



CS5330

Final Project

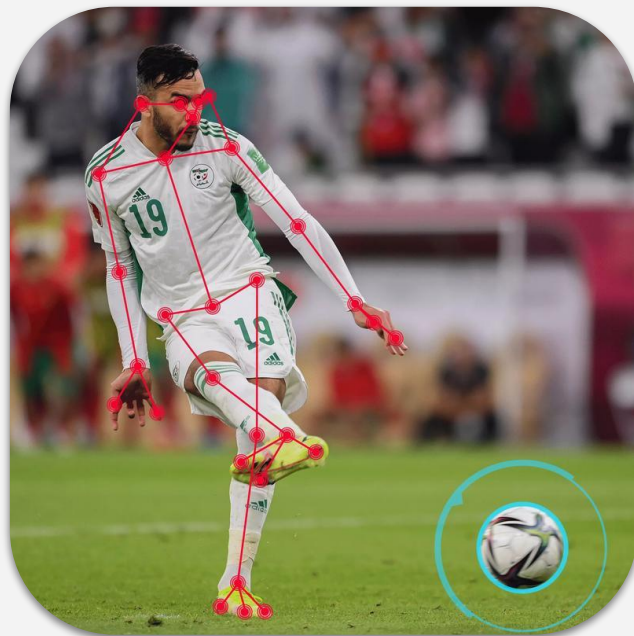
Presented by: Leonardo DaGraca, Priyanka Dipak
Gujar, Joseph Farrell, and Harshil Bhojwani



Introduction

This project's purpose was to use computer vision techniques to analyze football video data.

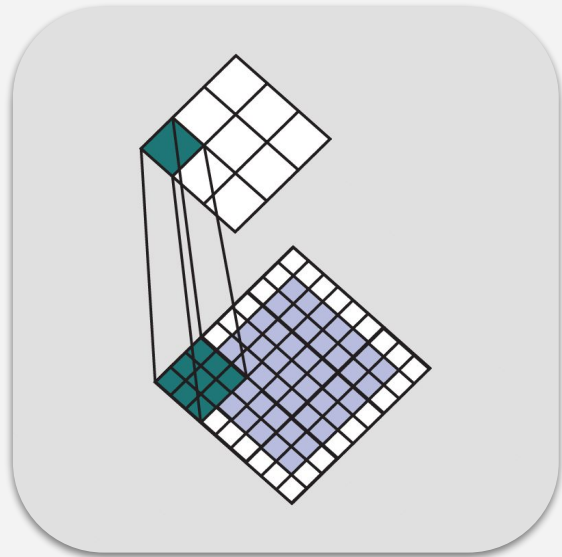
Our goals were to detect all active players on the pitch, differentiate teams by color, and track the ball while it is in play.



Approach

We knew we had to go about this by using a modern deep learning model to detect the desired objects in the video. Classical CV approaches alone may not suffice and would potentially be tedious to implement.

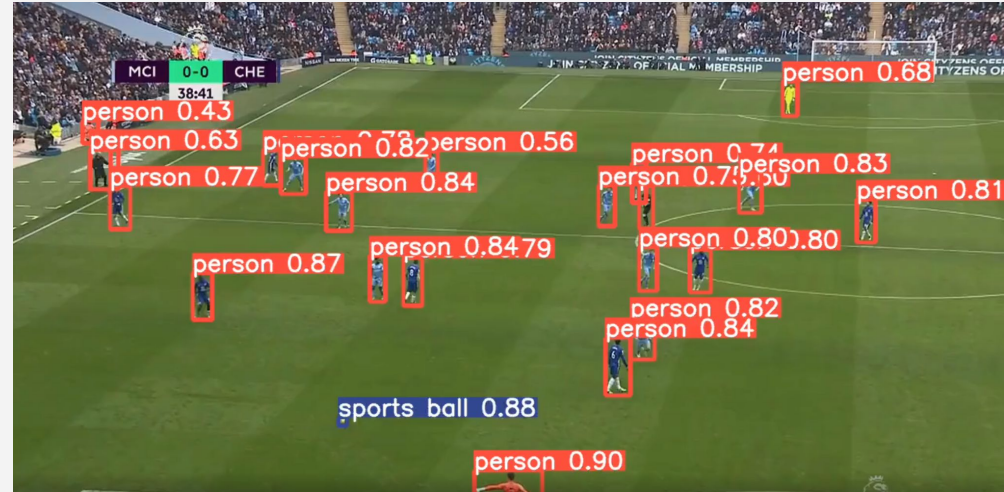
We decided to use the YOLOv8 network, pre-trained on the COCO dataset.



