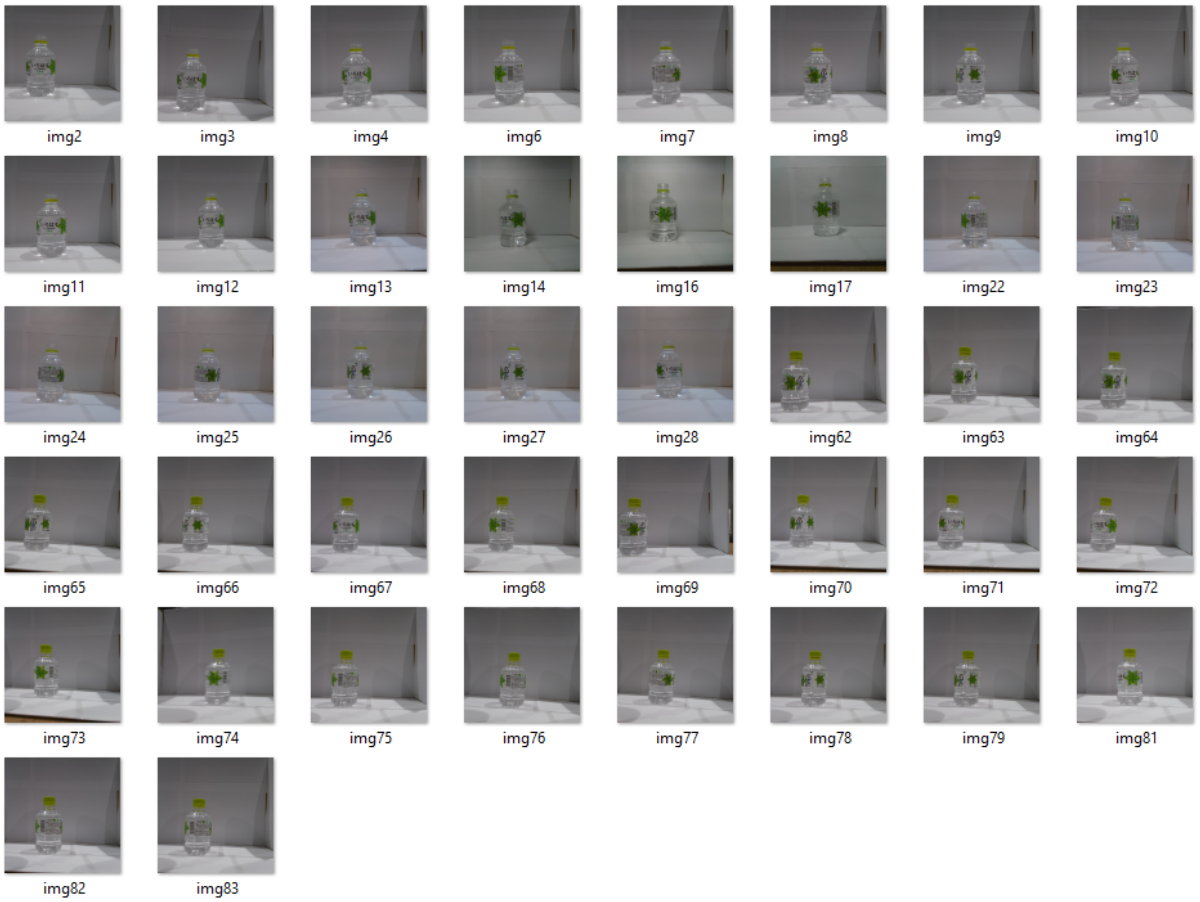
Bottle Color Recognition (CV Approach) Report (2)

Suprateem Banerjee
Machine Learning Engineer - Intern
Nimblebox.ai

Problem: To identify whether two provided bottles are of similar colour tones.
Github Code

In the previous report I had explained the metric and also tested the code on some incoherent data, while also stating how difficult it would be able to measure its performance adequately without some coherent data, i.e. images of similar bottles under similar lighting scenarios.

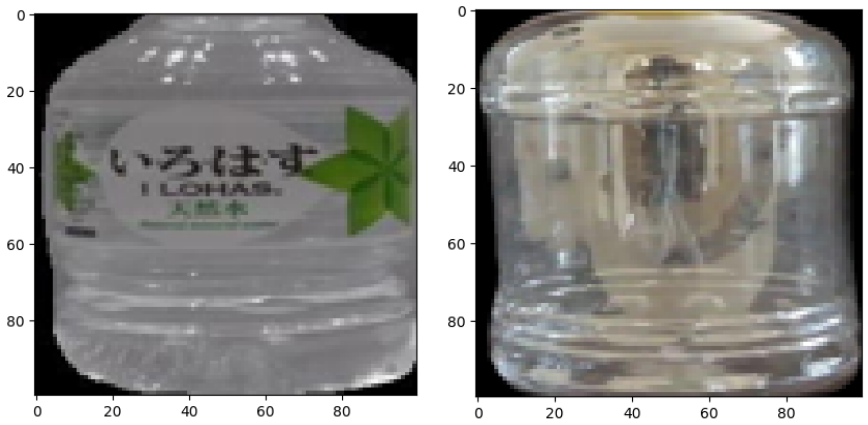
This report aims to conclude the exploration of the effectiveness of the algorithm having found a dataset which albeit being rather limited, serves the purpose of this experiment. The dataset in question is a batch of 46 images of soda bottles which has been collected from here which share similar lighting characteristics.



