

Face Emotion Detection Using Deep Learning

Paras Jain

Rochester Institute Of Technology

pj2196@g.rit.edu

Abstract

Facial emotion recognition is an emerging research field in detecting facial expression. Deep learning algorithms have gained immense success in different areas of implementation such as classification, recommendation models, object recognition, etc. The various types of modules that are brought together in this technique for the betterment of the working of the model are mainly contributed by the progress in deep learning. The main focus of this work is to create a neural network model capable of classifying human emotions into a set of 7 different classes. Image data is used to test, validate, and train the model. The system will be based on facial expression which is used for recognizing expressions from the facial images and classifying them into one of the 7 basic emotions. The model will be divided into three stages: pre-processing, face detection, and emotion detection.

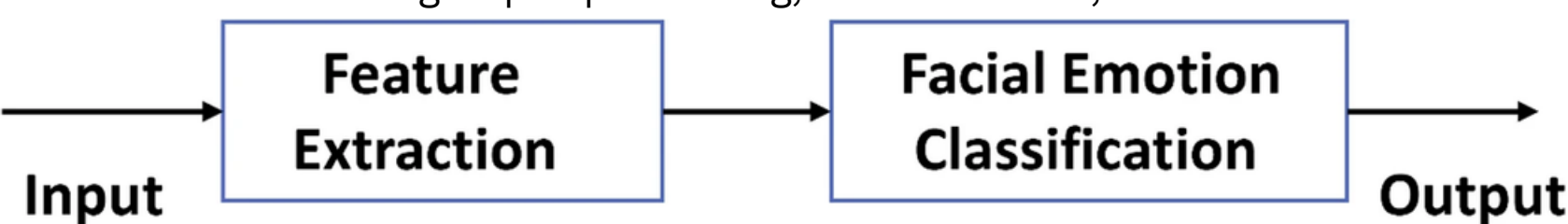


Figure 1 A simple structural view of facial expression recognition system.

Introduction

Facial expressions are important identifiers for human emotions because they correspond to human expressions. This problem is becoming a major research area, particularly in affective computing. Facial expression is a nonverbal way of emotional expression, and it can be taken as strong evidence to recognize the emotion of a human. The current approaches mainly focus on face investigation keeping background intact and hence building up a lot of non-essential and misleading features that confound the CNN and MLP training process. Detection of the action unit and detection of the facial point are the major first two steps for the proper working of the model.

Research Question

Q1)How accurate is the facial emotion detection model across different lighting conditions, ethnicities, and ages?

Q2)How do glasses, facial hair, and masks affect the accuracy of emotion detection, and how can the model compensate for it?

Methodology and Dataset

We are using the CNN model for feature extraction and MLP for feature classification. The model have 4 CNN layers with ReLU along with batch normalization and max pooling which increases our accuracy and model efficiency. The input comes as video images and we capture the photo and grayscale it and resize it to fit the model and then it is send to the model for classification.

The dataset used is FER2013+ which is one of the standard dataset for facial emotion detection.The data consists of 48x48 pixel grayscale images of faces. The faces have been automatically registered so that the face is more or less centred and occupies about the same amount of space in each image.



