Fútbol Match Highlights

Capstone 2 – 04 - Application of Inferential Statistics

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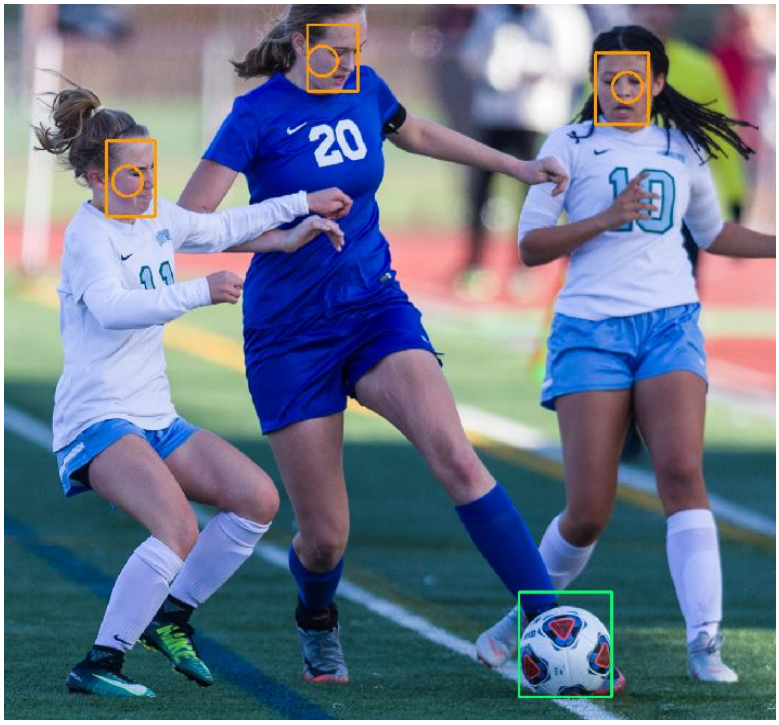
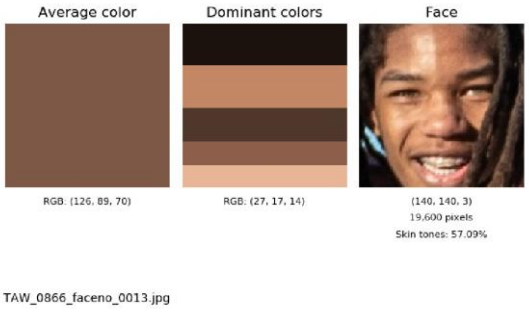
Problem: One of the first steps for any face recognition system is to detect the faces in an image. If a face is not detected, the facial recognition algorithm will never try to match it with a target face. At the same time, identifying incorrect faces will create a lot of additional noise in the data making facial recognition more challenging. The photo to the right shows three correctly identified faces (orange squares) and one incorrectly identified face, a soccer ball (green square).

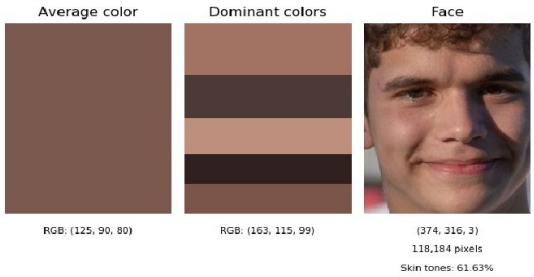


Solution: By setting our face detector (MTCNN in the example to the right) to allow a larger margin of error (or lower confidence), the detector recognizes over 99% of the faces in an image. However, this margin of error also creates a lot of false positives like the example to the right.

