

Department of Artificial Intelligence and Data Science

Vivekanand Education Society's

Institute of Technology

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TIC - TAC - TOE

Submitted in partial fulfillment of the requirements of the degree of
Bachelor of Engineering in Artificial Intelligence and Data Science

by

Yash Sarang

Shreya Singh

Surabhi Tambe

Parth Suryavanshi

under the guidance of

Dr. Anjali Yeole



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Department of Artificial Intelligence and Data Science

CERTIFICATE

This is to certify that Parth Suryavanshi, Yash Sarang, Surabhi Tambe, Shreya Singh of Second Year of Artificial Intelligence and Data Science studying at the University of Mumbai have satisfactorily presented the Mini Project entitled Tic-Tac-Toe as a part of the MINI-PROJECT for Semester-III under the guidance of Dr. Anjali Yeole in the year 2021-2022.

Date:16/12/2021

(Name and sign)
Head of Department

(Name and sign)
Supervisor/Guide



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DECLARATION

We, Parth Suryavanshi, Yash Sarang, Surabhi Tambe, and Shreya Singh from D6AD declare that this project represents our ideas in our own words without plagiarism and wherever others' ideas or words have been included, we have adequately cited and referenced the original sources.

We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our project work.

We declare that we have maintained a minimum of 75% attendance, as per the University of Mumbai norms.

We understand that any violation of the above will be cause for disciplinary action by the Institute.

Yours Faithfully,

1. Yash Sarang.

2. Parth Suryavanshi.

3. Surabhi Tambe.

4. Shreya Singh.

DATE: 16/12/2021.



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We are deeply indebted to the Vice-Principal and Head of the Artificial Intelligence and Data Science Department Dr. M. Vijayalakshmi and our Principal Dr. J.M. Nair for giving us this valuable opportunity to do this project.

We express our hearty gratitude to them for their assistance without which it would have been difficult in finishing this project synopsis and project review successfully.

We convey our deep sense of gratitude to all teaching and non-teaching staff for their constant encouragement, support, and selfless help throughout the project work. It is a great pleasure to acknowledge the help and suggestion, which we received from the Department of Artificial Intelligence and Data Science.



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● Abstract

Nowadays, every one of us, from Teachers to Students, is leading a very fast-paced life. Whether it's conducting Viva of 60+ students or planning out our Mini Projects, we need to take breaks in between. These breaks however have to be short and refreshing so that we can get back to work with a new mindset.

The problem however is that we spend hours scrolling through social media or playing games in the name of “taking a break”. We seek to solve this problem by providing a quick and fun way to take a break using our Mini Project: Tic-Tac-Toe.

You have probably played the Tic-Tac-Toe game to pass time during school hours. It's fun when you play with paper and pencil. Here, we have developed a **Mini Project in Python called Tic-Tac-Toe game** – a web-based game with graphics that can be run through any mobile device with a valid internet connection.

Being true to our department, we have also implemented AI for this project.

1. Introduction

1.1 Introduction

Everyone is already familiar with the classic Tic-Tac-Toe. The game is very popular among all the age groups around the world. It is fairly simple by itself but the real fun begins when we exceed the bounds of the 3x3 Tic-Tac-Toe. Our Project is an upscaled version of the classic 3x3 Tic-Tac-Toe and also supports 5x5 and 7x7 grid Tic-Tac-Toe.

It is also known as **Noughts and Crosses** or the **Xs and Os**, the other names for Tic-Tac-Toe, you've played with paper and pencil. This mini-project game is written in Python language in a very simple manner; it is complete and totally error-free.

1.2 Problem Statement

Build a game while implementing Artificial Intelligence into it.

