



CMR UNIVERSITY

Private University Established in Karnataka State by Act No. 45 of 2013

SCHOOL OF ENGINEERING AND TECHNOLOGY

A Project Report
on
“EMOJIFY using DEEP LEARNING”

Submitted in partial fulfillment of the requirements for the award of degree in

Bachelor of Technology

in

Computer Science and Engineering

Of CMR University, Bengaluru

Submitted by:

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2020-2021



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SCHOOL OF ENGINEERING AND TECHNOLOGY
Department of Computer Science and Engineering

CERTIFICATE

This is to Certify that the project work, entitled “***EMOJIFY using DEEP LEARNING***”, submitted to the CMR University, Bangalore, in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a record of work done by **Mr. Aayush Manoj Tirmalle** bearing university register number **18BBTCS002** during the academic year 2020-21 at School of Engineering and Technology, CMR University, Bangalore under my supervision and guidance .The project report has been approved as it satisfies the academic requirement in respect of project based course prescribed for Mini Project subject in the said degree.

Signature of the Guide
Mrs. Shruti Hegde

Signature of the HOD
Dr. Rubini P

Signature of the Dean
Dr.C. Prabhakar Reddy

Examiners Signature with date :



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Signature of the Guide
Mrs. Shruti Hegde

Signature of the HOD
Dr. Rubini P

Signature of the Dean
Dr.C. Prabhakar Reddy

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Signature of the Guide
Mrs. Shruti Hegde

Signature of the HOD
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Examiners Signature with date :



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Signature of the Guide
Mrs. Shruti Hegde

Signature of the HOD
Dr. Rubini P

Signature of the Dean
Dr.C. Prabhakar Reddy

Examiners Signature with date :

DECLARATION

I, Aayush Manoj Tirmalle(Reg No. 18BBTCS002) student of 5th semester B.Tech. Computer Science and Engineering, School of Engineering and Technology, CMR University Bangalore, hereby declare that the project work entitle ***EMOJIFY using DEEP LEARNING***” has been carried out by me under the guidance of Mrs.Shruti Hegde., Assistant professor, Teaching Associate, Department of Computer Science and Engineering, School of Engineering and Technology, CMR University. This report is submitted in partial fulfillment of the requirement for award of Bachelor of Technology in Computer Science and Engineering by CMR University, Bangalore during the academic year 2020-2021.The project report has been submitted as it satisfies the academic requirement in respect of project based course prescribed for Mini Project subject in the said degree.

Place: Bangalore

Date:

AAYUSH MANOJ TIRMALLE

18BBTCS002

DECLARATION

I, Aman .G. Nair(Reg No. 18BBTCS008) student of 5th semester B.Tech. Computer Science and Engineering, School of Engineering and Technology, CMR University Bangalore, hereby declare that the project work entitle “***EMOJIFY using DEEP LEARNING***” has been carried out by me under the guidance of Mrs.Shruti Hegde , Assistant professor, Teaching Associate, Department of Computer Science and Engineering, School of Engineering and Technology, CMR University. This report is submitted in partial fulfillment of the requirement for award of Bachelor of Technology in Computer Science and Engineering by CMR University, Bangalore during the academic year 2020-2021.The project report has been submitted as it satisfies the academic requirement in respect of project based course prescribed for Mini Project subject in the said degree.

Place: Bangalore

Date:

AMAN. G. NAIR

18BBTCS008

DECLARATION

I, HEMANTH KUMAR. B (Reg No. 18BBTCS042) student of 5th semester B.Tech. Computer Science and Engineering, School of Engineering and Technology, CMR University Bangalore, hereby declare that the project work entitle “***EMOJIFY using DEEP LEARNING***” has been carried out by me under the guidance of Mrs.Shruti Hegde, Assistant professor, Teaching Associate, Department of Computer Science and Engineering, School of Engineering and Technology, CMR University. This report is submitted in partial fulfillment of the requirement for award of Bachelor of Technology in Computer Science and Engineering by CMR University, Bangalore during the academic year 2020-2021. The project report has been submitted as it satisfies the academic requirement in respect of project based course prescribed for Mini Project subject in the said degree.

