

## Department of Artificial Intelligence and Machine Learning

**AI19511-Mobile Application Development Laboratory for ML and DL Applications**

### **MINI PROJECT**

**“FOOTSAL” - Football Analysis App using YOLO & EAST**

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- Problem Statement
- Objectives
- Abstract
- Introduction to Problem Domain
- Existing system
- Limitation of the Existing System
- Proposed system
- Architecture Diagram
- Algorithms/Techniques Used
- Conclusion

# PROBLEM STATEMENT

In the realm of sports analytics, the need for real-time insights and performance evaluation is increasingly vital. This project FOOTSAL aims to leverage advanced computer vision techniques, specifically YOLO and EAST, to analyze football matches.



## OBJECTIVE

To implement YOLO to detect and track players and the ball in live football match footage, ensuring high accuracy and speed in identifying key elements on the field. To develop algorithms to analyze detected objects and recognize significant game events (e.g., goals, fouls, assists) to provide context to the actions on the field. To extract and calculate important performance metrics, such as player speed, distance covered, and ball possession time, to generate insightful statistics for teams and analysts. To create an intuitive interface that visualizes the detected data and statistics in real-time, making it accessible for coaches, analysts, and fans to understand match dynamics. To provide actionable insights derived from the analysis, helping coaches and teams improve strategies and player performance based on quantifiable data.

## ABSTRACT

This project, “FOOTSAL” a Football Analysis Using YOLO and EAST, enhances football match analysis through real-time computer vision techniques. YOLO detects and tracks players and the ball, while EAST extracts textual data like player names and statistics from broadcast graphics. Key events, such as goals and fouls, are identified, allowing detailed analysis of player performance metrics. The system provides a user-friendly interface that delivers actionable insights for coaches, analysts, and fans, improving strategic decision-making and viewer engagement.

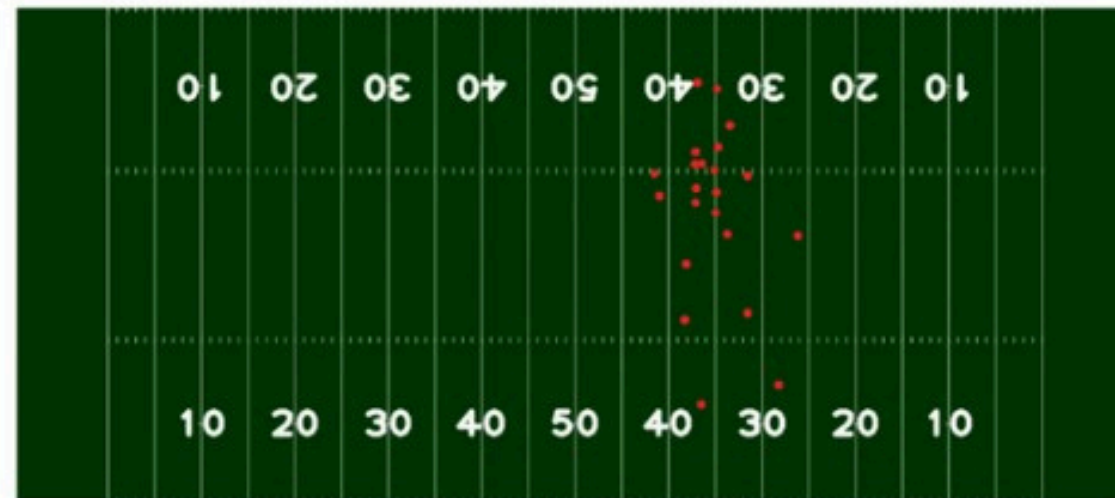
- **YOLO for Fast and Accurate Detection:** YOLO's ability to detect players and the ball in a single pass enhances speed and efficiency, compared to multi-stage object detection models like Faster R-CNN.
- **EAST for Efficient Text Extraction:** EAST's direct extraction of text information from broadcast footage provides critical game statistics, such as player names, scores, and time, enhancing the analysis with real-time data that existing systems miss.
- **By analyzing the spatial relationships between players and the ball,** the system will automatically detect key events like goals, fouls, passes, and assists. For example, when the ball crosses the goal line and is near a player, the system will register this as a goal event.



