

Sports Analytics: Ball Tracking Dashboard

Overview

The Sports Analytics: Ball Tracking Dashboard is an advanced computer vision-based platform developed for cricket analytics. It features automated ball trajectory detection and real-time visualization using deep learning models such as Detectron2, EfficientDet, and RetinaNet. The system accurately tracks the cricket ball's movement even under challenging conditions like high velocity, occlusions, and variable lighting, providing actionable insights for coaches, analysts, and players.

This project bridges the gap between AI-powered video analysis and interactive visualization, offering a real-time decision support tool that enhances fairness, transparency, and performance evaluation in the sport of cricket.

Technical Architecture

- Detectron2, EfficientDet, and RetinaNet: Object detection frameworks for cricket ball tracking.
- Python & PyTorch: For model training, fine-tuning, and inference.
- PyQt: GUI framework used to build an interactive trajectory visualization dashboard.
- OpenCV: For frame extraction, image preprocessing, and visualization.
- Numpy & Pandas: For data manipulation and trajectory calculations.
- Matplotlib: For plotting path and trajectory insights in real-time.

Features

- Precision Ball Tracking: Deep learning models trained with transfer learning on custom cricket datasets for accurate detection under varying conditions.
- Trajectory Visualization: PyQt-based GUI dynamically visualizes the ball's path and key events like impact points and angle changes.
- Automated Video Analysis: Frame extraction and detection workflows automate analysis of both live and recorded matches.
- Real-Time Feedback: Provides immediate visual and statistical feedback for coaching and umpiring.
- Performance Optimization: Path smoothing and adaptive frame rate analysis enhance processing speed and accuracy.

Benefits / Impact

- Enhanced Decision Support: Assists umpires and coaches in analyzing trajectory and impact events.
- Improved Training Analytics: Provides detailed ball movement data to optimize player performance.

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- Automation: Reduces manual review time through AI-driven detection and visualization.
- Real-Time Analysis: Enables immediate insights during live games.
- Transparency & Fairness: Minimizes human error and enhances the credibility of umpiring decisions.

Demonstrated Skills

- Computer Vision and Deep Learning (Detectron2, EfficientDet, RetinaNet)
- Transfer Learning and Model Optimization
- GUI Development with PyQt
- Video Frame Processing with OpenCV
- Real-Time Data Visualization and Trajectory Analysis
- Sports Analytics and Applied AI Engineering