Highlight Reel Creation from key soccer match events using Computer Vision

Bryan Mbanefo, Peter Nsaka, Yaron Sternberg

INTRODUCTION

Soccer video highlight generation is the process of creating short, edited clips of key moments from a soccer match for the purpose of summarizing the game and showcasing the most exciting or significant plays. The highlights can be created by manually selecting and cutting footage from a full-length video recording of the match; however, this process can be tedious and time consuming for the video production team.

In this project, we'd explore the automatic generation of soccer video highlights by utilizing machine learning models. This isn't a new problem space and has been explored in other papers such as Darapaneni, Narayana, et al.[1], Paduri et.al[2] amongst others. Our project will focus on the implementation of the YoloV and fast-RCNN models[1] and their evaluation based on speed and accuracy.

DATA

In this project we'd be generating our dataset from easily accessible footage of soccer matches downloaded from youtube. The videos will be converted to a set of images by extracting frames using the openCV library. Generated images will then be labeled by utilizing Labelimg(an image annotation tool) based on key events categories such as foul, corner kick, goal, issuance of cards and penalty kick. It is our goal to generate a dataset of 750 images.
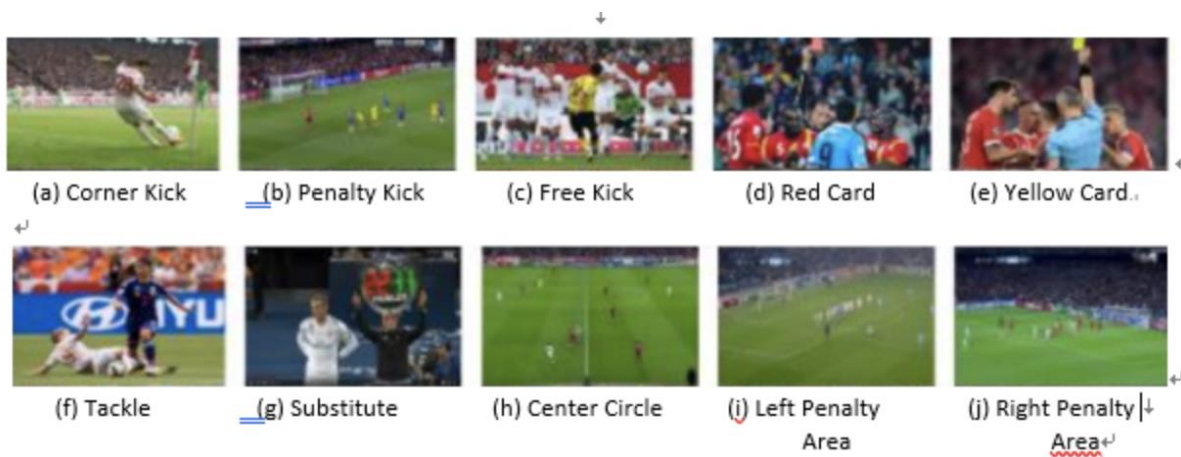

Fig. 1. Sample images representing our test data set

METHOD

The main focus is to implement the Faster-RCNN model for identification of key events in a soccer match. This model already exists and will simply be reimplemented from scratch. Additionally, we'd be working to improve the accuracy of the faster-RCNN model from 95% by a few percentage points. To do this, we'd be exploring various approaches including but not limited to using the LSTM model to identify the sequence and predict actual events better especially like shots at goal or actual goals. We'd also work on increasing the training dataset, improving data augmentation techniques as well as optimizing the model via hyperparameter tuning.
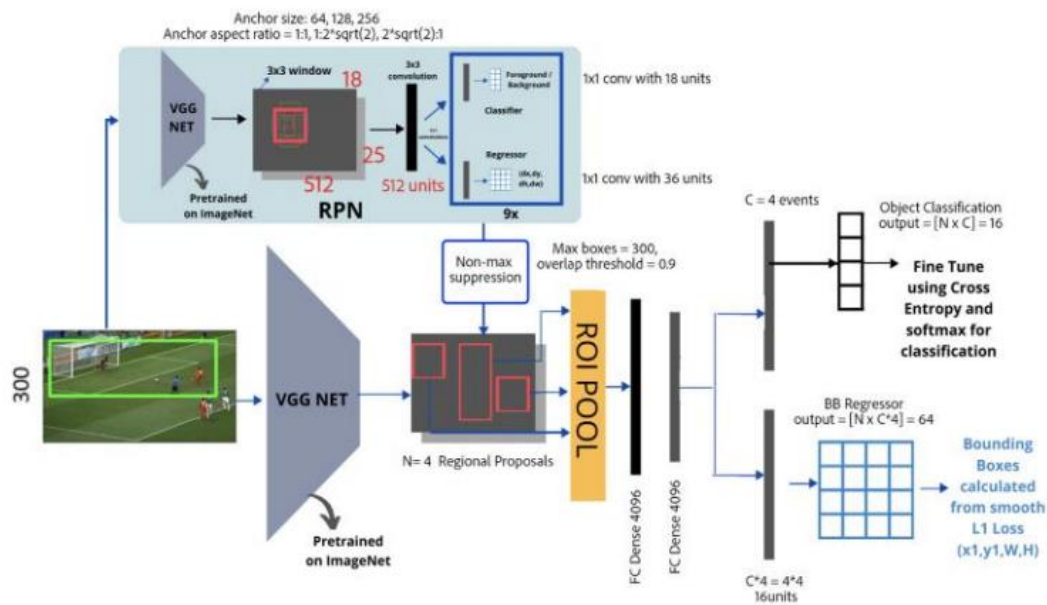

Fig. 2. Illustration of Faster R-CNN Model architecture[1]

EVALUATION AND GOALS

As a baseline evaluation metric, we'd use accuracy of detected events on our test dataset. Secondly we'd be evaluating our improved implementation of the model using LSTM on the original faster R-CNN model and highlight the changes that lead to performance improvements.

PROGRESS TIMELINE

- Generating and labeling training dataset - Feb 10th
- Faster R-CNN Re-Implementation - Feb 27th
- Faster R-CNN Model improvement - March 17th

REFERENCES

1. Darapaneni, Narayana, et al. Detecting Key Soccer Match Events to Create Highlights Using Computer Vision. arXiv, 2022, https://doi.org10.48550/ARXIV.2204.02573.
2. Jacek Komorowski, Grzegorz Kurzejamski, Grzegorz Sarwas: FootAndBall: Integrated player and ball detector. CoRR abs/1912.05445 (2019)