

# Assignment Report

## Player Re-Identification in Sports Footage

### Re-Identification in a Single Feed

#### 1. Approach and Methodology

This project focuses on player re-identification in a single video feed, commonly encountered in sports footage. The objective is to track players across frames and consistently assign IDs, even when they temporarily disappear and reappear.

##### Architecture Overview:

>YOLOv8 is used for player detection in each frame.

>BoT-SORT tracker, enhanced with a Re-Identification (ReID) module, maintains identity across frames.

>A custom .pt ReID model is integrated to compare appearance-based features.

Ultralytics' track() method is used with:

- tracker\_type: botsort
- with\_reid: True
- reid.model: path/to/reid\_model.pt

##### Processing Pipeline:

1. Load the trained YOLOv8 detection model.
2. Initialize BoT-SORT tracker with ReID.
3. Perform tracking on the input video.
4. Combine appearance and motion data to assign consistent IDs.
5. Save the output with bounding boxes and re-identified player **IDs**

#### 2. Techniques Tried and Their Outcomes

| Technique                    | Purpose                       | Outcome  |
|------------------------------|-------------------------------|--|
| <b>YOLOv8 Detection</b>      | Detect players frame-by-frame | Accurate and real-time detection achieved          |
| <b>BoT-SORT Tracker</b>      | Motion-based tracking         | Successfully retained IDs during movement          |
| <b>ReID .pt Model</b>        | Match player appearances      | Preserved identity even after re-entry             |
| <b>Custom Tracker Config</b> | Fine-tuned with parameters    | Prevented ID fragmentation and enhanced robustness |

#### Config Parameters Used:

- with\_reid: True
- reid: { model: 'reid\_model.pt' }
- proximity\_thresh, appearance\_thresh, fuse\_score, track\_buffer, etc.

### 3. Challenges Encountered

| Challenge                                   | Description  |
|---|--|
| <b>Appearance Variability</b>               | Players wearing similar uniforms or accessories created ambiguity for the ReID model, making identity assignment difficult.    |
| <b>Occlusion and Overlap</b>                | Player collisions or close interactions caused partial occlusion, leading to ID switches or temporary loss of tracking.        |
| <b>Camera Motion</b>                        | Fast pans, zooms, and viewpoint shifts during gameplay caused temporary tracking failures and reduced ID continuity.           |
| <b>Re-identification After Long Absence</b> | Players who exited the frame for longer durations often re-entered with different lighting or orientation, complicating re-ID. |
| <b>Illumination and Motion Blur</b>         | Rapid motion during play and varying lighting conditions degraded detection and appearance feature quality.                    |

| Challenge                            | Description   |
|--------------------------------------|---|
| Limited Generalization of ReID Model | The ReID model, trained on limited samples, struggled to generalize across different scenes or player angles. |

## 4. Project Summary

| Component       | Description  |
|-----------------|--|
| Detection Model | YOLOv8   |
| ReID Model      | Custom .pt classification model                        |
| Tracker         | BoT-SORT with ReID enabled                             |
| Input           | MP4 sports video (720p resolution)                     |
| Output          | Video with annotated bounding boxes and player IDs     |
| Key Feature     | Re-identifies players on re-entry within a single feed |