

## Cross-Camera Player Re-Identification

### Approach and Methodology

- Used **Ultralytics YOLOv11** fine-tuned on player and ball detection.
- Used **DeepSORT** for consistent player tracking within each video.
- Saved player crops frame-by-frame.
- Extracted appearance features using pre-trained **ResNet50** (from torchvision).
- Matched players using **cosine similarity** between ResNet feature vectors.

### Techniques Tried and Outcomes

- Tried both direct feature matching and simple heuristic checks (e.g., crop size, position) — feature-based approach was more reliable.
- Tried averaging features over multiple frames — improved consistency.
- DeepSORT provided reliable tracking but suffered when players overlapped or went off-frame.

### Challenges Encountered

- Camera angles had significant differences in lighting and player orientation.
- Some players wore similar uniforms causing confusion in appearance-only matching.
- Players occluding each other caused DeepSORT to assign wrong track IDs in some cases.
- Computational cost was high for feature extraction on every crop.

### If More Time / Resources:

- Train a dedicated **person re-ID model** (OSNet, FastReID) on sports player datasets.
- Use temporal smoothing or motion-based features to improve re-ID stability.
- Use ball/player interaction data to refine player identity matching.
- Optimize tracking for real-time or faster batch processing.

### Current Status

- Achieved **basic player mapping across two camera views**.
- Verified some player IDs remain consistent across both feeds.
- Not perfect, but clearly demonstrates feasibility.

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End of Report