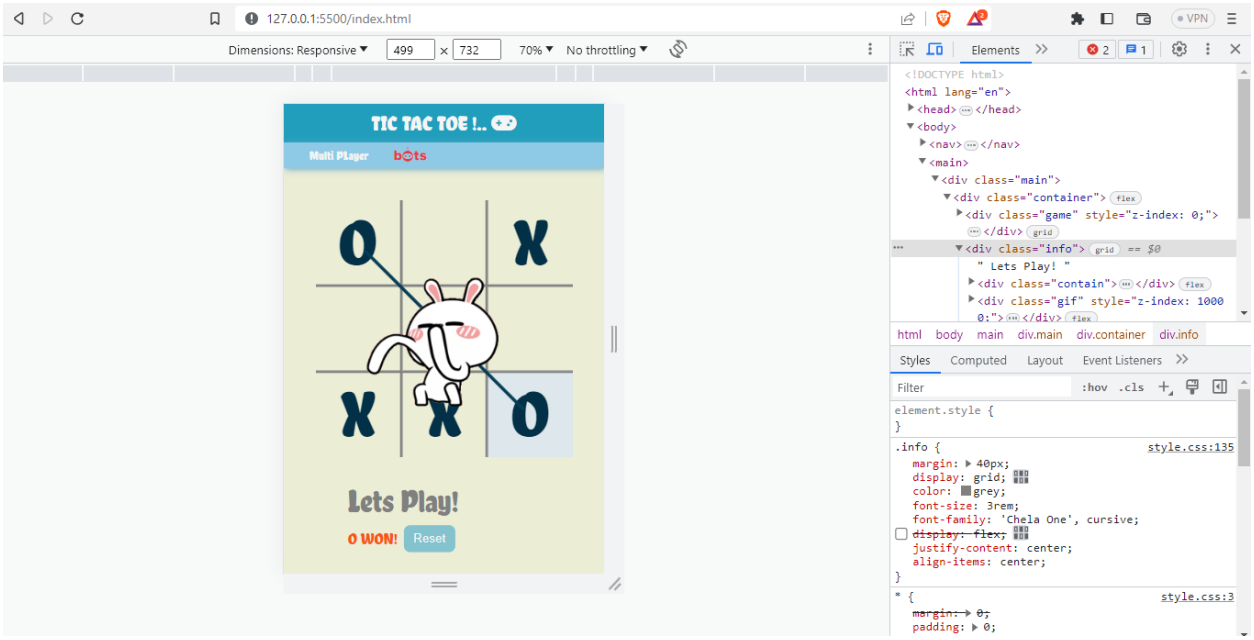
Then again You can reset the game and play again.

Responsiveness:

This game is Completely Responsive and can play without any issues in any device or screen size.


127.0.0.1:5500/bot.html
TIC TAC TOE !..
Multi PLayer
bots
X
Lets Play!
Wait it's Ai Turn
Reset
Elements
<!DOCTYPE html>
<html lang="en">
<head></head>
<body>
<nav></nav>
<main>

