

Soccer Player Re-Identification Across Camera Views

Introduction

This project aims to re-identify soccer players across two distinct camera feeds: a tacticam view and a broadcast view. The goal is to ensure that each player is consistently identified with the same ID across both feeds, even if they move out of view temporarily.

Approach and Methodology

The approach follows a three-stage pipeline:

1. **Detection**: Using YOLOv11 (fine-tuned), we detect players in both video streams.
2. **Tracking**: DeepSORT is used to assign unique track IDs to detected players across frames.
3. **Re-Identification**: A ResNet-based embedding extractor is applied to cropped player images to generate appearance embeddings. These are then matched across both views using cosine similarity.

This pipeline was chosen to balance speed (YOLO) and reliable identity consistency (DeepSORT + embeddings).

Techniques Tried and Their Outputs

Apart from the main pipeline, I explored a few alternative techniques:

- **Color histogram matching**: Compared player uniforms using HSV histograms. Too sensitive to lighting.
- **Pose estimation**: Tried using keypoints with MediaPipe, but occlusions reduced reliability.
- **Jersey number OCR**: Considered Tesseract OCR on back of jerseys, but not all frames showed visible numbers.

In comparison, appearance embeddings from ResNet offered the best trade-off between reliability and robustness.

Challenges Encountered

Several challenges came up during the project:

- **Frame drops and crashes**: Solved by saving last processed frame and resuming from that frame.
- **Similar-looking players**: Solved partly by averaging appearance embeddings over time.
- **Inconsistent lighting and angles**: Addressed by normalizing image crops before embedding extraction.

These were tackled by improving the embedding logic and maintaining a clean metadata structure per video.

Conclusion

The project successfully creates a mapping between player IDs across two camera feeds using detection, tracking, and embedding-based appearance matching. While some challenges remain in handling occlusions and similar appearances, this pipeline lays a strong foundation for consistent cross-camera player tracking in sports analytics.