Place: Bangalore

Date:

HEMANTH KUMAR .B

18BBTCS042

DECLARATION

I, K.N.PRAJWAL SAI (Reg No. 18BBTCS046) student of 5rd semester B.Tech. Computer Science and Engineering, School of Engineering and Technology, CMR University Bangalore, hereby declare that the project work entitle “ ***EMOJIFY using DEEP LEARNING***” has been carried out by me under the guidance of Mrs.Shruti Hegde, Assistant professor, Teaching Associate, Department of Computer Science and Engineering, School of Engineering and Technology, CMR University. This report is submitted in partial fulfillment of the requirement for award of Bachelor of Technology in Computer Science and Engineering by CMR University, Bangalore during the academic year 2020-2021. The project report has been submitted as it satisfies the academic requirement in respect of project based course prescribed for Mini Project subject in the said degree.

Place: Bangalore

Date:

K.N.PRAJWAL SAI

18BBTCS046

ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of this project would be incomplete without the mention of the people who made it possible, without whose constant guidance and encouragement would have made efforts go in vain. I consider myself privileged to express gratitude and respect towards all those who guided me through the completion of the project. I express my heartfelt sincere gratitude to Dr. C. Prabhakar Reddy, Dean, School of Engineering and Technology, CMR University for his support. I would like to express my thanks to Dr. Rubini P, Associate Professor and Head, Department of Computer Science and Engineering, School of Engineering and Technology, CMR University, Bangalore, for his encouragement that motivated me for the successful completion of Project work. I express my thanks to my Project Guide Mrs. Shruti Hegde, Department of Computer Science and Engineering, School of Engineering and Technology, CMR University for his constant support.

I would like to thank all the professors and staff of Computer Science and Engineering Department for their co-operation and timely guidance.

AAYUSH MANOJ TIRMALLE
18BBTCS001

ACKNOWLEDGEMENT

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AMAN.G.NAIR

18BBTCS008

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HEMANTH KUMAR B

18BBTCS042

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I would like to thank all the professors and staff of Computer Science and Engineering Department for their co-operation and timely guidance.

K.N.PRAJWAL SAI

18BBTCS046

ABSTRACT

In this project, we will build a convolution neural network architecture and train the model on FER2013 dataset for Emotion recognition from images. We will analyze the live video feeds in real-time to capture the face and find out the expression. Now we will classify the expression and map to corresponding avatar.

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CHAPTER 1

INRODUCTION

Emojis or avatars are ways to indicate nonverbal cues. These cues have become an essential part of online chatting, product review, brand emotion, and many more. It also leads to increasing data science research dedicated to emoji-driven storytelling. With advancements in computer vision and deep learning, it is now possible to detect human emotions from images.

Deep learning is a subset of machine learning in artificial intelligence (AI) that has networks capable of learning unsupervised from data that is unstructured or unlabelled. In this deep learning project, we will classify human facial expressions to filter and map corresponding emojis or avatars.

CHAPTER 2

Literature Survey

When interacting via text-based communication, it can be difficult for speakers to convey their emotions due to the absence of non-linguistic cues such as facial expression and body language. An emoji is a graphic symbol, ideogram, which represents not only facial expressions, but also concepts and ideas, such as celebration, weather, vehicles and buildings, food and drink, animals and plants, or emotions, feelings, and activities

Face2Emoji , a system and method to use users' facial emotional expressions as system input to filter emojis by emotional category. Despite that emojis can represent actions, objects, nature, and other symbols, the most commonly used emojis are faces which express emotion . Moreover, previous work has shown that emojis can be ranked by sentiment (cf., Emoji Sentiment Ranking by Novak et al.), textual notifications containing emojis exhibit differences in 3-valued sentiment across platforms , and for faces, emojis can be ranked by valence and arousal.