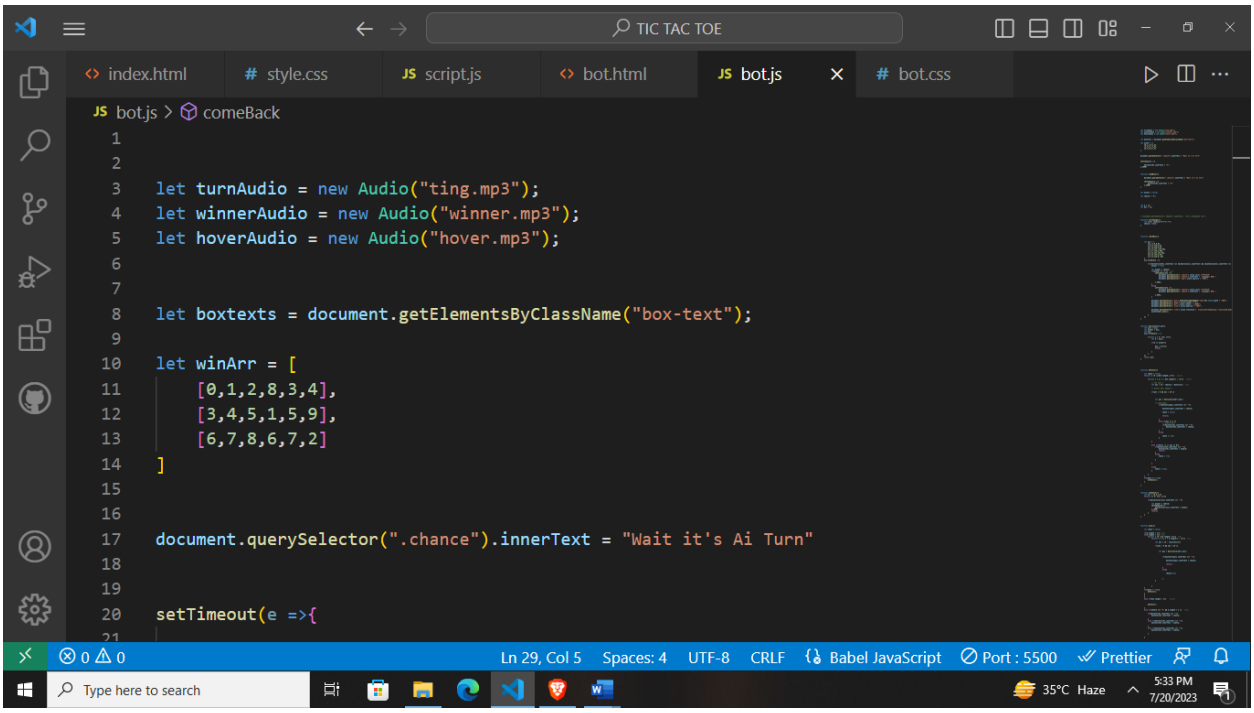
</main>
<script src="bot.js"></script>
html body main div.main div.container div.info
Styles
Computed
Layout
Event Listeners
Filter
:hov .cls
element.style {
}
.info {
style.css:135
margin: 40px;
display: grid;
color: grey;
font-size: 3rem;
font-family: 'Chela One', cursive;
display: flex;
justify-content: center;
align-items: center;
}
* {
style.css:3
margin: 0;
padding: 0;

