

# DRIVER'S EMOTION RECOGNITION FOR ACCIDENT PREVENTION

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## ABSTRACT

A real-time, camera-based system for determining the driver's emotions through facial expression. Prevent accidents by providing an on-board system for vehicles. Facial Detection and Recognition Research has been widely studied in recent years. The facial recognition applications play an important role in many areas such as security, camera surveillance, identity verification in modern electronic devices, criminal investigations, database management systems and smart card applications etc. This work presents deep learning algorithms used in facial recognition for accurate identification and detection. The main objective of facial recognition is to authenticate and identify facial features. The sequential process of the work is defined in three different phases where in the first phase human face is detected from the camera and in the second phase, the captured input is analyzed based on the features and database used with support of keras convolutional neural network model. In the last phase the human face is authenticated to classify the emotions of human as happy, neutral, angry, sad, disgusting and surprising. The proposed work presented is simplified in three objectives as face detection, recognition and emotion classification. In support of this work Open CV library, dataset and python programming is used for computer vision techniques involved. To prove real time efficacy, an experiment was conducted for multiple students to identify their inner emotions and find physiological changes for each face. The results of the experiments demonstrate the perfections in the face analysis system. Finally, the performance of automatic face detection and recognition is measured with Accuracy.

## 1. INTRODUCTION

We know Globalization has increased the number of road trips and vehicles. Which eventually has increased the number of traffic accidents and is becoming one of the most important causes of death worldwide. The Driver's emotional state plays an important role in the safety of the car. Therefore, the continuous monitoring of driver's emotion is very important for safety purposes.

So, for continuous monitoring of the driver's emotions, we have to build a machine-learning model which predicts the driver's emotions using facial recognition. If the emotions detected are happy, neutral etc. then there will be no action taken. But if negative emotions are detected such as Angry, Drowsy, Alcoholic then the LED will blink to show negative emotions.

## 2. OBJECTIVE

To monitor the driver's emotions, face expression recognition technology is used to detect the face and expressions of the person. Facial expression analysis is creating a positive impact on the development of human machine interactions for safe driving behaviour and road safety.

Expressing emotions usually happens in two methods of communication, namely, verbally and non-verbally. Verbal communication is easy to communicate and understand between people in most situations, whereas

nonverbal communication, such as showing emotions, is difficult to understand in some situations. A person's mental state can control a person when going through either a good situation or a bad situation, especially if the driver's emotions are considered. Emotions such as happiness and neutrality can put the driver in a good mental state and be able to drive the vehicle safely. However, emotions such as sadness, anger, disgust, and fear influence the driver's capabilities to cause road accidents. To avoid this, driver emotion monitoring became a crucial and necessary module in the advanced driver assistance systems in most automotive vehicles. These systems will control the vehicle functions according to the driver's emotions and help in avoiding road accidents.

### 3.LITERATURE SURVEY

Deep Learning algorithms are designed in such a way that they mimic the function of the human cerebral cortex. These algorithms are representations of deep neural networks i.e., neural networks with many hidden layers. Convolutional neural networks are deep learning algorithms that can train large datasets with millions of parameters, in the form of 2D images as input and convolve it with filters to produce the desired outputs. In this article, CNN models are built to evaluate its performance on image recognition and detection datasets.

Convolutional Neural Network (CNN) for Image Detection and Recognition 2018 by Rahul Chauhan, Kamal Kumar Ghanshala,

R.C Joshi First International Conference on Secure Cyber Computing and Communication (ICSCCC). Objects in the home that are often used tend to follow specific patterns in terms of time and location. Analysing these trends can help us keep track of our belongings and increase efficiency by reducing the amount of time wasted forgetting or looking for them. Tensor Flow, a relatively new framework from Google, was utilised to model our neural network in our project. Multiple objects in real-time video streams are detected using the TensorFlow Object Detection API. Data classification with deep learning using Tensorflow by Fatih Ertam, Galip Aydin in 2017 International Conference on Computer Science and Engineering (UBMK). Object Detection using TensorFlow by Yellamma Pachipala; M Harika; B Aakanksha; M Kavitha 2022 International Conference on Electronics and Renewable Systems (ICEARS).

