

# Fruit Classification

Tools: Python, opencv, matplotlib, pandas, jupyter notebook.

A basic fruit classification application developed for learning purposes that distinguishes between an apple image and banana image using two approaches which are later compared.

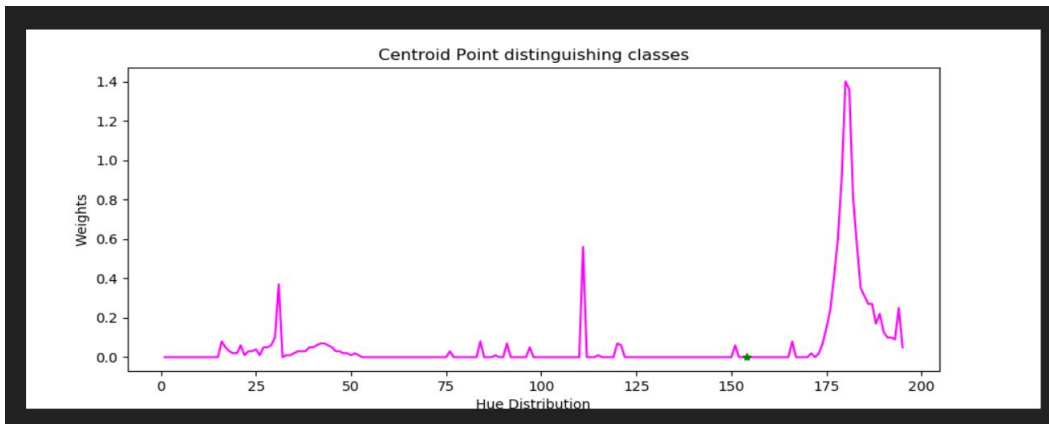
## 1. Basic Color Comparison:

In this each image is read using the opencv framework and color component percentage is extracted. Red and yellow color ratios are compared and the image category is marked.

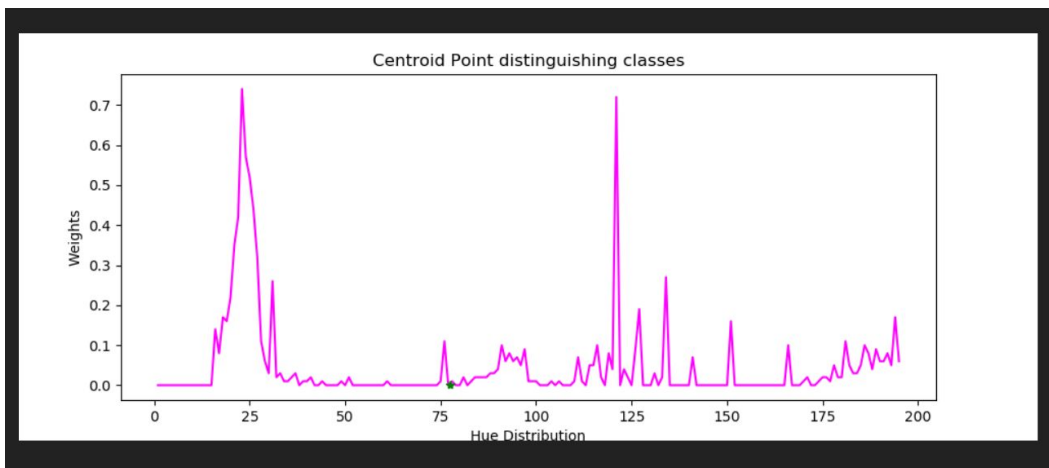
## 2. Hue Color Comparison:

In this method, the classifier is trained with sample images to calculate red and yellow hues. Here red ranges are from 2 : 15 (Neglecting White Component) and 170 onwards. These values are added beyond 180 mark in order to easily visualize the hue indices starting with Green (15 ~ 75), Blue (75 ~ 125) and Red (125 ~ 195 ). Aggregate hue index is calculated for sample images and stored. Centroid is calculated in order to segregate the apple hue values from banana hue values. Since this application currently only uses color as a feature, the centroid lies on the X axis. As we can see for apples we see the concentration beyond the 170 mark and centroid is closer to this concentration. In case of bananas as the yellow which is formed by both Red and Green, we see two spikes in our graph and hence the centroid is pulled in between resulting near 75 hue value.

### *Apple Hue Values and Centroid*



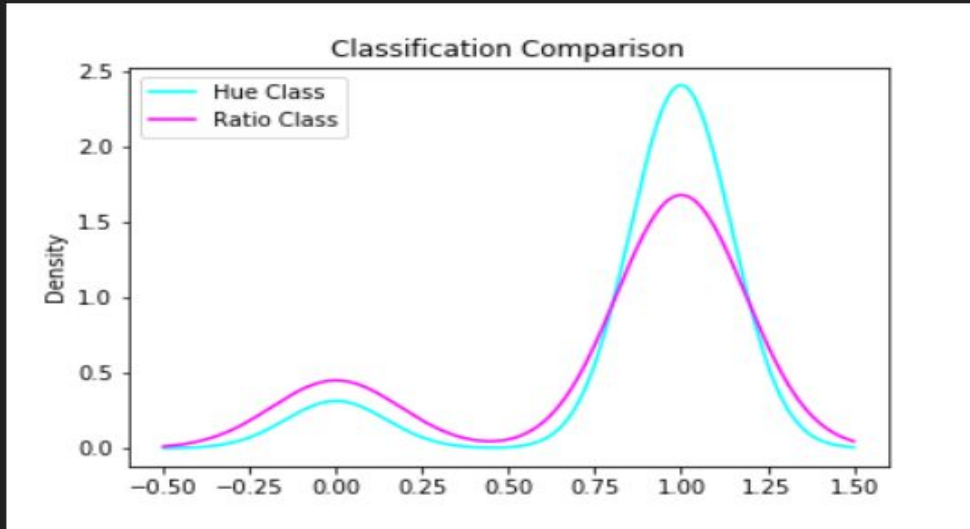
### *Banana Hue Values and Centroid*



### **Analysis:**

The above approaches have been tested on approximately 50 images(25 each). Comparing the above two methods, it's found that the basic color comparison yields 78% accuracy and the hue index method yields 88% accuracy.

#### *Distribution of Hue Vs Color ratio Accuracy*



*Note:* Since the classification is based on only color, this application fails to class correctly if the images contain both fruits, a mix of fruits eg: If banana is placed in a red plate. Since this is a basic learning app, it works best with single fruit images with less background details. Various algorithms such as grabcut/edge detection/background removal using scikit learn etc. have been tried and tested on some images but does not work 100 % for all sample images. Further enhancement involves adding new features like size of an object, removing background or object detection which will give better results.