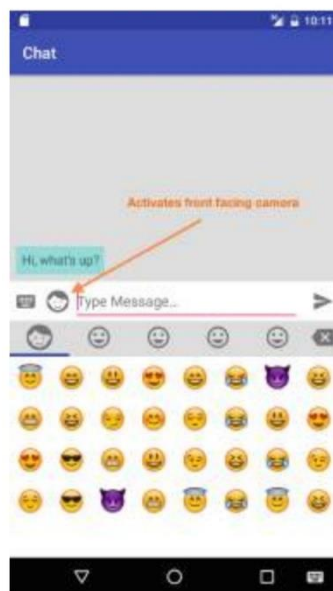


Figure 7: Early Android-based Face2Emoji prototype showing emojis (with Apple's® unicode rendering).

CHAPTER 3

SYSTEM DESIGN AND REQUIREMENTS

3.1 System Requirements

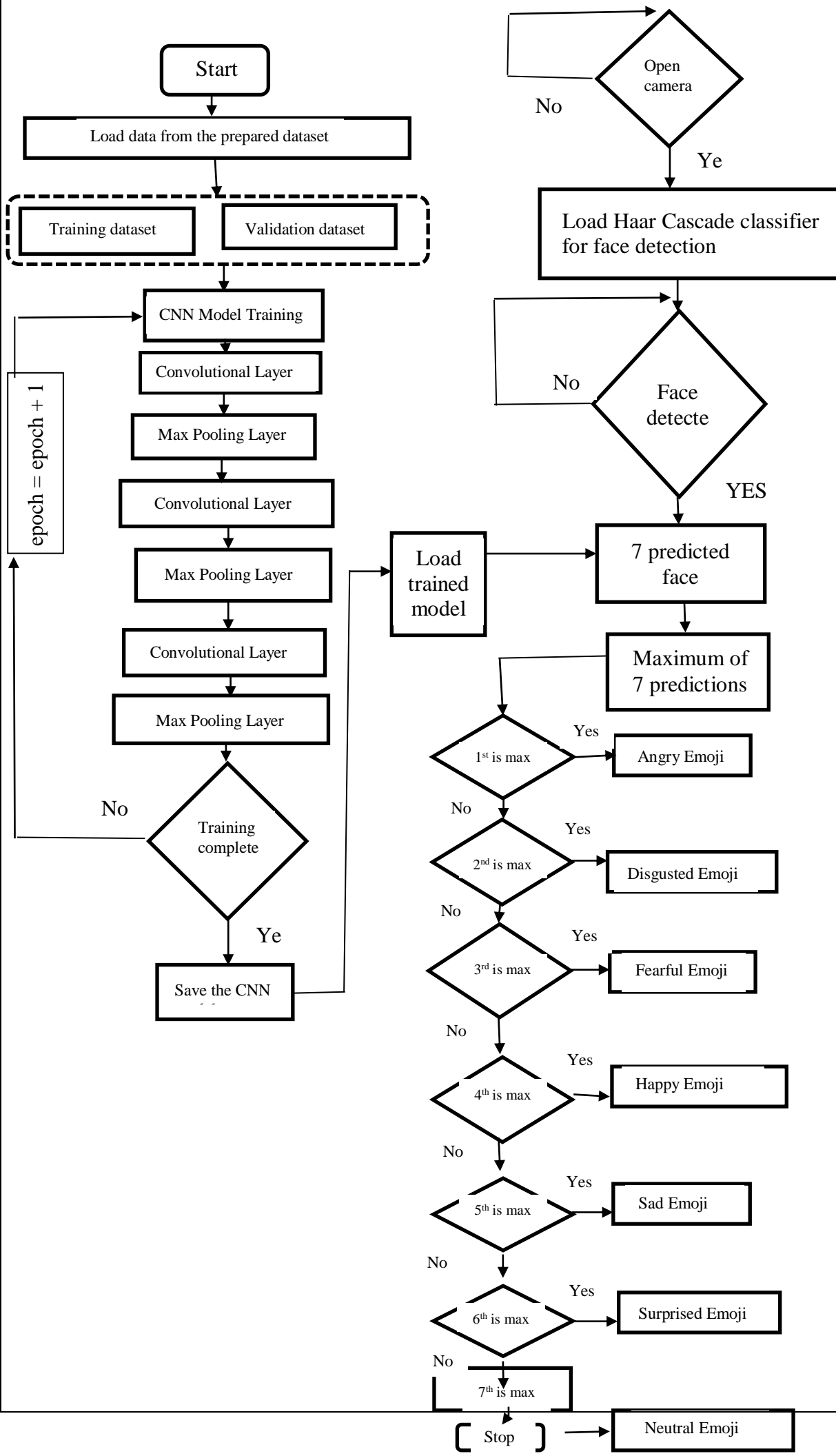
3.1.1 Software Requirements

- Operating System: Windows8.0 or higher
- Python
- Visual Studio Code
- FER 2013 Dataset
- Libraries : Keras , Tensorflow , OpenCV

3.1.2 Hardware Requirements

- Processor: Intel Core i3 8100 3.6 GHz.
- RAM: 2 GB and above.
- Keyboard and Mouse
- Webcam

3.2 SYSTEM DESIGN



CHAPTER 4

SYSTEM IMPLEMENTATION

4.1 ABOUT 'EMOJIFY'

The python code is able to detect the emotions on the person's face in real time with the use of webcam. The bounded box is generated on the face and the emotion detected is printed as label on top left of the bounding box. The emoji mapped to the detected facial expression is printed on the terminal.

4.2 CODE SNIPPETS

Make a file train.py and follow the steps:

1. Imports:

```
import numpy as np
import cv2
from keras.emotion_models import Sequential
from keras.layers import Dense, Dropout, Flatten
from keras.layers import Conv2D
from keras.optimizers import Adam
from keras.layers import MaxPooling2D
from keras.preprocessing.image import ImageDataGenerator
```

