Final Project: Final Project Description and Progress

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**Football Game Strategy AI (Coach's Assistant)**

This project will involve developing an AI agent that functions as a “Coach's Assistant” during a football game. The agent will analyze ongoing game data, such as game statistics, player performance, and opponent strategies, to suggest real-time offensive and defensive strategies to improve game outcomes. The goal is to provide coaches with AI-driven insights that can influence decisions on play-calling, player substitutions, and tactical adjustments to optimize team performance in real time.

**Scope**

The scope of this project will be centered around real-time strategy optimization during a football game. The AI agent will focus on:

* Game statistics analysis:
* Monitoring player statistics such as speed, stamina, tackles, passes, etc.
* Opponent analysis: Evaluating the opponent’s play style and weaknesses.
* Real-time strategy: Offering dynamic suggestions for offensive and defensive plays based on game conditions and player performance.
* Player management: Recommending substitutions based on fatigue or underperformance.
* Game conditions: Factoring in situational elements like time remaining, score, down and distance, and field position.

**Agent Type:**

This project will use a Hybrid Agent that combines Logic-based decision making for immediate, rule-based decisions (e.g., play type based on down, distance, and time) and Learning-based adaptation to improve its strategy suggestions over time by learning from previous games or simulations.

* Logic-based decision-making: For predefined situations like timeouts, player substitution rules, and basic tactical decisions.
* Learning-based adaptation: Use historical data to learn opponent tendencies and predict plays, as well as optimize the suggested strategies.

**Task Environment:**

1. Performance Measure:

* Touchdowns and Defensive Stops: Evaluate the success rate of offensive plays (yards gained, touchdowns scored) and defensive strategies (stopping the opposing team from scoring).
* Strategic Effectiveness: Measure how often the agent's suggestions lead to favorable outcomes (e.g., improved possession, higher scoring chances, or fewer defensive lapses).
* Player Performance Improvement: Assess the impact of the agent’s suggestions on player performance metrics (e.g., reduced fatigue, fewer injuries).

2. Environment:

* Ongoing Football Game: The environment will be a live or simulated football game, either real-time data from an actual game or a simulated match environment where the agent receives game information in a loop.
* Game Conditions: The environment will also account for various game factors like weather, field conditions, and crowd noise that can affect player performance.

3. Actuators:

* Strategy Suggestions: The agent will suggest offensive and defensive strategies (play types, formations, and player assignments).
* Player Substitutions: The agent will recommend player substitutions when fatigue, injury risks, or poor performance is detected.
* Timeouts: The agent will advise on the optimal use of timeouts for strategic breaks, game control, or resting key players.

4. Percepts:

* Game Statistics: Real-time game statistics such as possession, passing accuracy, rushing yards, and turnovers.
* Player Conditions: The agent will monitor individual player performance and physical conditions like fatigue, stamina, and injuries.
* Game Progress: The agent will track the time left, scoreline, field position, down and distance, as well as the opponent’s tactical decisions.

**Code Implementation:**

1. The AI agent will need modules for:

* Data input: For game statistics, player conditions, and opponent tendencies.
* Logic-based decisions: To handle predefined game situations and rules (e.g., timeouts, substitutions).
* Learning algorithms: Reinforcement learning or supervised learning algorithms to improve decision-making over time by learning from historical data.
* Strategy output: Real-time suggestions to the coach on tactics, substitutions, or timeouts based on the agent's analysis.