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Project Title: Python Classification of NFL Plays Using Keras

Type of Task: Classification using supervised learning

**Data**

The initial training dataset, as of now, consists of five “run” plays and five “pass” plays pulled from videos from the NFL website. These videos will be broken down into individual frames/images to train our dataset. From there, the classifier that is built will be used to try to correctly classify 6-10 test videos to determine the accuracy of our classifier. If needed, additional tuning and training will be performed to produce a better model.

**Analysis**

To begin analyzing the data, we can initially view video frames using *matplotlib*’s *imread* function. From there, we can create a *mapping* CSV file to label the images/frames taken from our training video set to determine labels for each frame (pass/run/neither). We can then use the VGG16 pretrained model from *keras* to preprocess the input image/frame data and create training, test, and validation data sets. With these sets created and preprocessing done, a model can be built and compiled, used to make predictions, and its accuracy will be determined. If needed, additional training and parameter tuning can be performed depending on the accuracy of our model.

**Anticipated Difficulties**

There are a couple anticipated difficulties with this problem/project. The first is the amount of processing power it may take to train a model based on data that is as high a load size as multiple videos. This may lead to slow or reduced performance. Another issue could potentially be with video quality. While the videos being used are coming directly from the NFL website, these videos still may not be high enough quality for our model to correctly read the images/frames, which could lead to complications in training our model.

**Timeline**

Week 1 & 2: Project proposal

Week 3: Video collection and splitting (training/validation/test)

Week 4: Frame extraction and CSV map creation

Week 5: Training/testing of initial model

Week 6: Additional training/tuning/testing to improve model

Week 7: Project write-up

Week 8: Finish project write-up and presentation

**Addressing Questions**

**Do you have deep learning or neural network experience?**

While I have not taken a deep learning course at Regis, I have taken numerous Udemy/EdX/etc. courses and done multiple personal projects in deep learning in my personal time, as well as having machine learning experience in previous and current jobs in both R and Python.

**Are you getting and labeling data yourself or is the data already clipped and labeled?**

I am pulling the videos manually, and while frame/image splitting is done in code, I am also manually labeling and creating a *mapping.csv* file with binary classification of whether a certain frame contains the football in the air, indicating a pass play.

**How many run and pass plays do you have? Or how many run/pass video plays do you plan on using?**

As of now, I have five runs and five pass videos for training, with each having an average of 8 to 12 frames/images. I will more than likely include an additional five videos for each type of play to have a large training image pool.