2. Initialize the training and validation generators:

```
train_dir = 'data/train'
val_dir = 'data/test'
train_datagen = ImageDataGenerator(rescale=1./255)
val_datagen = ImageDataGenerator(rescale=1./255)
train_generator = train_datagen.flow_from_directory(
    train_dir,
    target_size=(48,48),
    batch_size=64,
    color_mode="gray_framescale",
    class_mode='categorical')
```

```
validation_generator = val_datagen.flow_from_directory(
val_dir,
target_size=(48,48),
batch_size=64,
color_mode="gray_framescale",
class_mode='categorical')
```

3. Build the convolution network architecture:

```
emotion_model = Sequential()
emotion_model.add(Conv2D(32, kernel_size=(3, 3), activation='relu', input_shape=(48,48,1)))
emotion_model.add(Conv2D(64, kernel_size=(3, 3), activation='relu'))
emotion_model.add(MaxPooling2D(pool_size=(2, 2)))
emotion_model.add(Dropout(0.25))
emotion_model.add(Conv2D(128, kernel_size=(3, 3), activation='relu'))
emotion_model.add(MaxPooling2D(pool_size=(2, 2)))
emotion_model.add(Conv2D(128, kernel_size=(3, 3), activation='relu'))
emotion_model.add(MaxPooling2D(pool_size=(2, 2)))
emotion_model.add(Dropout(0.25))
emotion_model.add(Flatten())
emotion_model.add(Dense(1024, activation='relu'))
emotion_model.add(Dropout(0.5))
emotion_model.add(Dense(7, activation='softmax'))
```

