**Player Re-identification Across Views**

***LIAT.AI Internship Assignment***

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**1. Objective**

The goal of this project is to **detect, track, and re-identify football players** across two distinct video feeds—**broadcast** and **tacticam**—using advanced computer vision techniques. The challenge lies in maintaining **consistent identities** across varying angles, resolutions, and occlusions.

**2. Methodology**

**2.1 Detection and Tracking**

* A **fine-tuned YOLOv8** model (best.pt) was used to detect **players and balls** in each frame.
* **DeepSORT** tracking algorithm was employed to associate detections over time, assigning unique IDs to each player.
* Tracking results were saved as .pkl files (broadcast\_tracks.pkl, tacticam\_tracks.pkl) for **faster re-processing**.

**2.2 Cross-View Identity Matching**

* For each **Tacticam-tracked player**, the **most informative frame** was chosen based on bounding box area.
* The selected region was **cropped and passed through a ResNet18** model to extract **deep feature embeddings**.
* Embeddings were compared against broadcast player tracks using **cosine similarity**.
* A **composite matching score** was generated using both **visual similarity** and **spatial heuristics**, helping determine the most likely broadcast match.

**3. Results & Outputs**

* player\_mappings.csv: Contains the final mapping of **Tacticam IDs to Broadcast IDs**.
* results/matches/: Folder with **side-by-side cropped match images** showing visual correspondences.
* .pkl files: Cached tracking data for both video streams.

Example log output:

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Broadcast IDs: ['1', '3', '23']

Tacticam IDs: ['2', '4']

🔄 Matching Tacticam ID: 2

**4. Challenges**

* **Low-resolution bounding boxes** at distance affected embedding quality.
* Certain players were **not visible in both views**, causing false negatives.
* Lack of **jersey number OCR** and **camera calibration** hindered accurate mapping.
* **Lighting differences** and **camera motion** added to visual discrepancies between feeds.

**5. Future Improvements**

* Integrate **OCR-based jersey number detection** to improve match accuracy.
* Use **temporal matching** (over multiple frames) for increased robustness.
* Apply **jersey color clustering** to assist in team-based heuristics.
* Explore **CLIP or other vision-language models** for more powerful feature embeddings.
* Consider **camera geometry estimation** to align spatial views more precisely.