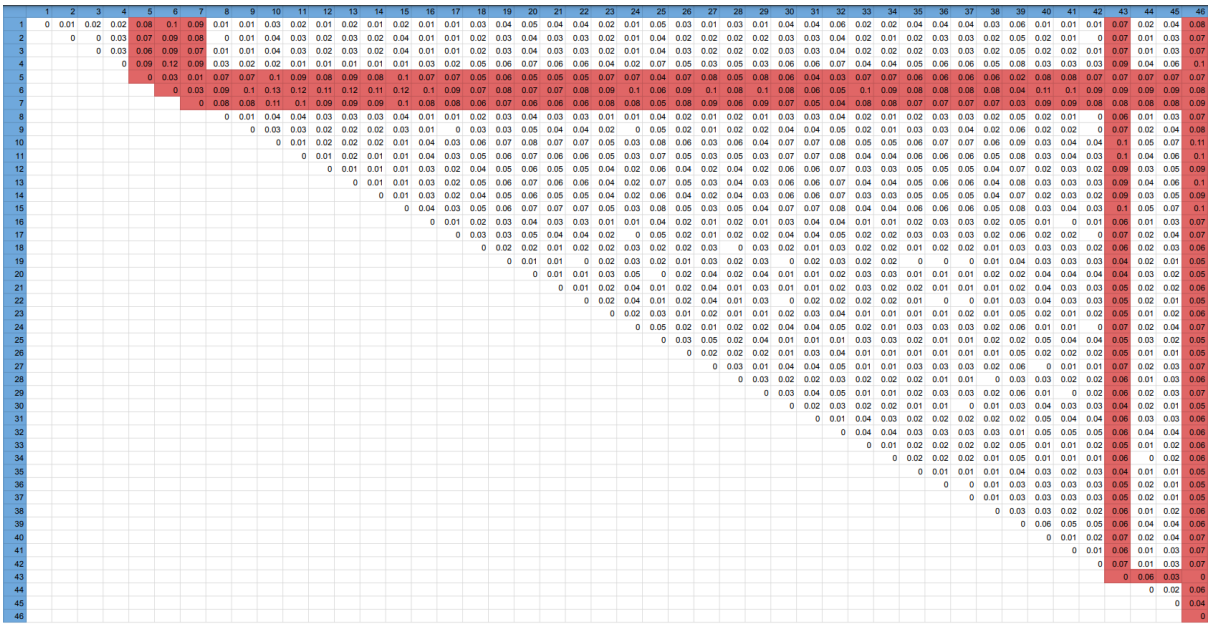
Then the bottles were segmented as below (here are some other similarly lit bottles as well).

Recall that in our previous report we had already explained how we choose to eliminate the top 20% of the resized image so as to avoid the colour of the cap from affecting our metric.

Two such processed samples are shown below (note that the one on the right is from the few images from a different set of bottles, but similarly lit).



The bottles were then compared one-to-one and their total deviations noted in this Exploration Sheet.



We have the image numbers marked in **blue**, as labels, and have charted the one to one comparison. The lower half of the diagonal has been omitted because *Image 1* compared to *Image 2* would result in the same deviation in color signature as when *Image 2* is compared to *Image 1*, i.e. the comparison is commutative in nature.

We find that for certain images, in our case 5 out of our 46 image dataset (**~10%**), the deviations are higher compared to the remaining. This I would consider as outliers, and has been marked in **red**.

Observations

If we consider the dataset as a whole, i.e. if we choose to not consider outliers, we find that the highest deviation in this limited dataset is **0.13**. If we wish to put a threshold after careful examination of the exploration, I would say a threshold of **0.15** should be sufficient in order to conclude they are of similar color. As elaborated in the previous report, this technique is sensitive to even a slight change in color tone, which makes it extremely useful in a conveyor belt set up in a manufacturing unit.

However, if we wish to take outliers into account, and choose to re-examine, or eliminate these outliers, then the highest deviation that is recorded in this dataset, excluding outlier samples, is **0.9**. In this case, the threshold can be comfortably set at as low as **0.1**.

Summary

Given the observations I find this method to be extremely effective in recognizing chromatic defects in bottle samples for our use case.