4. Compile and train the model:

```
emotion_model.compile(loss='categorical_crossentropy',optimizer=Adam(lr=0.0001, decay=1e-
6),metrics=['accuracy'])
emotion_model_info = emotion_model.fit_generator(
train_generator,
steps_per_epoch=28709 // 64,
epochs=50,
validation_data=validation_generator,
validation_steps=7178 // 64)
```

5. Save the model weights:

```
emotion_model.save_weights('model.h5')
```

6. Using openCV haarcascade xml detect the bounding boxes of face in the webcam and predict the emotions:

```
cv2ocl.setUseOpenCL(False)
emotion_dict = {0: "Angry", 1: "Disgusted", 2: "Fearful", 3: "Happy", 4: "Neutral", 5: "Sad", 6: "Surprised" }
```

```

cap = cv2.VideoCapture(0)
while True:
    ret, frame = cap.read()
    if not ret:
        break
    bounding_box = cv2.CascadeClassifier('/home/shivam/.local/lib/python3.6/site-
packages/cv2/data/haarcascade_frontalface_default.xml')
    gray_frame = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    num_faces = bounding_box.detectMultiScale(gray_frame,scaleFactor=1.3, minNeighbors=5)
    for (x, y, w, h) in num_faces:
        cv2.rectangle(frame, (x, y-50), (x+w, y+h+10), (255, 0, 0), 2)
        roi_gray_frame = gray_frame[y:y + h, x:x + w]
        cropped_img = np.expand_dims(np.expand_dims(cv2.resize(roi_gray_frame, (48, 48)), -1), 0)
        emotion_prediction = emotion_model.predict(cropped_img)
        maxindex = int(np.argmax(emotion_prediction))
        cv2.putText(frame, emotion_dict[maxindex], (x+20, y-60), cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255,
255), 2, cv2.LINE_AA)
        cv2.imshow('Video', cv2.resize(frame,(1200,860),interpolation = cv2.INTER_CUBIC))
    if cv2.waitKey(1) & 0xFF == ord('q'):
        cap.release()
        cv2.destroyAllWindows()
        break

```

Code for GUI and mapping with emojis

Create a folder named emojis and save the emojis corresponding to each of the seven emotions in the dataset.

Paste the below code in gui.py and run the file.

```

import tkinter as tk
from tkinter import *
import cv2
from PIL import Image, ImageTk
import os
import numpy as np
import cv2
from keras.models import Sequential
from keras.layers import Dense, Dropout, Flatten
from keras.layers import Conv2D
from keras.optimizers import Adam
from keras.layers import MaxPooling2D
from keras.preprocessing.image import ImageDataGenerator
emotion_model = Sequential()
emotion_model.add(Conv2D(32, kernel_size=(3, 3), activation='relu', input_shape=(48,48,1)))

