Cross-Camera Player Re-Identification - Report

Objective

To identify and match the same players across two different video streams (broadcast and tacticam) using object detection and appearance-based re-identification.

Methodology

1. Player Detection

- Used a fine-tuned YOLOv8 model to detect players in both broadcast.mp4 and tacticam.mp4.
- Each frame was parsed, and detected players were cropped and saved for further comparison.

2. Re-Identification

- Used a ResNet18 model pretrained on ImageNet for feature extraction.
- Generated embedding vectors for each cropped player image from both views.
- Computed cosine similarity between all pairs and chose top matches.
- Saved results as a CSV file.

Techniques Attempted

- **Model Loading Variants:**
    - Initially attempted to load the YOLOv8 model via ultralytics.YOLO, but due to serialization issues, switched to PyTorch's torch.load for raw model use.
- **Feature Matching:**
    - Used cosine similarity between feature vectors.
    - Basic one-to-one greedy matching was implemented for simplicity.

Challenges

- **Model Serialization Errors:**
    - Encountered Ultralytics internal module conflicts when loading .pt weights.
    - Resolved by falling back to PyTorch-native loading.

- **Player Overlap and Occlusion:**
    - Many player detections had overlapping or occluded instances, making re-identification difficult.
- **Compute Time:**
    - Running entirely on CPU made the process slower. GPU would significantly improve performance.

Final Output

- matched_players.csv lists player pairs between cameras.
- Can be used to trace player identity consistently across both views.

Incomplete Aspects

- No UI for visualization of matched results.
- Does not yet use temporal or spatial tracking.
- Could integrate better models like OSNet or custom ReID-trained networks.

Future Work

- Improve accuracy using metric learning and temporal consistency.
- Implement advanced tracking algorithms.
- Optimize for real-time performance.

Conclusion

A working pipeline was developed to detect and match players across multiple views using a detection + ReID approach. Despite limitations, it serves as a solid baseline for real-world sports analytics applications.