Tic-Tac-Toe AI Web Application — Project Documentation

Introduction

This project is a Tic-Tac-Toe AI web application created as part of the CodSoft Internship by Vishal Baibhav Panda. It combines a Flask backend that powers the AI logic with a modern frontend featuring neon design and interactive gameplay.

Features

- Human vs AI gameplay using minimax algorithm with alpha-beta pruning.
- AI vs AI simulation mode with automatic gameplay.
- Fallback local AI implementation if backend is unavailable.
- Interactive neon-themed UI with animated particle background.
- Switch side and restart game options.
- Responsive design suitable for desktop and mobile.
- Separate backend and frontend code organization for clarity.

Project Structure

The project is organized into two main directories: `backend/` and `frontend/`:

```
project-root/
├── backend/
│   └── app.py            # Flask server providing API for AI moves
├── frontend/
│   ├── index.html        # Main landing page
│   ├── game.html         # Tic-Tac-Toe game page
│   ├── css/
│   │   └── styles.css    # Styling for pages
│   └── js/
│       ├── game.js       # Game logic and interaction
│       ├── minimax_fallback.js # Local AI fallback
│       ├── background.js     # Neon animated background
└── README.md             # Project description
```

Backend (Flask)

The backend is built using Flask and provides an API endpoint `/api/move`. It accepts the current board state and returns the optimal move for the AI using the minimax algorithm with alpha-beta pruning. If the backend fails or is unreachable, the frontend falls back to a local AI implementation.

Frontend

The frontend consists of HTML, CSS, and JavaScript files. It provides the user interface for playing Tic-Tac-Toe, switching sides, restarting games, and running AI vs AI matches. The design features a neon aesthetic with an animated particle background.

Installation & Setup

1. Clone or copy the repository to your system.
2. Navigate to the project root.
3. Install dependencies:
   ```bash
   pip install flask flask-cors
   ```
4. Run the backend server:
   ```bash
   python backend/app.py
   ```
5. Open a browser and go to `http://127.0.0.1:5000/` to access the main page.

Usage

- From the homepage, click 'Open Tic-Tac-Toe Demo' to play.
- On the game page:
  * Click a cell to make your move.
  * Use 'Switch Side' to swap between X and O.
  * Use 'Restart' to reset the game.
  * Use 'AI vs AI' to watch two AIs play against each other.
  * Use 'Force Local AI' if the backend is unavailable.
- A 'Back to Home' button allows returning to the main page.

License