Figure 2 Example of images in the dataset

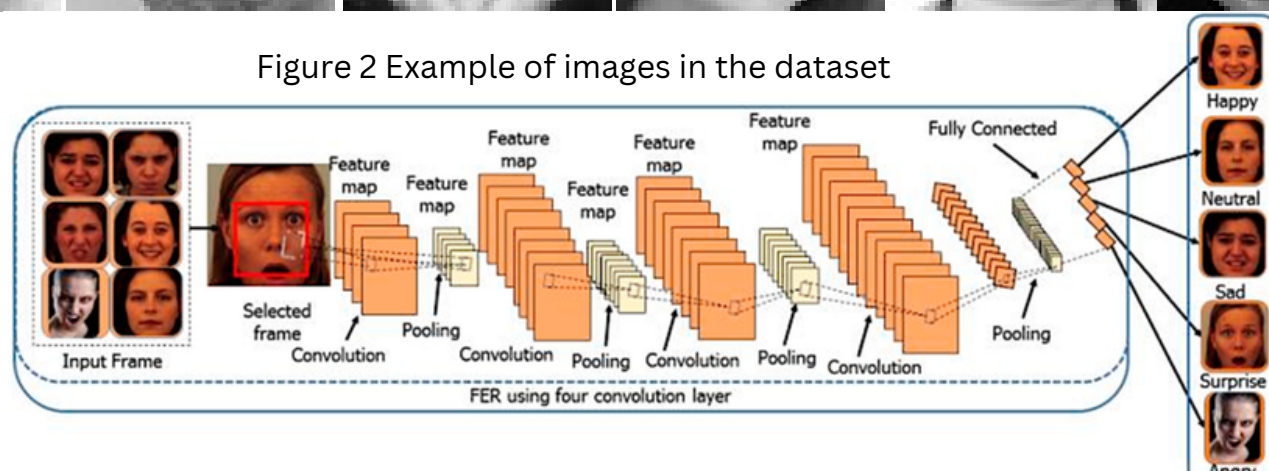


Figure3 CNN model with 4 layer for FER

Results

Model	Training Accuracy	Testing Accuracy
CNN-MLP(proposed model)	73	61
Random Classifier	70	65
KNN model	59	58
SVM model	80	74