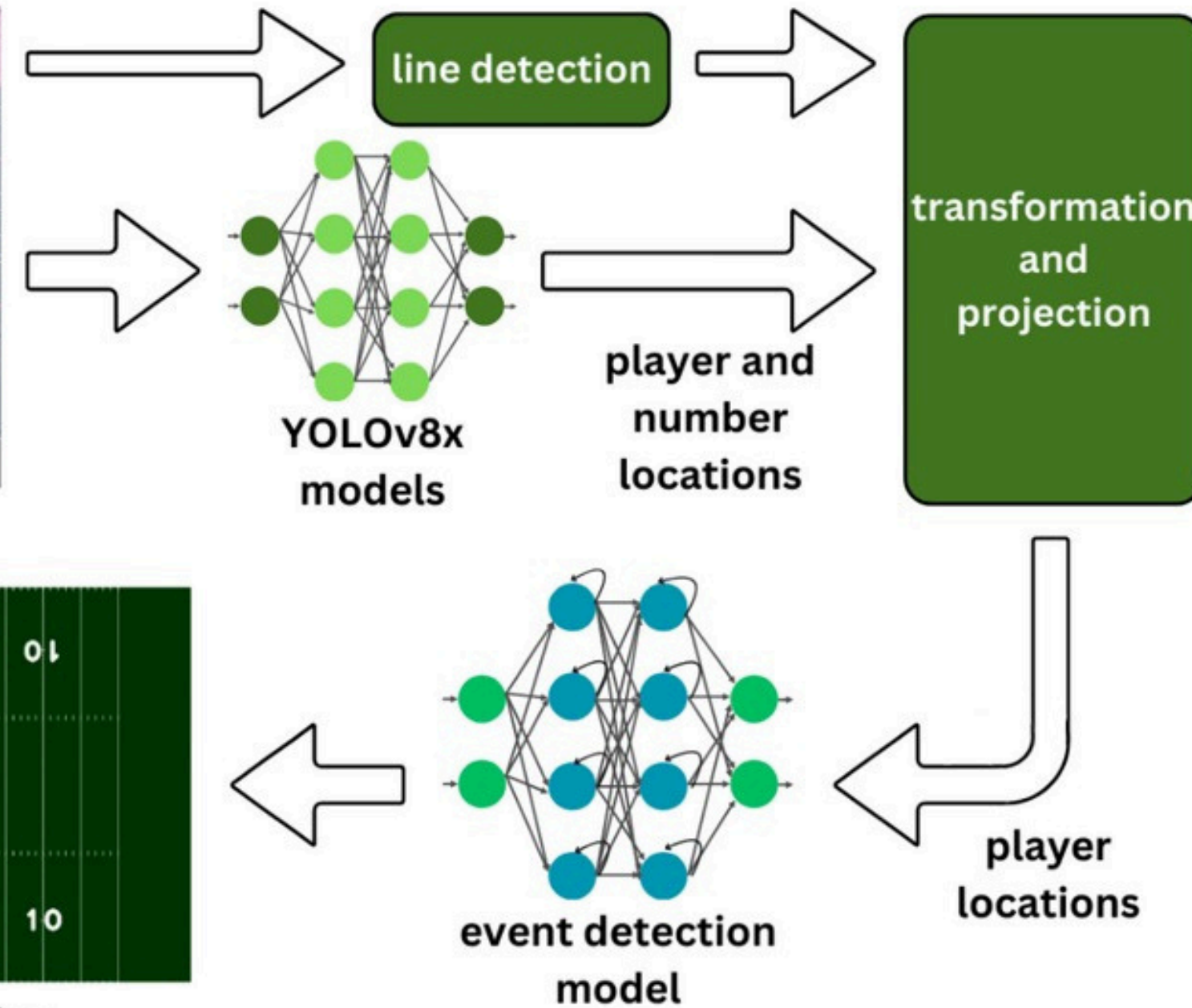
# ARCHITECTURAL DESIGN FOR PROPOSED SYSTEM



