Term Project - Project Proposal

Course Number	CPS 843/CP8307
Course Title	Introduction to Computer Vision
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Project Overview

Basketball Action Recognition Using Computer Vision

The purpose of our project is to develop a tool able to recognize and identify various basketball actions performed in games including but not limited to shooting the ball, dunking the ball, and players blocking other players. Additionally, our tool will be capable of tracking the current location of the ball on the court as well. Our tool will take in and analyze footage of basketball games, whether professional or amateur leagues, to record and display the amount of times a specific action was performed in play. This will be helpful towards performance analysis and the effectiveness of certain techniques.

Project Objectives

- ☐ Train a Computer Vision model capable of detecting basketball actions with high accuracy.
- ☐ Classify and label objects where the model believes is an action.
- ☐ Recognize when the ball has entered the basket.
- ☐ Record and display amount of times a specific action was performed in play.
- ☐ Track the basketball in play with high accuracy and precision.
- ☐ Determine which team a player is on depending on the jersey color.

Technology Stack

- Python
- OpenCV
- YOLOv5/YOLOv8, SpaceJam, etc. (Pre-existing sports trained model we can build upon)
- Tensorflow or PyTorch (for potential model training and fine tuning of pretrained models.)
- LabelBox, CVAT or OpenCV built-ins for annotating the basketball actions

Potential Challenges

Some potential challenges we may run into are tracking the ball, potential variability of movements as basketball is a very dynamic game. For instance, if there is a situation where the ball is obstructed by a crowd of players, the model may struggle keeping track of the basketball. In other situations, the ball may be moving too fast for the camera or out of frame, these challenges are primarily due to the hardware and setting rather than the actual program. Furthermore, some courts may look different than others. Taking this into account, our model will train off images/videos from various NBA courts to ensure that our model is not confused by the sudden color shifts and court layouts. We will also have to consider any false positives that may be triggered as a result of players faking certain actions common in play (faking a shot, faking a pass, etc). Lastly, we will have to consider the computational resources that real-time computer vision requires to optimize the performance of our tool while still remaining accurate.