```

```

emotion_model.add(Conv2D(64, kernel_size=(3, 3), activation='relu'))
emotion_model.add(MaxPooling2D(pool_size=(2, 2)))
emotion_model.add(Dropout(0.25))
emotion_model.add(Conv2D(128, kernel_size=(3, 3), activation='relu'))
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emotion_model.add(Dropout(0.25))
emotion_model.add(Flatten())
emotion_model.add(Dense(1024, activation='relu'))
emotion_model.add(Dropout(0.5))
emotion_model.add(Dense(7, activation='softmax'))
emotion_model.load_weights('model.h5')
cv2ocl.setUseOpenCL(False)
emotion_dict = {0: " Angry ", 1: "Disgusted", 2: " Fearful ", 3: " Happy ", 4: " Neutral ", 5: " Sad ", 6:
"Surprised"}
emoji_dist={0:"./emojis/angry.png",2:"./emojis/disgusted.png",2:"./emojis/fearful.png",3:"./emojis/happy.png",
4:"./emojis/neutral.png",5:"./emojis/sad.png",6:"./emojis/surpriced.png"}
global last_frame1
last_frame1 = np.zeros((480, 640, 3), dtype=np.uint8)
global cap1
show_text=[0]
def show_vid():
cap1 = cv2.VideoCapture(0)
if not cap1.isOpened():
print("cant open the camera1")
flag1, frame1 = cap1.read()
frame1 = cv2.resize(frame1,(600,500))
bounding_box = cv2.CascadeClassifier('/home/shivam/.local/lib/python3.6/site-
packages/cv2/data/haarcascade_frontalface_default.xml')
gray_frame = cv2.cvtColor(frame1, cv2.COLOR_BGR2GRAY)
num_faces = bounding_box.detectMultiScale(gray_frame,scaleFactor=1.3, minNeighbors=5)
for (x, y, w, h) in num_faces:
cv2.rectangle(frame1, (x, y-50), (x+w, y+h+10), (255, 0, 0), 2)
roi_gray_frame = gray_frame[y:y + h, x:x + w]
cropped_img = np.expand_dims(np.expand_dims(cv2.resize(roi_gray_frame, (48, 48)), -1), 0)
prediction = emotion_model.predict(cropped_img)
maxindex = int(np.argmax(prediction))
cv2.putText(frame1, emotion_dict[maxindex], (x+20, y-60), cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255,
255), 2, cv2.LINE_AA)
show_text[0]=maxindex
if flag1 is None:
print ("Major error!")
elif flag1:

```



```

global last_frame1
last_frame1 = frame1.copy()
pic = cv2.cvtColor(last_frame1, cv2.COLOR_BGR2RGB)
img = Image.fromarray(pic)
imgtk = ImageTk.PhotoImage(image=img)
lmain.imgtk = imgtk
lmain.configure(image=imgtk)
lmain.after(10, show_vid)
if cv2.waitKey(1) & 0xFF == ord('q'):
    exit()
def show_vid2():
    frame2=cv2.imread(emoji_dist[show_text[0]])
    pic2=cv2.cvtColor(frame2,cv2.COLOR_BGR2RGB)
    img2=Image.fromarray(frame2)
    imgtk2=ImageTk.PhotoImage(image=img2)
    lmain2.imgtk2=imgtk2
    lmain3.configure(text=emotion_dict[show_text[0]],font=('arial',45,'bold'))
    lmain2.configure(image=imgtk2)
    lmain2.after(10, show_vid2)
if __name__ == '__main__':
    root=tk.Tk()
    img = ImageTk.PhotoImage(Image.open("logo.png"))
    heading = Label(root,image=img,bg='black')
    heading.pack()
    heading2=Label(root,text="Photo to Emoji",pady=20, font=('arial',45,'bold'),bg='black',fg='#CDCDCD')
    heading2.pack()
    lmain = tk.Label(master=root,padx=50,bd=10)
    lmain2 = tk.Label(master=root,bd=10)
    lmain3=tk.Label(master=root,bd=10,fg="#CDCDCD",bg='black')
    lmain.pack(side=LEFT)
    lmain.place(x=50,y=250)
    lmain3.pack()
    lmain3.place(x=960,y=250)
    lmain2.pack(side=RIGHT)
    lmain2.place(x=900,y=350)
    root.title("Photo To Emoji")
    root.geometry("1400x900+100+10")
    root['bg']='black'
    exitbutton = Button(root, text='Quit',fg="red",command=root.destroy,font=('arial',25,'bold')).pack(side =
    BOTTOM)
    show_vid()
    show_vid2()
    root.mainloop()

```

5. Application of Project

In recent years, the use of facial expression recognition systems or softwares have been increasing. There are many applications of this product.