football game video clip



locations of players in formation



### 1. Object Detection (YOLO)

- YOLO (You Only Look Once): YOLOv5 and other YOLO versions are widely used for fast and accurate real-time object detection. YOLO detects and identifies players, the ball, and other on-field objects, enabling automated tracking and monitoring during live games. SSD (Single Shot Detector) and Faster R-CNN are also used in some systems for object detection but are generally slower than YOLO for real-time applications.

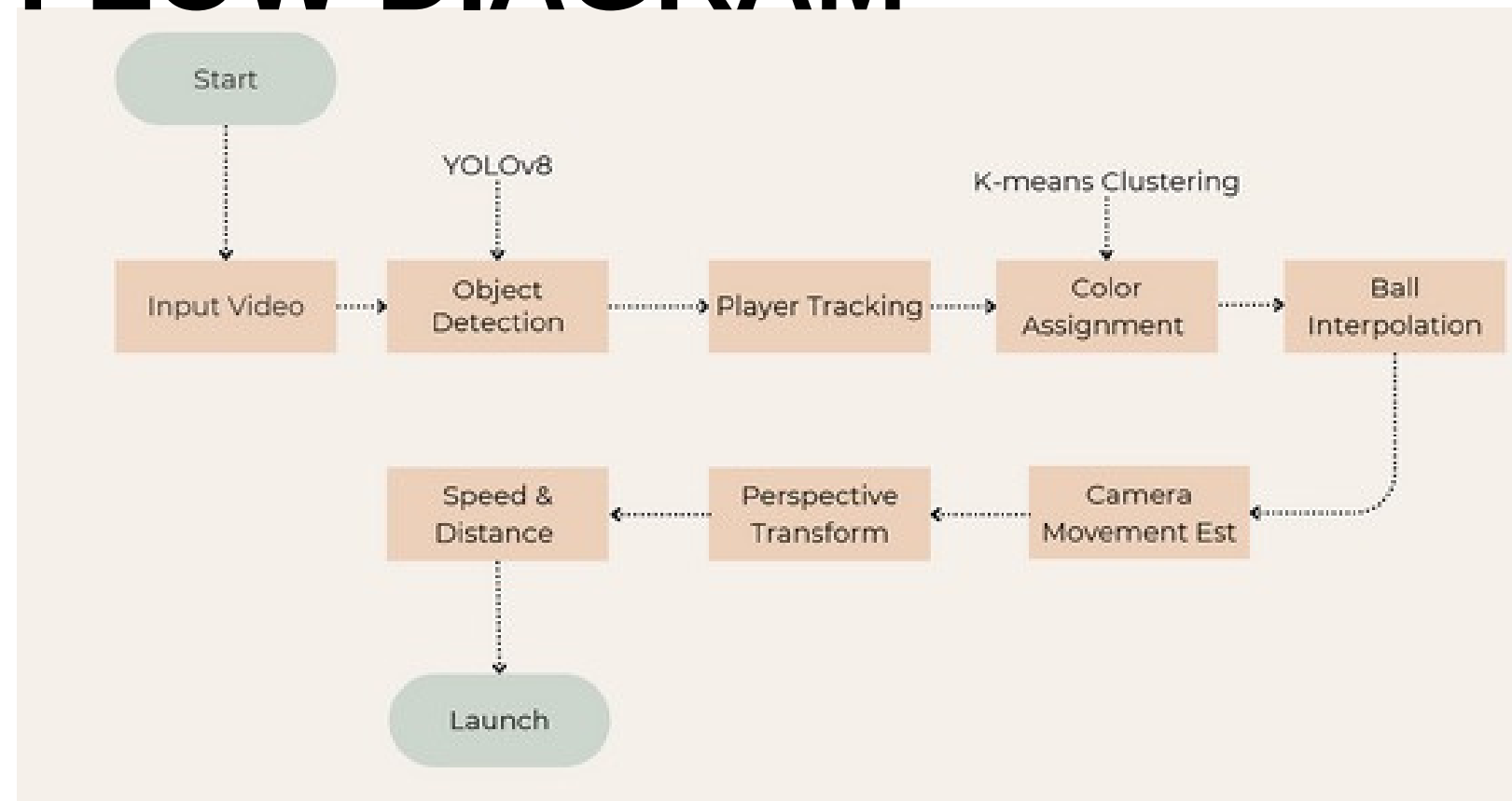
### 2. Text Detection and Recognition (EAST and OCR)