### 3.FLOWCHART FOR DRIVER EMOTION DETECTION

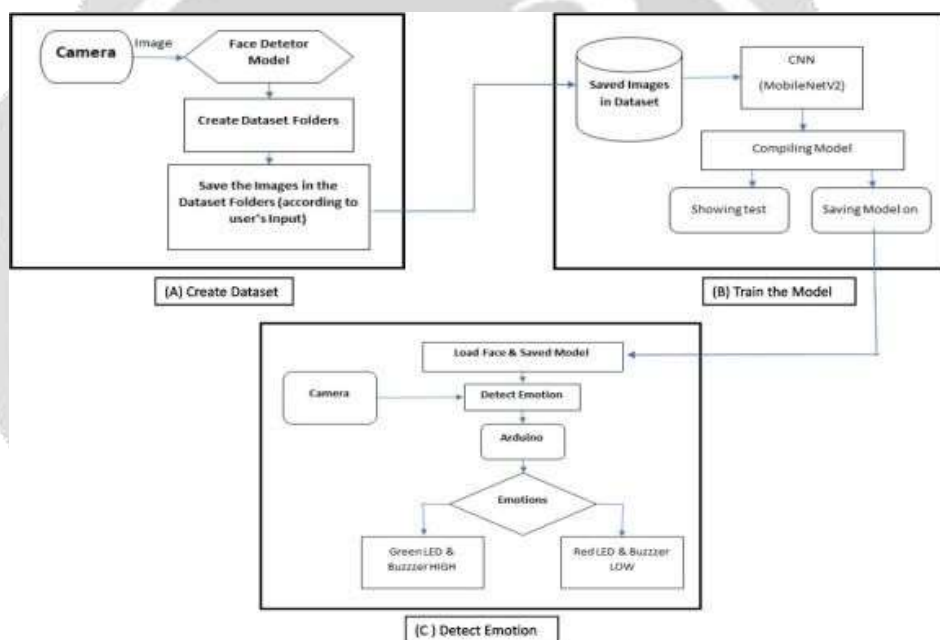


Fig.1 Flowchart For proposed System

The user can create his/her own dataset or else can use the Emotion-detection model directly. If user wants to create his/her own dataset or add more data in dataset then, create\_dataset.py file needs to be run. Fig(A) shows the flowchart of the create dataset file. The camera will continuously capture the user. Face model is used to detect the face in the image sent by the camera then, user can save their emotion's photos according to their expression. This program will create the folder for the different emotions. The images can be saved in that folder, just by tapping the initial letter button of the emotion (A for anger, H for Happy, S for Sad, N for Neutral, Q for Quit) by the user.

The saved images in the Dataset will now be loaded in the Train\_emotion\_detector.py. These images are used to train the CNN model and detect emotion which is shown in fig(B). Once the model is loaded with the images it is then compiled and the training & testing report is shown in the output of the terminal. The plot of accuracy and loss is also plotted and saved as plot.png on the same directory. The trained model is saved on the hard disk for further use.

The camera will capture the video and it is then sent frame by frame to our trained model to detect the emotion of the driver. Once the Emotion is detected by the model it is further transferred to the Arduino UNO R3. Arduino UNO R3 is used to control the LED's and buzzer. If the emotions detected are happy, neutral etc. then there will be no action taken. But if negative emotions are detected such as Angry, Drowsy, Alcoholic then the LED will blink & buzzer will be HIGH to show negative emotions.

The Result of the project is as follows:-

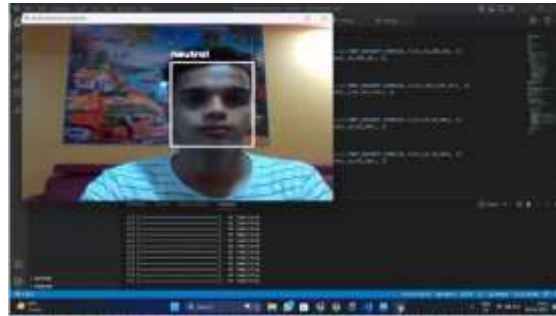


Fig.2 Emotion Detection Output 1

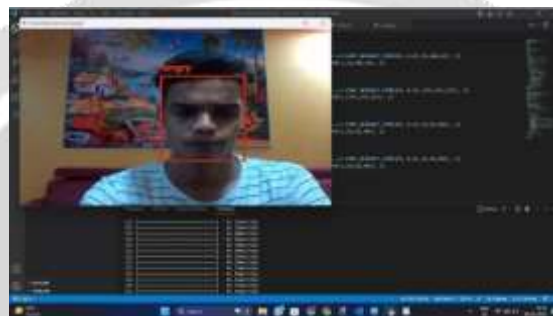


Fig.3 Emotion Detection Output 2



Fig.4 Emotion Detection Output 3

#### 4. SOFTWARE AND SYSTEM DESCRIPTION

We have used Python as it is the major code language for AI and ML. It surpasses Java in popularity and has many advantages, such as a great library ecosystem, good visualization options, A low entry barrier, Community support, Flexibility, Readability, and Platform independence. It serves as a framework for using already- trained deep learning models to perform image and video analysis. For compiling code, we have used Virtual Studio Code. And for programming the Arduino UNO R3 we have used Arduino IDE.

We used the power of Artificial Intelligence to work on Emotion Recognition and deal with human faces, this space is generally referred to as Computer Vision. We were able to extract emotions from photos and videos of human faces. Emotion and Face Detection have numerous use-cases in today's world. We see object detection algorithms in public parking lots, traffic monitoring systems, etc. that take images of people driving vehicles to keep records. Emotion Detection is furthermore used in therapy where physical meetings of the therapist and their patient are not possible. The study of human cognition has also evolved medicines. On the technological front, virtual assistants, profile evaluation assistants, and automation bots are built to mimic the actions of humans and replace them with the hope of increasing accuracy and decreasing errors. It is therefore a very important part of the Artificial Intelligence inspired world we live in today.

## 5.CONCLUSION

This system can warn the passengers that the driver is not in a good state to drive. Through this, many vehicle accidents can be prevented.

## 6.ACKNOWLEDGEMENT

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