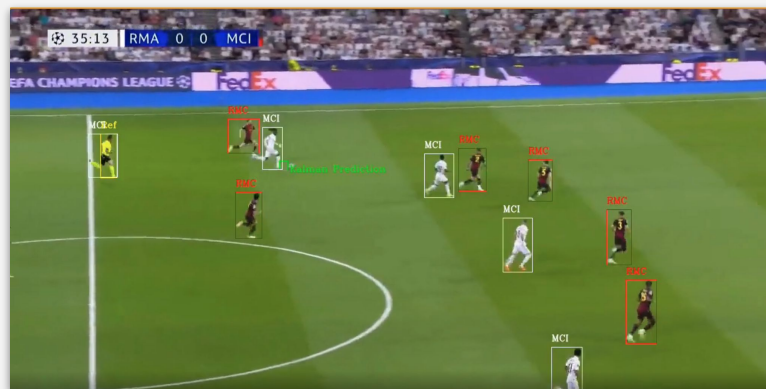
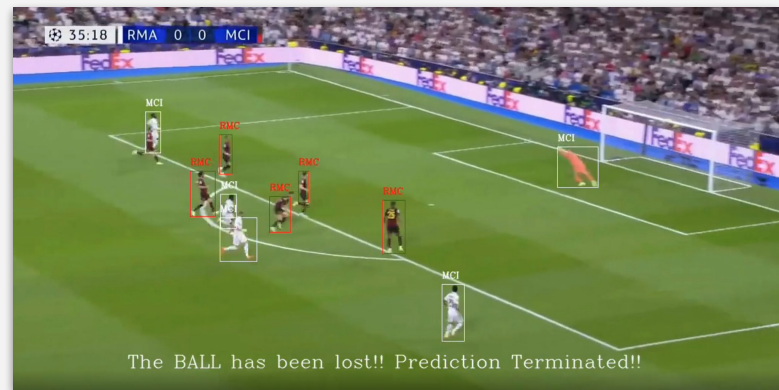
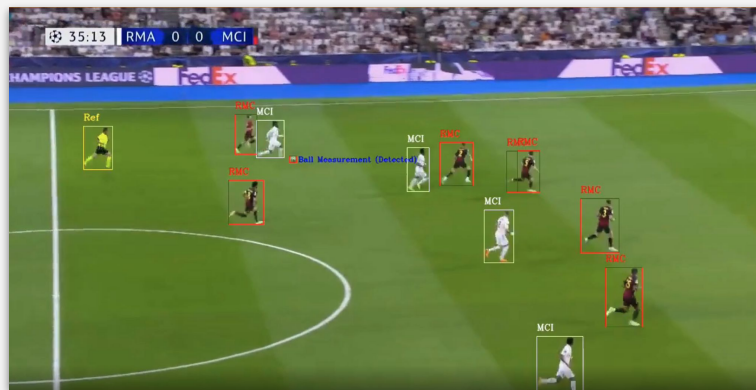
Approach

YOLOv8 serves as a robust starting point and is able to detect individuals quite easily.

However, it could not detect the ball or differentiate between individuals as easily.