- EAST (Efficient and Accurate Scene Text Detector): EAST is commonly used to detect text in broadcast overlays, scoreboards, and player stats on live video feeds. It efficiently locates text regions, which can then be processed for recognition. OCR (Optical Character Recognition): OCR tools like Tesseract are applied to the text detected by EAST, allowing automatic extraction of broadcast statistics like scores, player names, or substitution notifications.

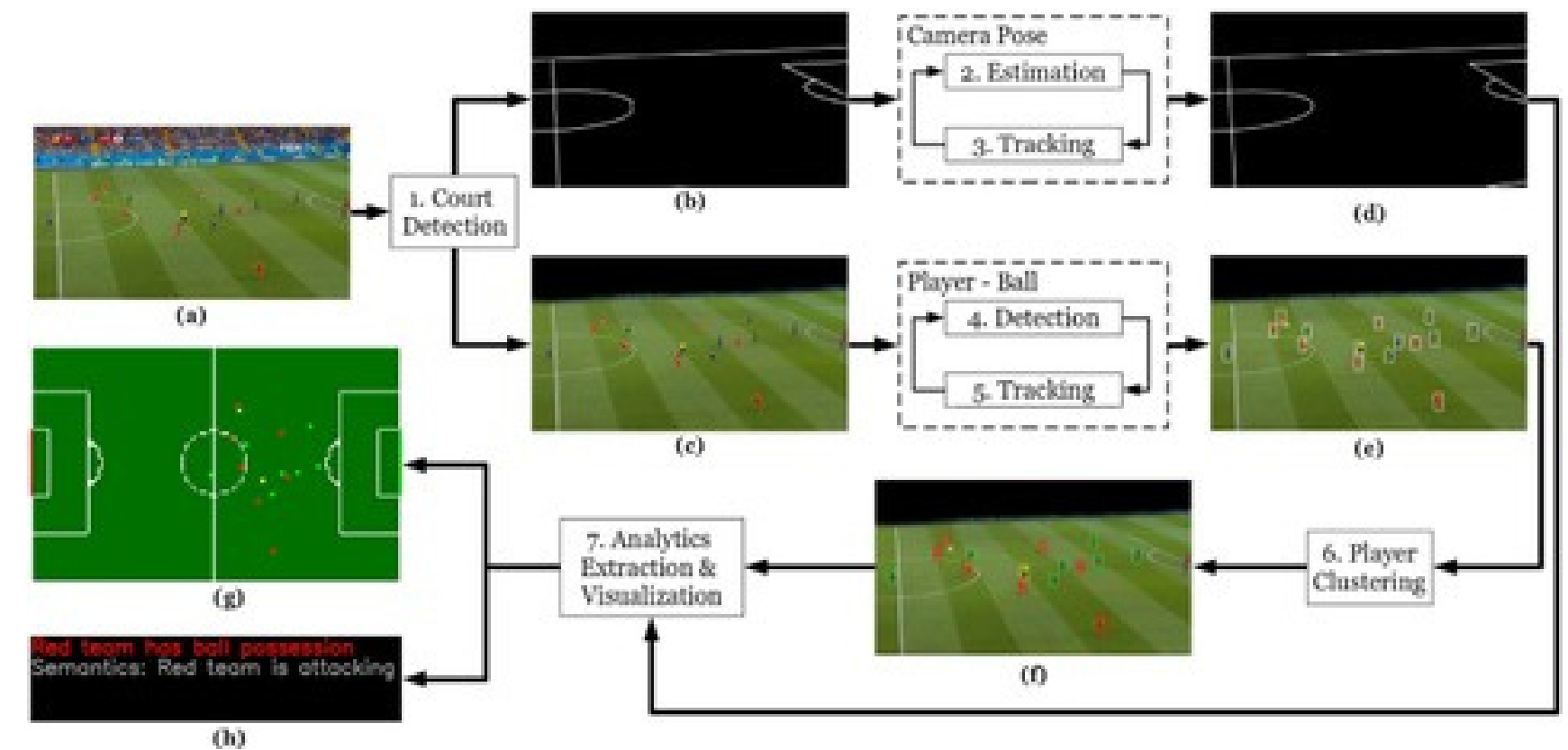


# ER/USE CASE DIAGRAM

## FLOW DIAGRAM



## MODEL FLOW



- **Real-Time Analysis:** YOLO and EAST enable quick detection of players, ball, and broadcast text, providing immediate insights.
- **Automated Event Detection:** The system automatically identifies goals, fouls, passes, and assists by analyzing spatial relationships, reducing manual work.
- **Improved Accuracy:** Automation minimizes human error and enhances the consistency of data.
- **Enhanced Decision-Making:** Coaches and analysts get timely, accurate insights, supporting better tactical choices.
- **Efficient Data Handling:** Handles large data volumes faster and more effectively than traditional methods.

## LITERATURE REVIEW

- **YOLO for Object Detection:** Studies show that YOLO is highly effective for real-time detection of players and ball positions due to its single-pass architecture, which is faster and more efficient than multi-stage detectors like Faster R-CNN (Redmon et al., 2016).
- **EAST for Text Extraction:** The EAST model has proven valuable in extracting text from broadcast footage, such as scores and player stats, directly from frames, supporting immediate access to critical game data (Zhou et al., 2017).
- **Automated Event Detection with Spatial Analysis:** Research in sports analytics highlights the importance of spatial relationships for identifying key events like goals and passes, enabling automated tagging that reduces manual effort (Shi et al., 2020).
- **Reduced Human Error through Automation:** Automated systems in sports analytics have been shown to enhance accuracy by minimizing human intervention, leading to consistent and reliable analysis outcomes (Wang & Lee, 2019).
- **Real-Time Decision Support:** Studies emphasize that real-time data access improves coaches' and analysts' ability to make prompt, informed decisions during games, supporting dynamic tactical adjustments (Gade et al., 2018).