Figure 4 Comparison with different model

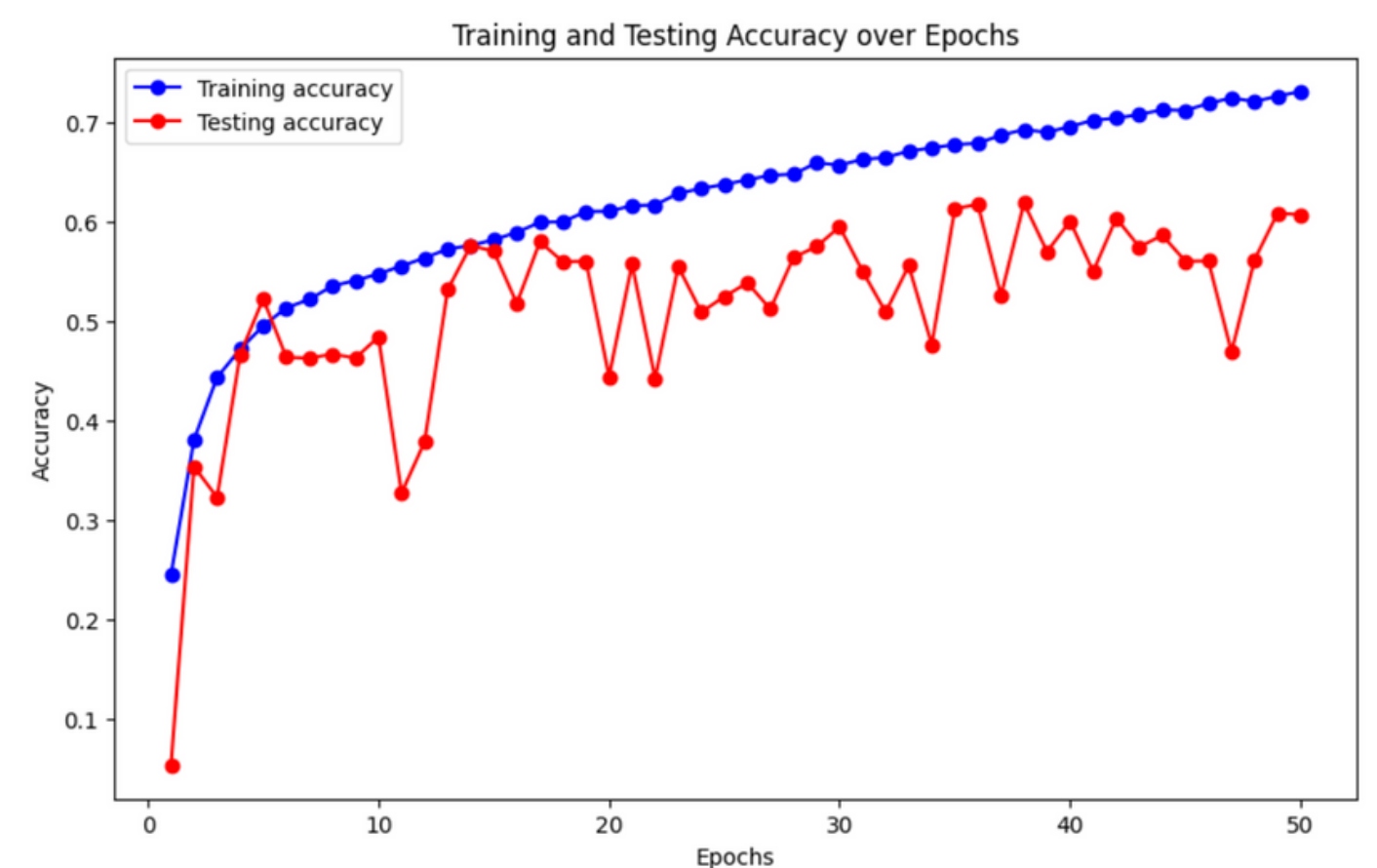


Figure 5 Training and Testing Accuracy

Discussion

It was observed that during training some other model had better accuracy than the proposed model but when detecting the emotion these model were biased to a single class and they did not properly detect the facial expression

Q1)During the experimentation it was noticed that the model accuracy do not seems to change much with respect to ethnicities and age. There is a decrease in accuracy(around 30%) when the lighting conditions are not that acceptable as the face is not captured properly.

Q2) Glasses and facial hair do not have any impact on the accuracy but if the person is wearing a mask or covering their face then the model don't catches the face from the image which results in no emotion detection

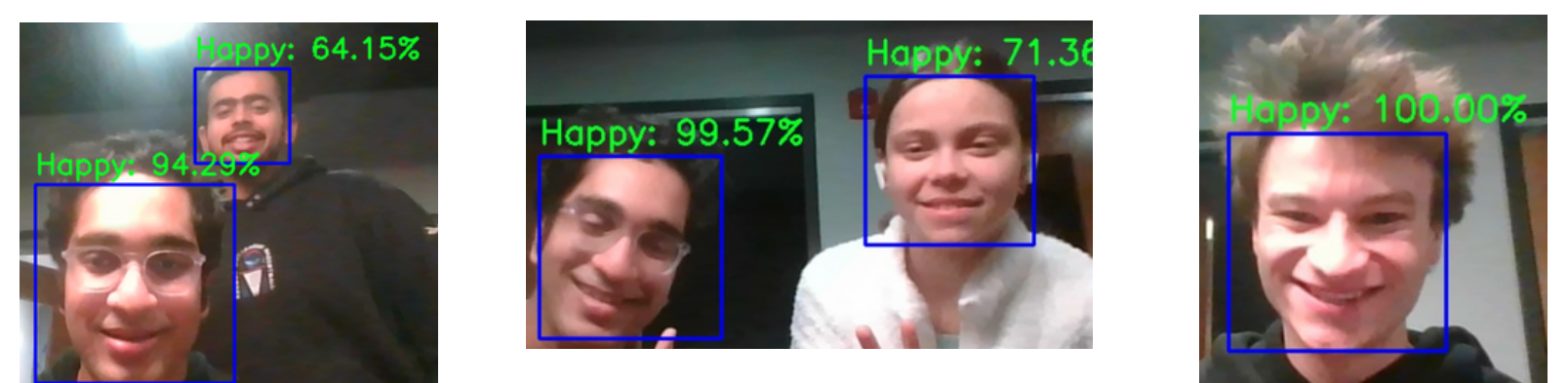


Figure 6 Outputs under different conditions

References

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