

## **Epochs**

Definition: A hyperparameter that defines the number times that the learning algorithm will work through the entire training dataset - the amount of iterations an algorithm will run through.

Example in Context: Our model has 5 epochs as a hyperparameter meaning that the model will run through the training dataset a total of 5 times.

## **Neural Network**

Definition: A neural network is a connection of neurons with weights and biases that takes in an input and calculates a value that if it is greater than a certain threshold, outputs a specific number.

Example: For example, suppose we are trying to predict whether an image is an apple so our input is a vectorized image of a piece of fruit. For the purpose of this example, the vectorized image is made up of a series of numbers that is then passed through our different neurons and weights. These neurons and weights create a new sum which is then passed through an activation function - this activation function ultimately tells us if our new sum is beyond our threshold value or not. Meaning, anything above a 7 is likely to be an apple so our neural network says so.

## **Convolutional Neural Network**

A convolutional neural network is similar to that of a regular neural network except that there are several layers of neurons and weights. The function is the same being that it takes in an input and spits out an output. We used a CNN for this project and we are able to adjust the different layers in the size of neurons and the weights in order to manipulate how the input is read and classified as an output.

## **mAP score**

mAP score is mean average precision score which is used to compare the actual bounding box to the detected box returning a score - the higher the score the more accurate the model is in detecting the objects correctly.

## **Precision**

Precision helps us measure the ability to classify positive samples in the model whether they were correct or not.

## **Recall**

Recall helps us measure how many positive samples were correctly classified by the ML model.

## **Training**

A training dataset is a portion of the actual dataset used for the machine learning model to learn patterns, thus training the model.

## **Testing**

The testing dataset represents the actual dataset that the model will generate predictions from. It is used after the training dataset.

## **AWS Sagemaker**

This is a fully managed machine learning software that we used for this project.

## **IoU**

IoU stands for intersection over union, meaning the value used in object detection to measure the overlap of a predicted versus actual bounding box for an object. The closer the predicted bounding box is to the actual, the greater the intersection and the greater the IoU value is.

## **NMS Threshold**

NMS threshold stands for the non maximum suppression which is a technique used in numerous computer vision tasks. It is a class of algorithms to select one entity (such as a bounding box in this case) of many overlapping entities.

## **Confidence Threshold**

Confidence threshold is a value used to determine whether or not certain labels should be assigned when a confidence value is lower than a certain threshold.

### ***Absolute Threshold (average confidence score)***

This is a single number that subsets the bounding boxes for those that have a confidence score above the threshold

### ***Percentile Threshold (Top X% confidence bounding boxes)***

A percentile threshold is used as another cutoff point for a confidence threshold when analyzing the accuracy of bounding boxes. For example, if the percentile threshold is the 80th percentile, we take all the bounding boxes in the output that have a confidence score above the 80th percentile.

### **IoU Threshold**

Referring to IoU above, this is the cutoff value for the IoU value.

### **RecordIO**

This is SageMaker's desired format for training and validation data for their object detection models where it is a file set of binary data exchange formats that divide the data into individual records (Apache Mesos, n.d.).