## REFERENCES:-

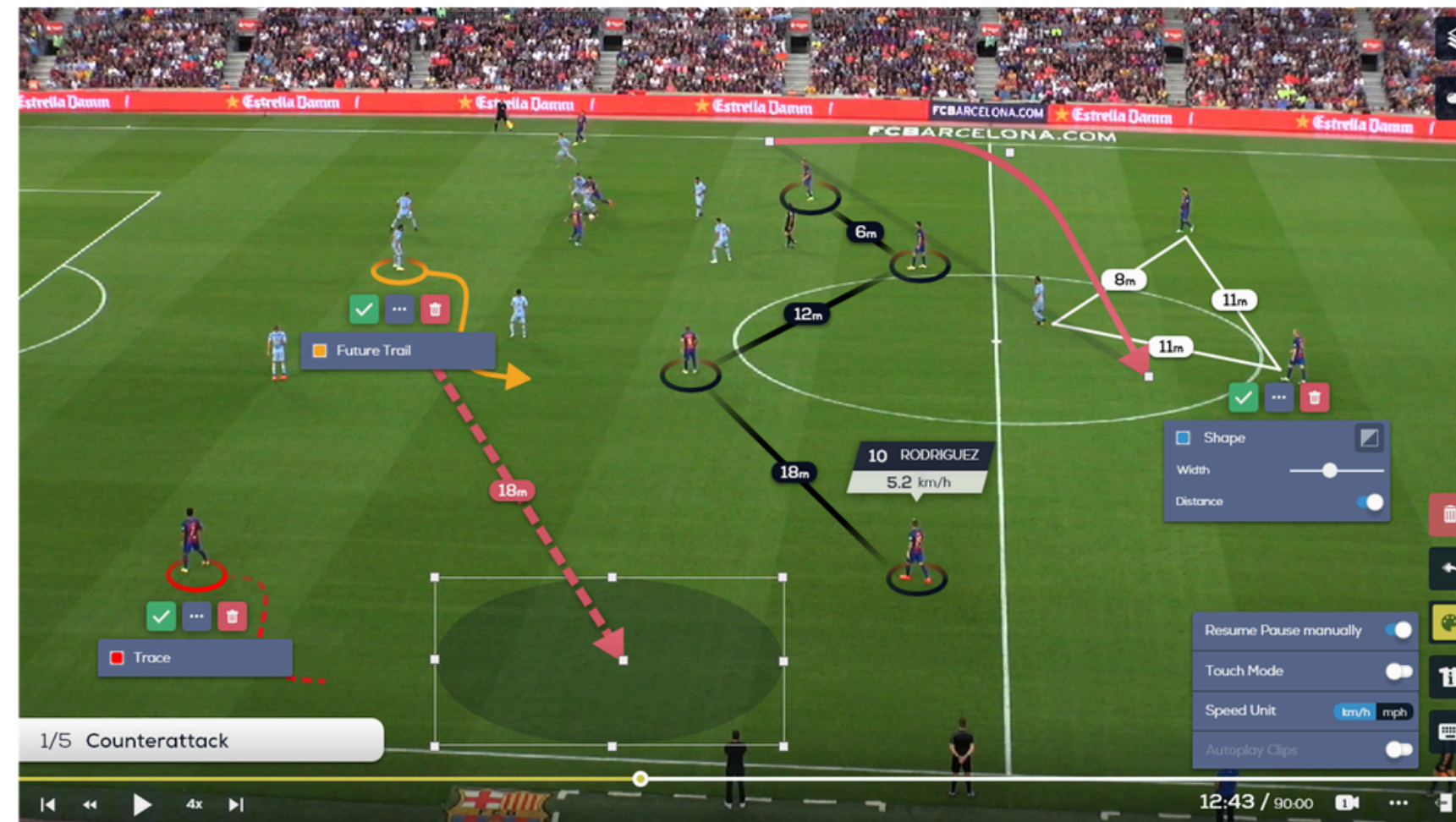
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## Results and Discussions:-

### Results Overview:-

- This project applied YOLOv5x ultra for object detection and EAST for text extraction in football game analysis. We used a 36 video with 750 frames, tracking players and the ball and extracting broadcast statistics. Key results include:





## CONCLUSION

In conclusion, the integration of computer vision techniques, such as YOLO for player and ball detection and tracking, revolutionizes football analysis by providing real-time insights into player performance, team formations, and key match events. By tracking speed, distance covered, and ball possession, the system offers valuable data to coaches and analysts for enhancing strategies and decision-making. Additionally, the use of visual augmentations and statistics further improves the viewer experience and engagement. This approach ultimately empowers teams with a more comprehensive understanding of the game, leading to better performance optimization and tactical planning.

**THANK YOU!!**