1. **Market Research:** Based on the current customers and partners engagements, the company is able to deduce marketing strategies and customized products in order to retain them. An expression reader in this situation can be useful as it can record the customers' or partners' emotions by advertisements or meetings and thus aid the company with this data.
2. **Health and Medicine:** In the field of health, this product can help in many methods. In every aspect of health care, it can be used to determine the emotions of a patient undergoing a surgery or a treatment process and notify the respective doctor about them. Using them as a basis a doctor can advise a better treatment suitable for the patient and thus easing out the difficulties or pain for them.
3. **Psychology:** It is the scientific study of the human mind and its functions, and it is done for the purpose of education or research including the medicinal part. This product has a lot of uses in the field of psychology as psychology is very closely related to emotions. Thus, learning emotions of humans at different situations can give us a much better knowledge about his/her mental psychology.
4. **Autism:** It refers to a broad range of conditions which are characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication. Thus for a person who is incapable of reading expressions of the society and understanding their emotions, face expression recognition system can aid a lot by characterizing it for such people and thus make it easier for them to react in a social gathering and thereby easing their lives.
5. **Lie Detection:** The machine developed for lie detection uses the sensors to find any abnormality in the blood flow streams of the user. This product can aid it by characterizing any suspicious changes in the expressions/emotions of the person who is being tested.
6. **Security System:** In a environment like an ATM or a bank, where the treat to security is a major problem, the security cameras can be enabled with this software in order to detect any suspicious expression to enhance the precautionary measures.

7. **Education:** This product can be used to measure real-time learner responses and engagement with their educational content and thus adapt, personalize the content and measure effectiveness of lecturer.

CHAPTER 6

RESULTS AND DISCUSSION

6.1 SCREEN SHOTS

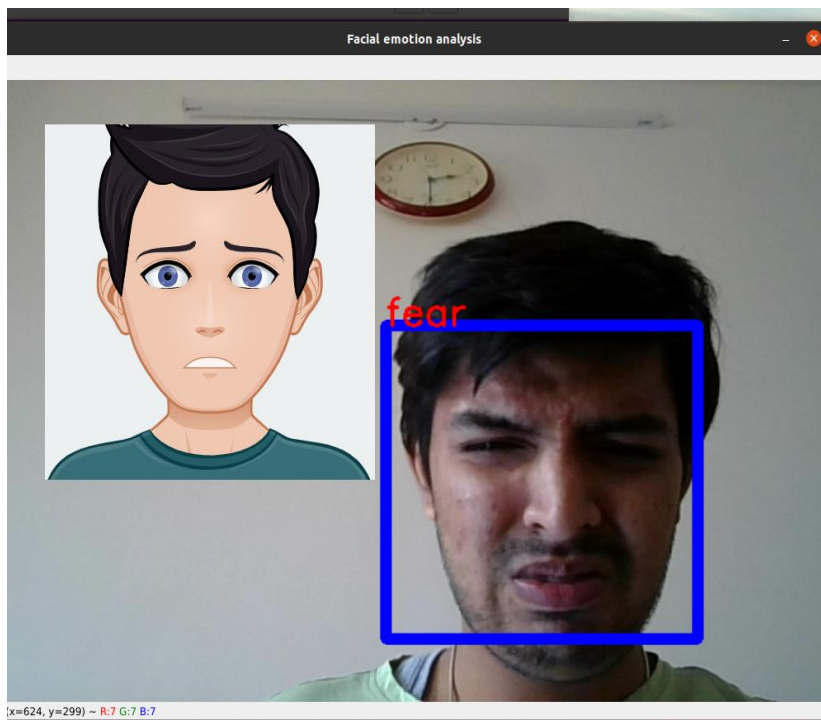


Fig 1.