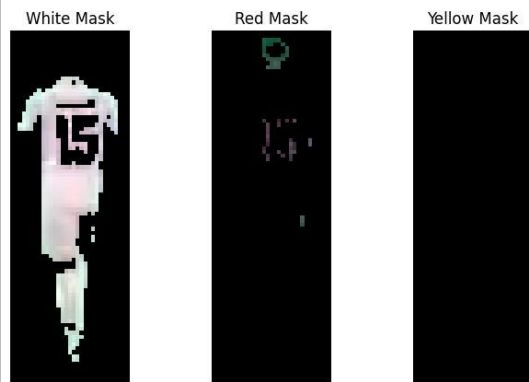


Methods - Ball Tracking



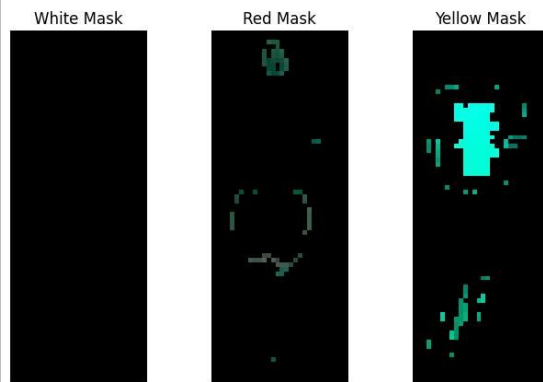
Methods - Differentiate Objects

**Masking Outcome for Player Bounding Box
BGR Color Space**



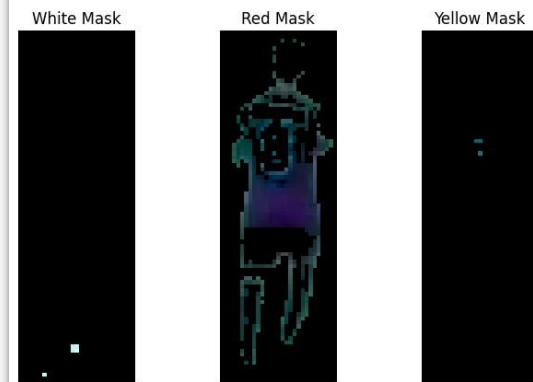
Person is wearing "White"

**Masking Outcome for Player Bounding Box
BGR Color Space**



Person is wearing "Yellow"

**Masking Outcome for Player Bounding Box
BGR Color Space**

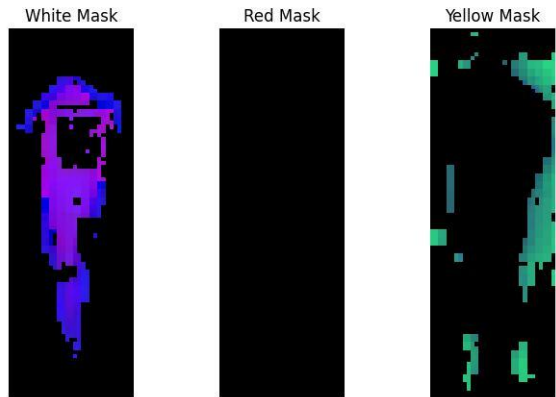


Person is wearing "Red"



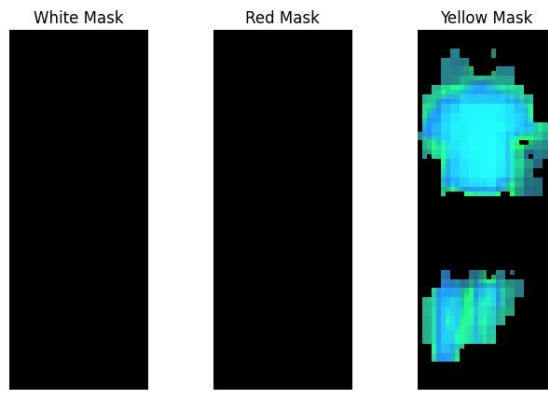
Methods - Differentiate Objects

**Masking Outcome for Player Bounding Box
HSV Color Space**



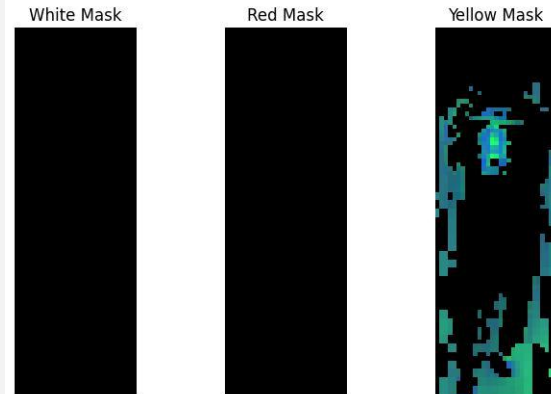
Person is wearing "White"

**Masking Outcome for Player Bounding Box
HSV Color Space**



Person is wearing "Yellow"