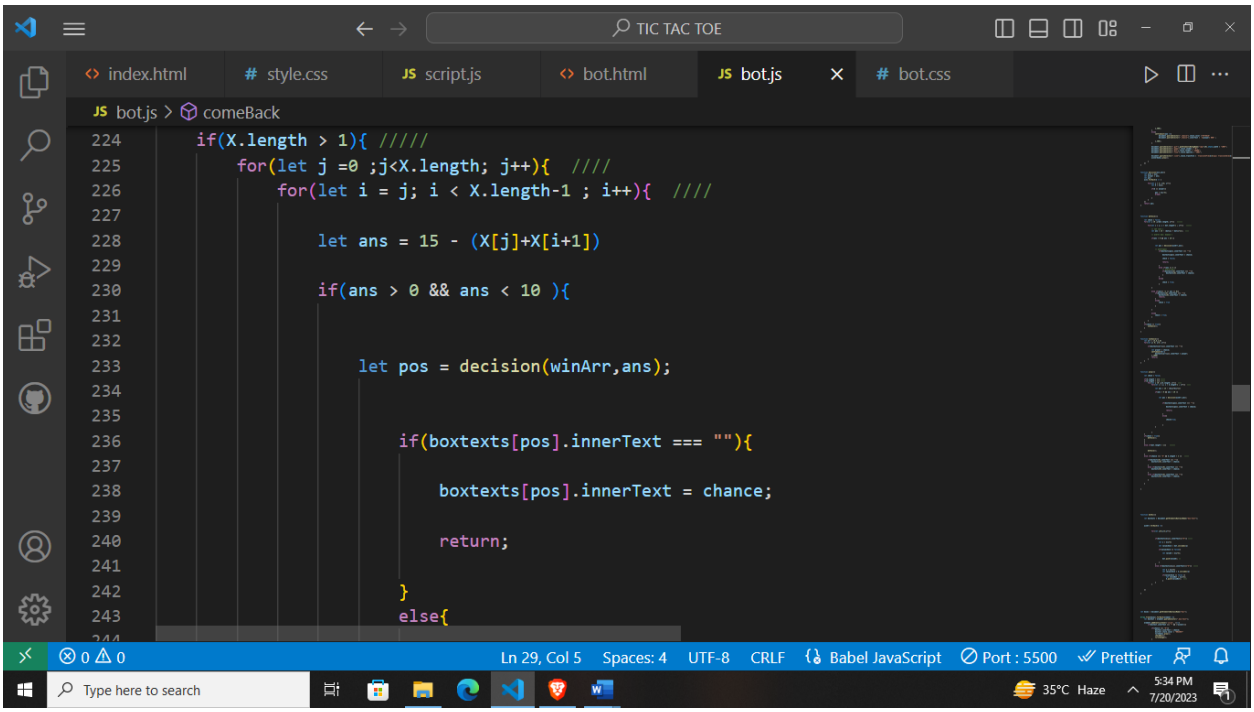

127.0.0.1:5500/index.html
TIC TAC TOE !..
Multi PLayer
bots
O
X
X
X
O
Lets Play!
O WON!
Reset
Elements
<!DOCTYPE html>
<html lang="en">
<head></head>
<body>
<nav></nav>
<main>

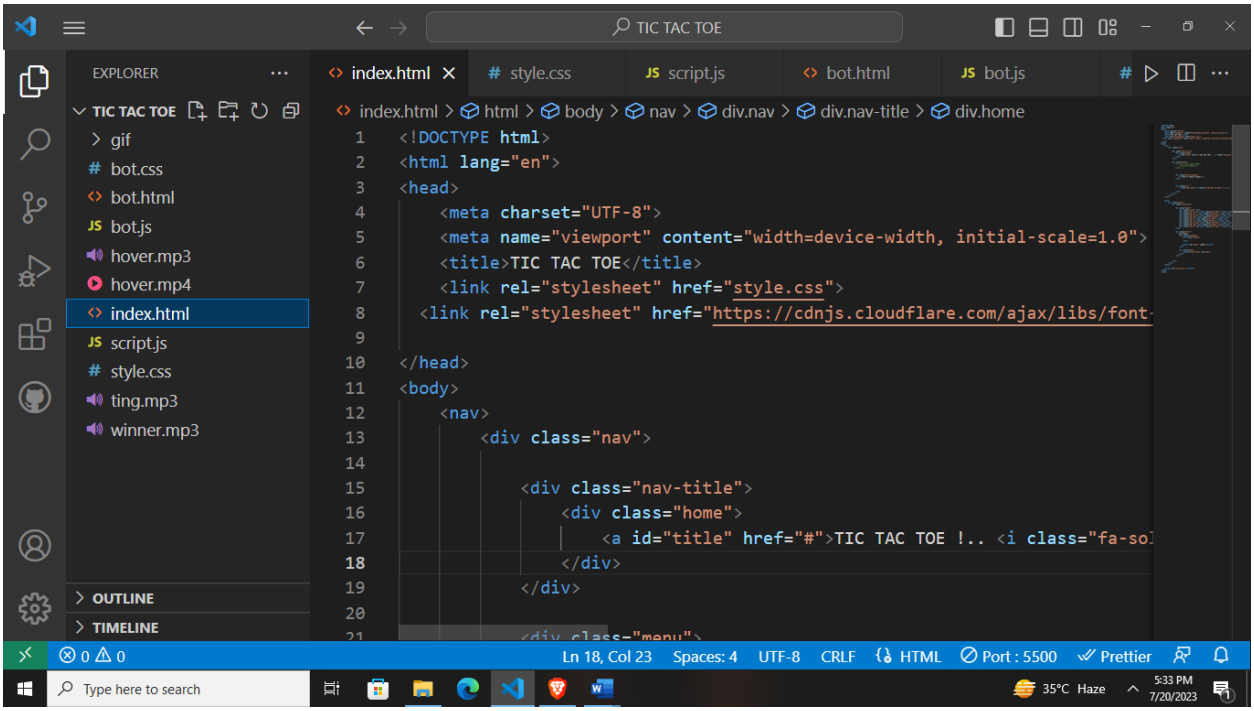
" Lets Play! "