1.3 Objectives

The main objective of this project is to create a fun and simple game of tic tac toe. There will be three versions of Tic-Tac-Toe :



- 3x3 board
- 5x5 board
- 7x7 board

1.4 Scope

Traditionally, the game of Tic-Tac-Toe is a pencil and paper game played by two people. Our project seeks to bring the joy of Tic-Tac-Toe in the form of a website. The best part about this is that you can play it all alone against an AI-driven bot and it'll be compatible with both P.C. and mobile. It's a good brain exercise for all age groups of people.

2. Literature Survey

2.1 Literature/Techniques studied.

- MiniMax Algorithm.
- Heuristic Search.
- Backtracking Algorithm.

2.2 Papers/Findings

Papers :

International Journal of Computer Trends and Technology (IJCTT) - (volume 12 number 2 – Jun 2014.)

Books :

Internet & World Wide Web: How to Program Deitel, PJ Deitel.

3. Analysis and Design

3.1 Analysis of the system

Creating the Board:

For an 'n x n' Tic-Tac-Toe board, we will create an array of $(n+2)^2$ elements. For example, for a 3x3 board, we'll make an array of 25 elements. This step is required for the easy navigation of the board by our AI.

In case AI plays first, then this move is chosen randomly by using the `rand()` function followed by Algorithm generated moves.

The game is run using a while loop until one of the 3 "End Game Conditions" occur:

- Human wins
- AI wins
- Draw

3.2 Proposed Solutions

We plan on using the MiniMax algorithm and the Heuristic search method.

Heuristic search in AI is a technique to solve a problem faster than classic methods or to find an approximate solution when classic methods cannot. This is achieved by trading optimality, completeness, accuracy, or precision for speed. The heuristic search technique can evaluate the available information and make a decision on which branch to follow. The heuristic technique is capable of producing a solution that is good enough for the problem.

The AI will play based on the Minimax Algorithm to determine the optimum move. It is used to determine the best move possible.

To understand the algorithm, let's determine a "score" for a game state at any interval of time.

On winning : score = +10, On losing : score = -10.

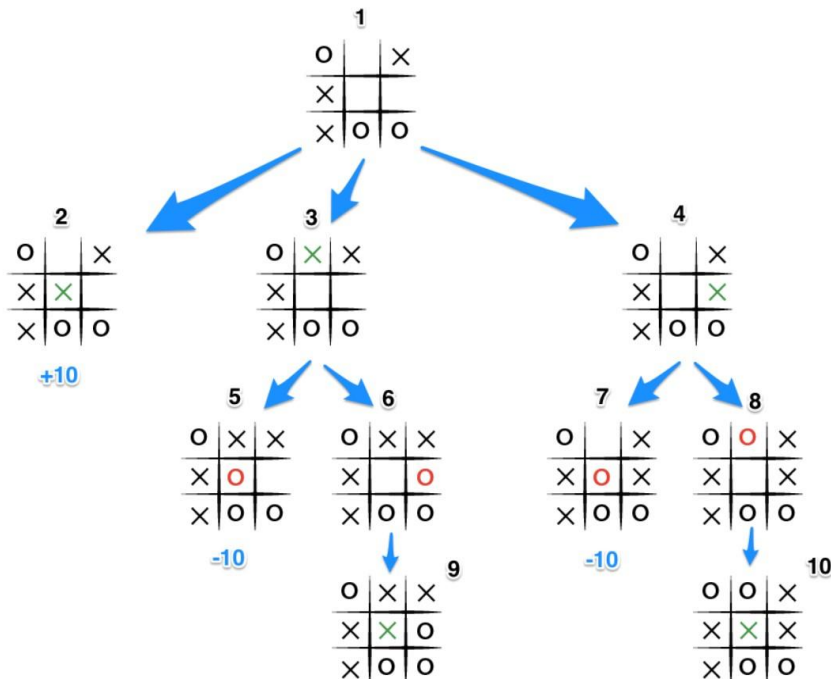
For draw : score = 0.

In Minimax the two players are called maximizer and minimizer. The maximizer tries to get the highest score possible while the minimizer tries to do the opposite and get the lowest score possible for the opponent.