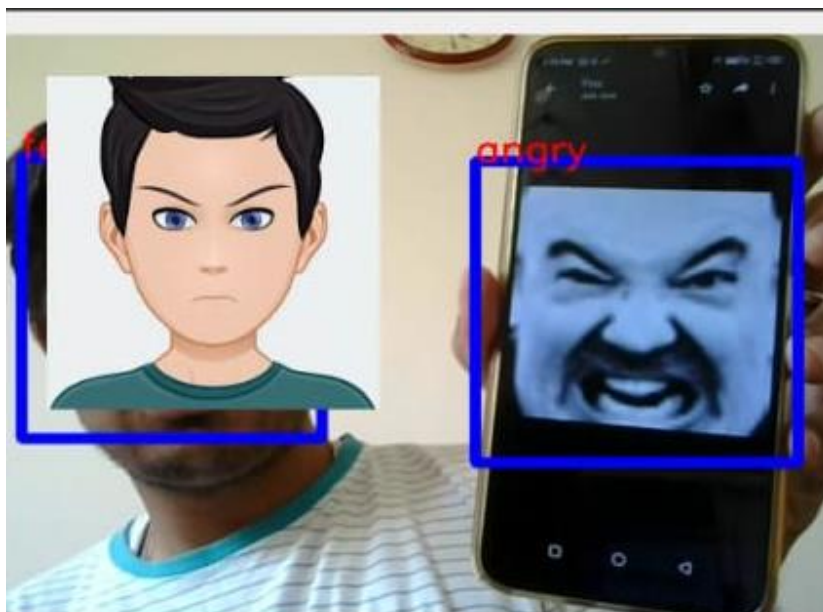


Fig 2.

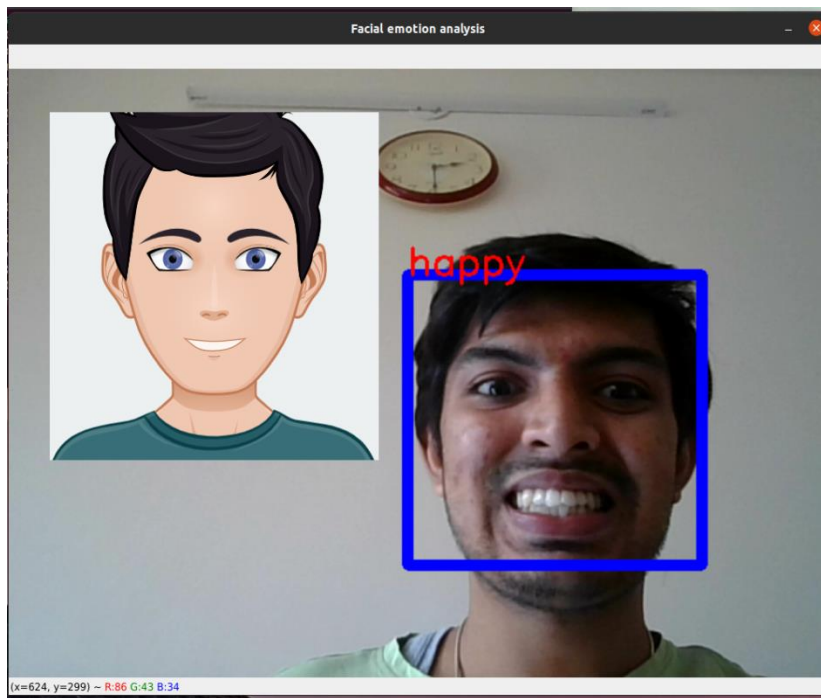


Fig 3.

7.Drawbacks

1. The project is able to detect only four facial expressions/emotions right now i.e. angry, sad, happy, and surprise.
2. It is not 100% accurate and needs improvement in it.

8.Future Prospects

The model needs to be trained more so that it becomes capable of detecting all human emotions. At the same time, the accuracy of the software is also aimed to improve.

9.Conclusion

In this deep learning project for beginners, we have built a convolution neural network to recognize facial emotions. We have trained our model on the FER2013 dataset. Then we are mapping those emotions with the corresponding emojis or avatars.

Using OpenCV's haar cascade xml we are getting the bounding box of the faces in the webcam. Then we feed these boxes to the trained model for classification.

10.REFERENCES

- <https://data-flair.training/blogs/create-emoji-with-deep-learning/>
- **Stackoverflow.com**
- **Kaggle.com**