Color histogram based image classification using emojis as labels

Kolli, Susmitha(MS Electrical Engineering)
Mehta, Pankti (MS Electrical Engineering)

Project Advisor: Birsen Sirkeci

Electrical Engineering Department

Introduction

Emojis are an ever-growing items in computer-mediated communication. They function as paralinguistic devices which help convey messages in the absence of objects such as intonation, facial expressions, body language and gestures. The craze for the emojis is increasing day by day. Oxford Dictionary named the emoji - “face with tears of Joy” as the word of the year 2015 [4].New sets of emojis are being released into the market every day making it arduous for the user to select an emoji among the huge sets of emojis.

The goal of this project is to provide reduced pertinent set of emojis to user’s input image and make emoji communication effective and simple. In this project we have designed an machine learning based application which can predict emoji that represent emotion of an image.

Methodology

Data set preparation: Dataset has two main classes which are happy and sad. Happy class is an accumulation of images which give happy emotion when they are visualized. Sad class is an accumulation of images which give sad emotion when they are visualized.

Survey: Based upon the survey results six emojis were allocated to entire dataset and the dataset have been further divided into six subclasses such that, three of the sub classes goes under happy class and the other three under sad class.

Data labelling: Each image in the data set is marked with an emoji by 6 different participants , the emoji which as highest probability is given as a label for the respective image.

Methodology

Input Features: In this project color intensities and brightness of an image are considered as the input features.

Color Histogram: A color histogram represents the distribution of colors in an image. It can be visualized as a graph (or plot) that gives a high-level intuition of the intensity (pixel value) distribution. In this project RGB color space is used. Each color band takes 8 bits. So, the range for each color band lies in between (0,255).[1]

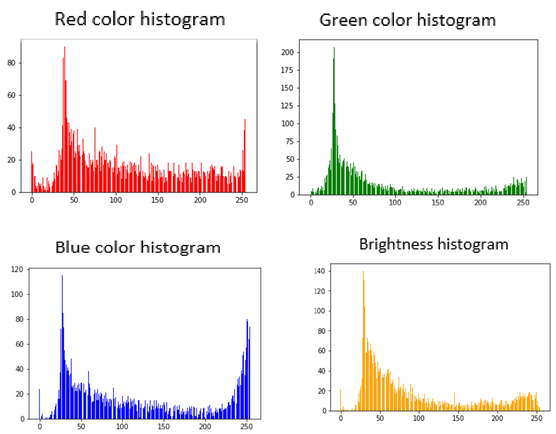
RGB histogram is preferred to k- color histogram to avoid problems such as dimensionality curse and cross talk.

Brightness:

```
def get_brightness(inp):
    w0 = 0.21
    w1 = 0.72
    w2 = 0.07
    r = inp[:,:,0]
    g = inp[:,:,1]
    b = inp[:,:,2]
    brightness = w0*r+w1*g+w2*b
    return brightness.copy()
```

When dealing with brightness higher weight is given to green color because green color is the most visible color for human eye.

Histograms representing intensities of each color and brightness in an image.

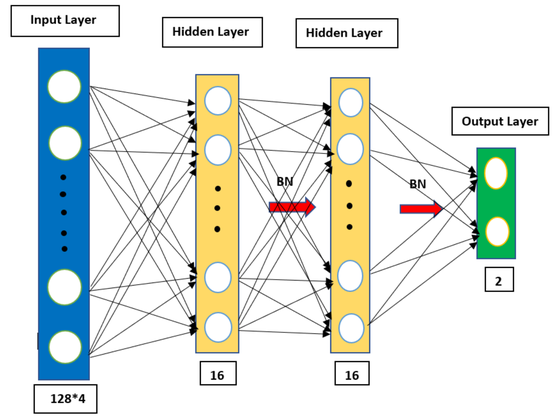


When plotting the histogram, the X-axis serves as “bins”

Validation Technique: 5-fold cross-validation, the original sample is randomly partitioned into 5 equal size subsamples. Of the 5 subsamples, a single subsample is retained as the validation data for testing the model, and the remaining 4 sub samples are used as training data.

Algorithm : Deep Neural Networks. Two hidden layers are used in this model. Activation function: relu activation function is used for all the hidden layers and softmax is used for the output layer. This project uses supervised learning technique and is a classification problem.

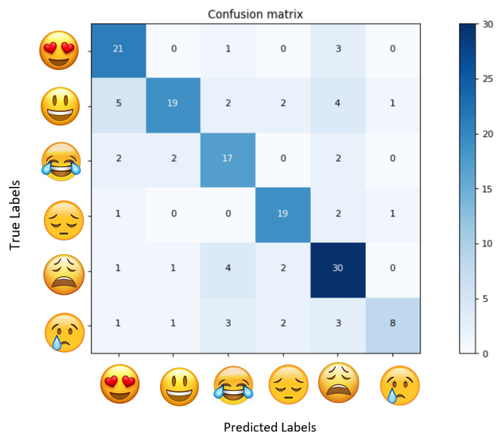
Fully Connected Multi Layer Perceptron



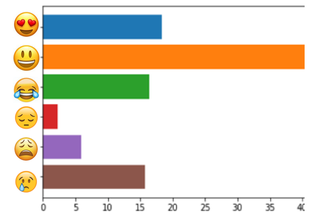
Analysis and Results

Training Accuracy obtained for image classification: 90%

Test Accuracy obtained for image classification: 75%



Emoji Prediction



Summary/Conclusions

Color histogram based image classification is the main focus of this project. Advantage in usage of simple color histogram features is showcased. Color histogram based classification is one of the quickest ways of image classification techniques. Comparison of features is computationally fast and efficient.

In this project, with simple features from color histogram a considerable amount of accuracy is obtained which shows the importance of color in image classification.

Key References

[1] Swain, M. J., & Ballard, D. H. (1992). Indexing via color histograms. In Active Perception and Robot Vision (pp. 261-273). Springer Berlin Heidelberg.

[2] Szabolcs Sergyan, "Content-based image retrieval using automatically determined color regions of images", Applied Machine Intelligence and Informatics 2009. SAMI 2009. 7th International Symposium on, pp. 41-45, 2009.

[3] Sz. Sergyan, “Color Content-based Image Classification,” 5th Slovakian-Hungarian Joint Symposium on Applied Machine Intelligence and Infor-matics, Poprad, Slovakia, pp. 427–434, 200

[4] Oxford dictonary word of the year 2015 - https://en.oxforddictionaries.com/word-of-the-year/word-of-the-year-2015

Acknowledgements

We are deeply indebted to Professor Birsen Sirkeci for her invaluable comments and assistance in the preparation of this study.