Here is how the algorithm will look :

- a. Create a scores list.
- b. For each state of the game, add the minimax result of that state to the scores list.
- c. If it's maximizer's turn, return the maximum score from the scores list and vice versa.
- d. Repeat the steps until the game is over.

3.3 Design of the proposed system



4. Results and Discussion

1. Main Screen

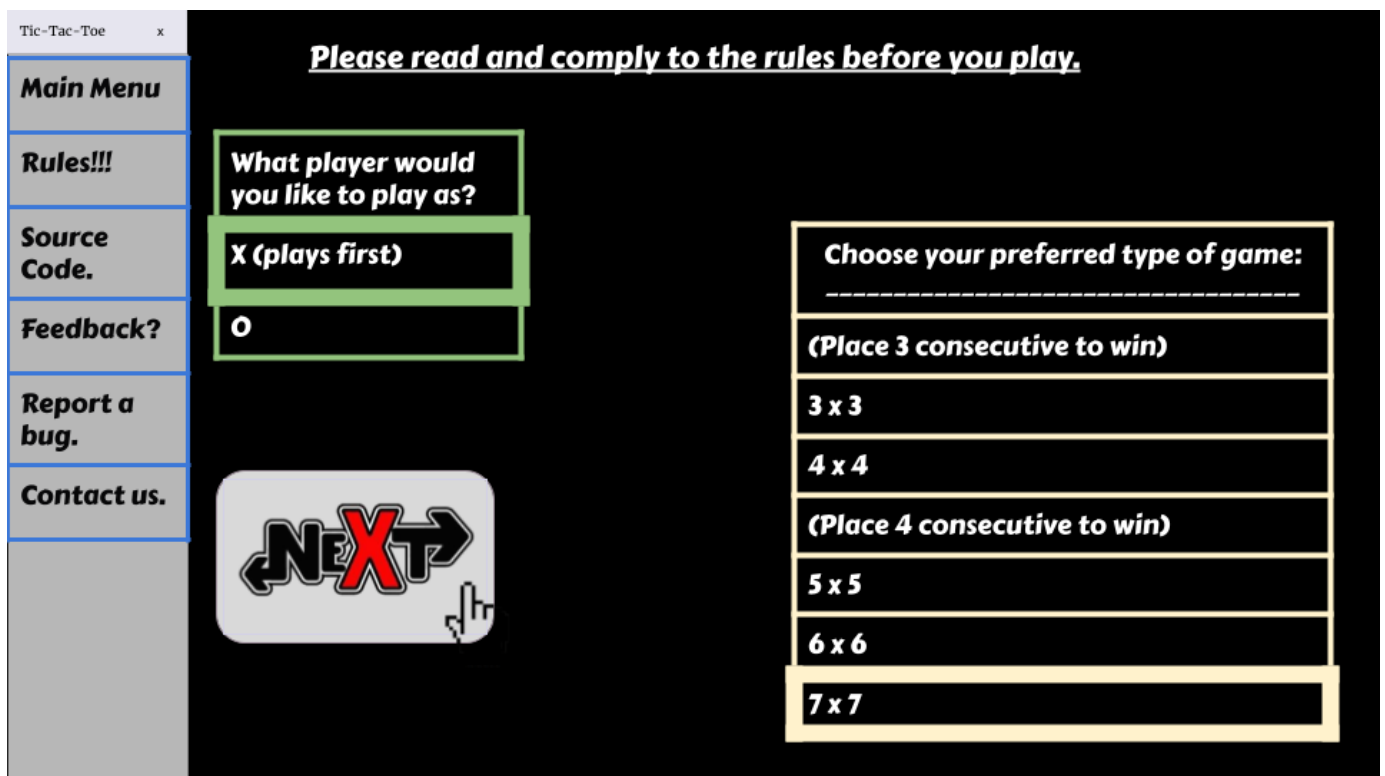
The main screen of our game UI would present the user to select the game type he'd like to play the game on, Single Player i.e vs an AI or Local Multiplayer.(2 players on the same device)



