Project Title: Chess Board Tracking and Integration with Chess Engines for Streamers

Team Members:

- **Aaditya Bir Singh** (E22CSEU0620)
- **Chhaveesh Manocha** (E22CSEU0581)

Introduction: Chess streamers and enthusiasts often face challenges in keeping an accurate digital representation of their physical chess board during live gameplay. Our project aims to develop a **real-time chess board tracking system** using a camera. The system will capture the physical board's state and update a digital chessboard accordingly. Additionally, it will integrate with a chess engine to analyze the game, provide suggestions, and enhance the viewing experience for audiences on platforms like YouTube and Twitch.

Proposed System: The system follows a structured pipeline with the following key steps:

1. **Board Detection & Calibration:**
    - Recognizing the chessboard layout using image processing techniques.
    - Identifying board orientation and calibrating positions of squares.
2. **Piece Recognition & Movement Tracking:**
    - Detecting individual pieces using deep learning-based object detection.
    - Tracking movements between frames to update board positions.
3. **Chess Engine Integration:**
    - Feeding board state into a chess engine (Stockfish, Leela Chess Zero, etc.).
    - Providing real-time analysis, move suggestions, and game evaluation.
4. **Streaming & UI Display:**
    - Overlaying the detected chess position on a virtual board for streamers.
    - Exporting PGN (Portable Game Notation) files for post-game analysis.

Technologies Used:

- **Computer Vision:** OpenCV, MediaPipe, TensorFlow
- **Chess Engine:** Stockfish, Leela Chess Zero
- **Programming Languages:** Python
- **Streaming Integration:** OBS, Flask-based API for real-time updates

Expected Impact:

- Enables chess streamers to display an accurate digital version of the board without manual input.
- Provides AI-powered insights to enhance audience engagement.

- Helps chess enthusiasts analyze and improve their gameplay efficiently.

Conclusion: This project bridges the gap between physical and digital chess by leveraging AI and computer vision techniques. It aims to improve accessibility for chess players and streamers while enhancing the overall viewer experience.