Re-Identification in a Single Feed

Objective

The goal of this project is to simulate real-time player re-identification in a 15-second football video. Each player is assigned a unique ID during the initial few seconds, and the same ID is retained even when players exit and re-enter the frame later in the clip.

Approach and Methodology

1. Detection:

- Used YOLOv11 for detecting players and the ball in each frame.

2. Feature Extraction:

- Extracted appearance features using a pretrained ResNet model.

3. Re-Identification:

- Assigned IDs based on visual embeddings.
- Used cosine similarity for identity matching.

4. Tracking:

- Applied a centroid-based tracker with memory buffer for occlusion handling.

Techniques Tried & Outcomes

- YOLOv11: High recall for players (~95% accuracy).
- ResNet Embeddings: Effective at distinguishing players.
- Cosine Similarity: Robust for short-time matching.
- IoU-based Filtering: Helped remove duplicate detections.

Challenges Encountered

- Difficult to re-identify similar-looking players after occlusion.
- Players moving fast or partly out of frame caused mismatches.
- Real-time processing synchronization was challenging.

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Incomplete / Future Work

- Advanced trackers like Deep SORT or ByteTrack could improve accuracy.
- Adding a re-ID confidence threshold could reduce false matches.
- Model currently lacks Kalman Filtering and global optimization.

Files Provided

- main.py: Pipeline execution.
- reid_utils.py: Identity matching functions.
- video_handler.py: Frame processing and video handling.
- README.md: Setup instructions.
- report.pdf: This report.