Face Emotion Recognition
A system to recognize human expression and classify them in real-time

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Problem Statement

With the rapid growth of AI, it has become a necessity to understand human emotions with the help of computational power. Though subtle at times, an expression has a lot to say about a person's state of mind.

Humans are definitely highly capable when it comes to emotion recognition but can computers or any algorithm recognize the same ? That is what we have approached in our study.

Let's dive into this presentation to reveal what high computational power and algorithmic thinking can achieve.

Introduction

Image processing is an important field of machine learning and signal processing. Out of several applications of image processing, facial emotion recognition is one of the most important domains. Many user interest areas which involve human-computer interactions make use of facial emotion recognition.

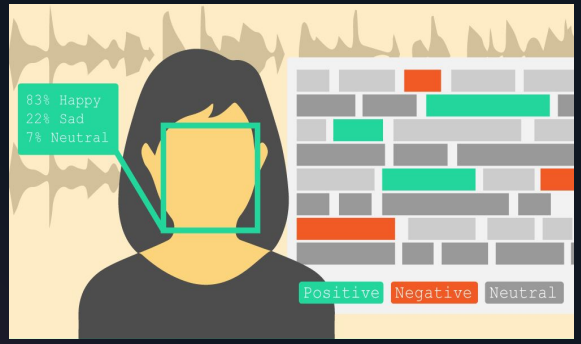
The main objective of this project is to develop a system that takes input video feed from any camera source and recognize human expression and classify them in real-time.

Although similar projects have already been done in this domain we aim to develop not only an Automatic Facial Expression Recognition System but also improve the accuracy of this system compared to the other available systems.

Motivation & Contribution

Facial Emotion Recognition has always been easy for human beings since they can learn from their experience very quickly. However for a machine, the same task has proved to be very resource demanding since they can only work on the basis of instructions. This has motivated us to develop a system that uses comparatively less computational power and delivers quick classification results.

However our chief motivation came from the needs of the physically handicapped people who can't express their expressions. We hope this system would be able to cater to some of their needs in general.



Proposed Solution

Since traditional machine learning algorithms fail to meet human needs in real-time, Convolutional neural networks(CNNs) were introduced to gain better success rates in these fields. CNN has an added advantage where it can extract features automatically and learn accordingly.

In this project, we aim to deliver an application or system that would be able to detect human emotions from a live webcam or camera feed. We would be using the same Deep CNN to achieve our work aim. The model will be trained, tested and validated using some collected image datasets.

In image processing for the detection of face elements, we are using the HAAR filters from the OpenCV framework. Image preprocessing would also be done for feature extraction and fine-tuning of our model.

Methodology Used

FACE RECOGNITION

Face Recognition is an application of computer vision which identifies human faces in digital images. In our project the faces are first located using the HAAR classifier which extracts various facial contours.

IMAGE PREPROCESSING:

Image Preprocessing is the most common operation on image data. Image Preprocessing involves reducing image noise,conversion of image from colour to grayscale and also geometric transformation of images.

EMOTION CLASSIFICATION

This is the final stage of our proposed methodology which involves classifying of given faces into one of the seven basic emotions like anger ,fear, happiness etc. This stage has been implemented using Convolutional Neural Networks(CNNs) to attain maximum accuracy.

Dataset Used

FER2013 Dataset

The dataset we have used for this project is a image-pixel valued dataset which is mainly a csv dataset with the 7 different emotion labels and pixel values of all corresponding images. The dataset is divided into training and validation data in the ratio 80:20 respectively.

Application Architecture

SS1

Our proposed application takes input of a real time video feed and analyses it. The basic functionality involves detecting the face and recognising the emotion of the same. Finally it returns one of the classified labels according to the input.

SS2

Model Building & Training

The sequential CNN model is one of the most basic models used in Deep Learning and our model is no exception. We have added multiple blocks of convolutional layers that helps to propagate the information from one layer to another and help the model to learn accurately

Our model was trained for 25 epochs and it achieved a high accuracy of 98.76%. The model doesn't seem to overfit or underfit in anyway. Moreover no such callbacks were used for early stoppings.

Model Building & Training

Results and Analysis

Deployment