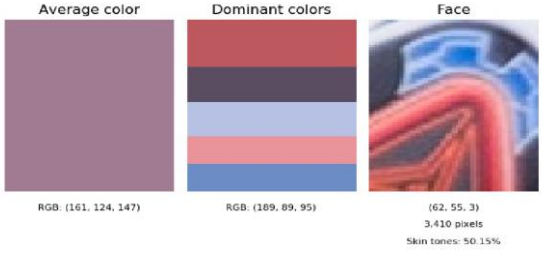
The objective was to find a summary statistic that could be utilized to remove the incorrectly identified faces. I calculated and reviewed the average color, square pixels, percent of original image, the top 5 dominate colors, and the average skin tones in the identified faces. The skin tones proved to be the most promising but also brought many challenges. The lighting, shadows and nationalities all proved challenging. Below are a few examples:



TAW_0866_faceno_0013.jpg



TAW_0855_faceno_0000.jpg



TAW_1177_faceno_0003.jpg

The hypothesis test was to see if the difference in percent skin tones in a face image was statistically significant. The null and alternative hypothesis are as follows:

H_o: Percent Skin Tones has no effect on face identification, means are same

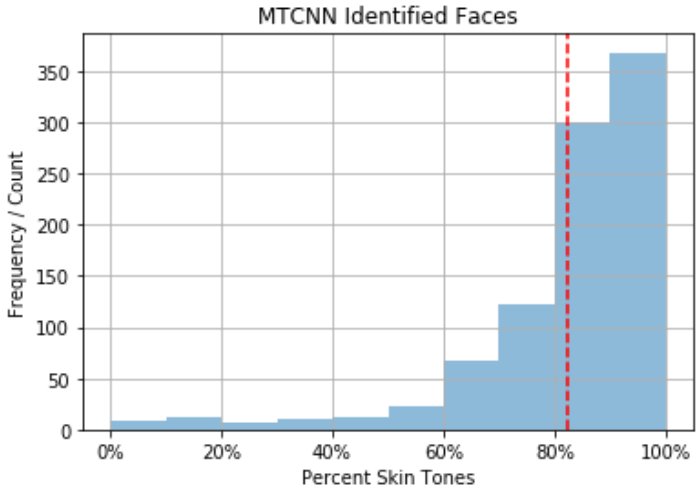
H_1: Percent Skin Tones has effect on face identification, means are different

Samples: **931**

Mean: **82.39% (dashed red line)**

Std Dev: **16.86%**

Median: **87.69%**

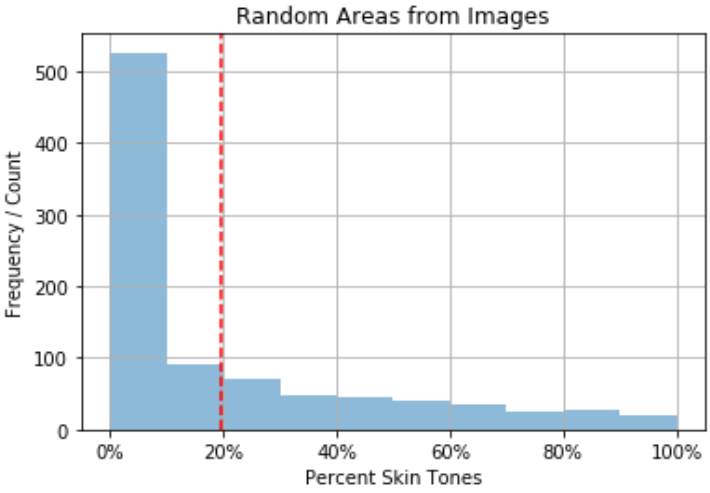


Samples: **931**

Mean: **19.72% (dashed red line)**

Std Dev: **26.71%**

Median: **5.98%**



I calculated a two-sided t-test for the null hypothesis that the samples have identical average (expected) values utilizing a significance level of .05. The p-value was 0.0000000 so **I rejected the null hypothesis in favor of the alternative hypothesis.**

H_1: Percent Skin Tones has effect on face identification, means are different

Next Steps: Although I could utilize bootstrap hypothesis testing to verify the above results, the results are so clear I will instead look to utilize the percent of skin tones in a machine learning model to remove incorrectly identified faces. Since the data is labeled, the results will be easily interpreted with a confusion matrix.