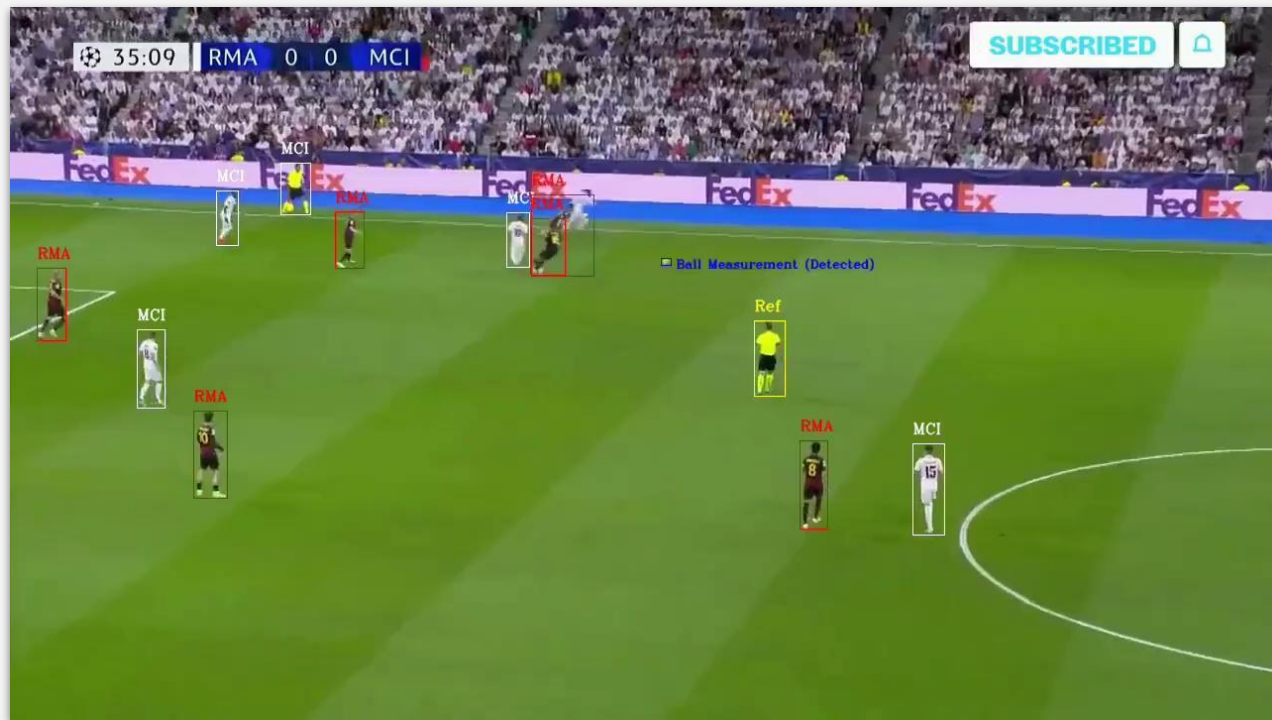
**Masking Outcome for Player Bounding Box
HSV Color Space**



Person is wearing "Red"

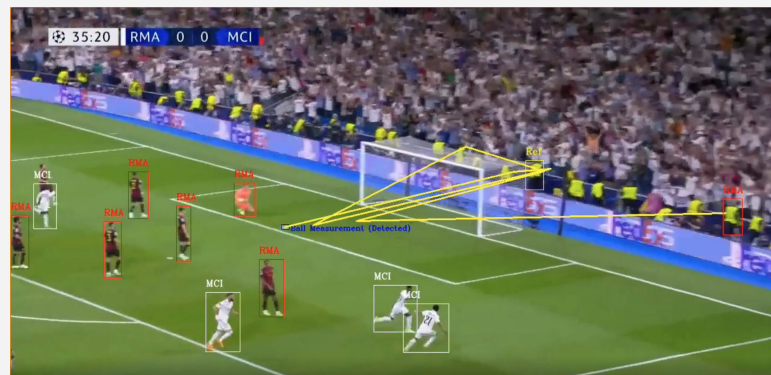
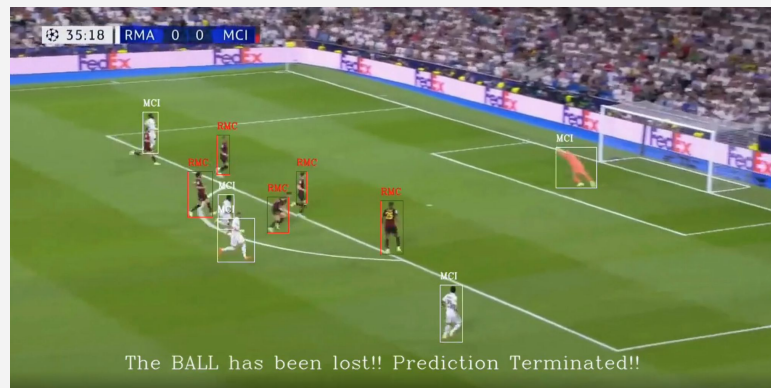


Experiments & Results



Limitations

- Inefficient ball detection for small feature set.
- Inaccurate results while calculating ball velocity, ball possession, mapping ball trajectory.
- Undesirable output for long trajectories results for mapping a 2d ball trajectory for a frame extracted in 3d space..



Conclusion

Achievements

- Player detection
- Team classification
- Ball tracking
- Applying classical CV techniques with modern techniques



Improvements

- Retrain YOLO on our own curated database
- Using K-means to differentiate teams
- Ball trajectory