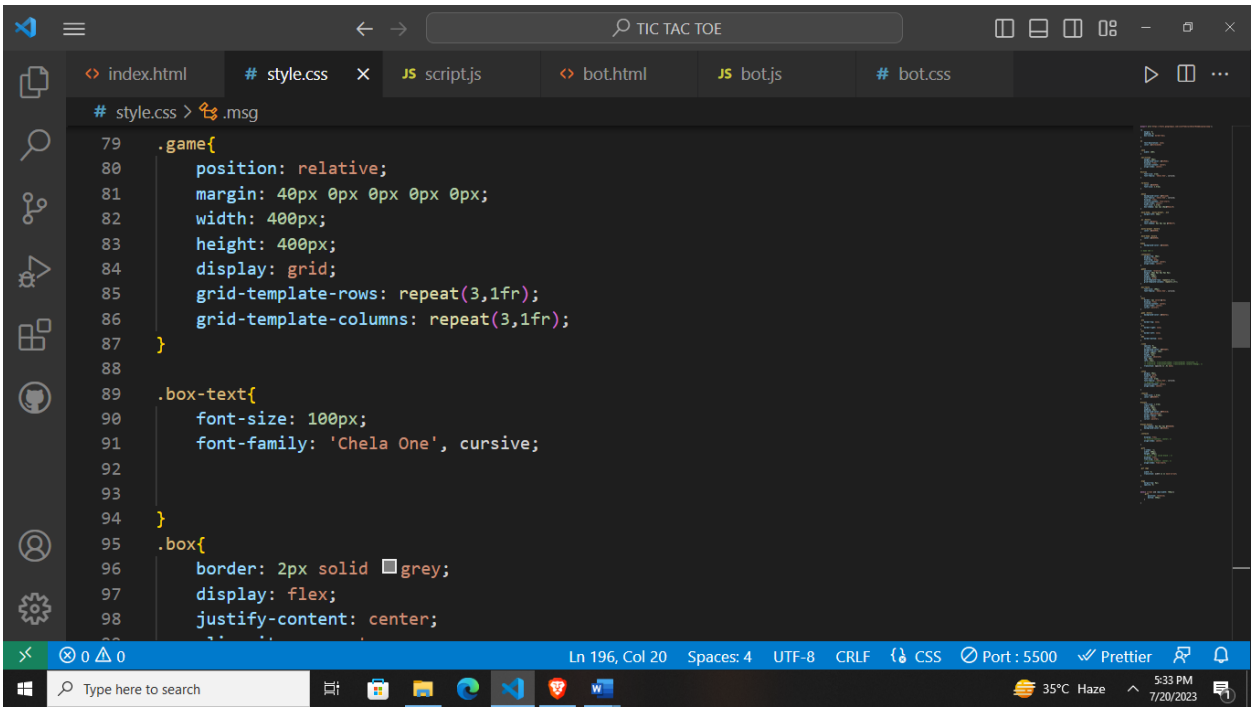
html body main div.main div.container div.info
Styles
Computed
Layout
Event Listeners
Filter
:hov .cls
element.style {
}
.info {
style.css:135
margin: 40px;
display: grid;
color: grey;
font-size: 3rem;
font-family: 'Chela One', cursive;
display: flex;
justify-content: center;
align-items: center;
}
* {
style.css:3
margin: 0;
padding: 0;

Some Code Snippets:









Can View the Source Code at:
https://codepen.io/Rishuraj_code1/pen/bGQKomd