2. Selection Screen

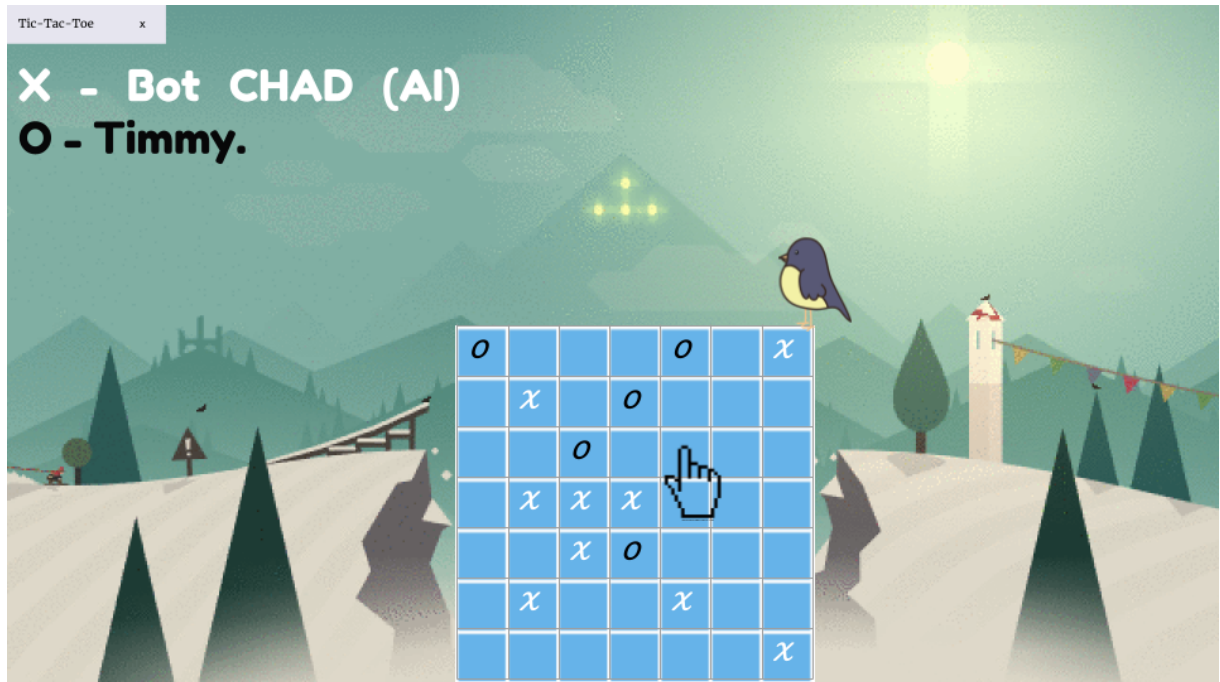
After the selection of the main game mode, we get to select the game type. That is whether we want to be the one who plays first (X) or we want the AI to play the first move, and also the option of choosing from 3x3 to 7x7.

We can also see a menu tab on the left-hand side of the screen which would help us to navigate efficiently at all times on our website of the game.



3. Game Screen

This would be the Interactive screen on which the player would play the game. It would display the names of the players and have the Menu tab and a cursor would appear which would point to the tile you'd be placing your turn (X or O) at.



5. Conclusion and Future Work

1. Extend the code of 3x3 up to 5x5 and 7x7.
2. Create the website using python for backend and HTML, CSS, JAVASCRIPT for frontend.

References :

International Journal of Computer Trends and Technology (IJCTT) - volume 12 number 2 – Jun 2014.

- IOP Conference Series: Materials Science and Engineering.
- <https://www.neverstopbuilding.com/blog/minimax>