

Real-Time Player Tracking Using YOLOv11

Introduction : -

This project focuses on real-time player detection and tracking from a 15-second football video using a fine-tuned YOLOv11 model. The primary objective is to maintain unique player IDs, even when players leave the frame and return.

Approach and Methodology : -

Model: A custom-trained YOLOv11 object detection model was used to detect 'player' and 'ball' classes.

Tracker: ByteTrack (used in Ultralytics) was used for tracking.

Workflow:

1. Load video using OpenCV.
2. Run YOLOv11 on each frame.
3. Track players and assign/display IDs.
4. Show live annotated video using OpenCV.

Challenges Encountered : -

a) Slow Inference on Local Machine (No GPU):

1. Without GPU acceleration, YOLOv11 + tracker performed slowly.
2. Dropped frames led to missed detections and tracker resets.
3. Result: Player IDs were frequently reassigned when the frame rate lagged.

b) ID Reassignment on Occlusion or Exit:

1. ByteTrack, being motion-based only, cannot distinguish players based on appearance.
2. When a player leaves and re-enters the frame, the tracker assigns a new ID.
3. This breaks the main project goal of consistent identity over time.

Techniques Tried and Their Outcomes : -

1. ByteTrack (Ultralytics) - Easy to integrate. Worked well when all players stayed in-frame. Failed for re-entries.
2. Custom Centroid Tracker - Very fast, but inaccurate in crowding or when players overlapped.

Remaining Work and Future Plans : -

1. Integrate StrongSORT with Re-ID features.
2. Export tracking results to CSV and save annotated videos.
3. Deploy to GPU environments (e.g., Google Colab, AWS EC2)