FINAL PROJECT REPORT
SWE_1010
Course: Digital Image Processing
Professor: Dr.Geetha S

EMOTION RECOGNITION USING FACIALEXPRESSIONS

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Abstract: *Expressions on the face are a vital mode of communication in humans as well as animals. Human behavior, psychological traits, are all easily studied using facial expressions. It is also widely used in medical treatments and therapies. An emotion recognition system from facial expression is used for recognizing expressions from the facial images and classifying them into one of the six basic emotions. Feature extraction and classification are the two main steps in an emotion recognition system.*

INTRODUCTION

THE PROCESS OF HUMAN COMMUNICATION IS INEXTRICABLY LINKED TO THE FLUCTUATION OF VARIOUS EMOTIONS. WHEN PEOPLE ARE EXPERIENCING BASIC EMOTIONS, THEIR FACES WILL DISPLAY A VARIETY OF EXPRESSION PATTERNS, EACH WITH ITS OWN SET OF CHARACTERISTICS AND DISTRIBUTION SCALE. FACIAL EXPRESSION RECOGNITION IS A CRUCIAL PART OF HUMAN-COMPUTER INTERACTION THAT ALLOWS COMPUTERS TO UNDERSTAND FACIAL EXPRESSIONS BASED ON HUMAN THINKING. ACCORDING TO THE PROCESSING OF FACIAL EXPRESSION RECOGNITION PROCESS CAN BE DIVIDED INTO THREE IMPORTANT FACE DETECTION, FEATURE EXTRACTION AND CLASSIFICATION MODULE, FACE DETECTION AS THE KEY TECHNOLOGY OF FACE RECOGNITION, WHICH CAN EFFECTIVELY EXTRACTED FROM THE ORIGINAL FACE IMAGE OF EXCELLENT CHARACTERISTICS AND THE CHARACTERISTICS OF CORRECT CLASSIFICATION BECOMES KEY FACTOR AFFECTING THE RECOGNITION RESULT.

LITERATURE SURVEY

. EMOTION RECOGNITION USING FACIAL EXPRESSIONS - PROCEDIA COMPUTER SCIENCE, VOLUME 108, 2017, PAGES 1175-1184

IN THE ARTICLE THERE ARE PRESENTED THE RESULTS OF RECOGNITION OF SEVEN EMOTIONAL STATES (NEUTRAL, JOY, SADNESS, SURPRISE, ANGER, FEAR, DISGUST) BASED ON FACIAL EXPRESSIONS. COEFFICIENTS DESCRIBING ELEMENTS OF FACIAL EXPRESSIONS, REGISTERED FOR SIX SUBJECTS, WERE USED AS FEATURES. THE FEATURES HAVE BEEN CALCULATED FOR THREE-DIMENSIONAL FACE MODEL. THE CLASSIFICATION OF FEATURES WERE PERFORMED USING K-NN CLASSIFIER AND MLP NEURAL NETWORK.

DATASET

HTTPS://GITHUB.COM/MUXSPACE/FACIAL_EXPRESSIONS/BLOB/MASTER/DATA/500_PICTS_SATZ.CSV

MOTIVATION

Sentiment Analysis and Face Detection, individually 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. Sentiment Analysis 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.

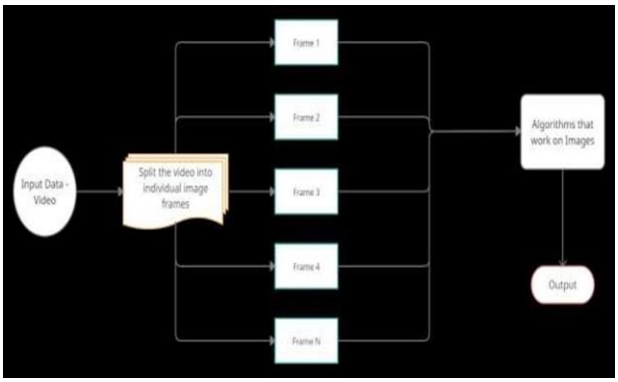
- **opencv_python Keras**
- **Pandas Numpy Imutils scikit_learn**
- **Any IDE for python Laptop/pc spec 8gb ram**

REQUIREMENTS:

SOFTWARE REQUIREMENTS:

- **OPENCV_PYTHON**
- **KERAS**
- **PANDAS**
- **NUMPY**
- **IMUTILS**
- **SCIKIT_LEARN**
- **ANY IDE FOR PYTHON LAPTOP/PC SPEC 8GB RAM**

ARCHITECTURAL DESIGN



MODULES

1. Function to extract individual frames
   OpenCV comes with many powerful video editing functions. In current scenario, techniques such as image scanning, face recognition can be accomplished using OpenCV. It is the extraction of meaningful information from videos or images. OpenCv library can be used to perform multiple operations on videos.
2. Emotion recognition algorithm integration with the separate images
   To make full use of the features of the key areas of facial expressions, we simply put, feature fusion is to combine multiple different features extracted by different algorithms into a new feature with stronger characterization capabilities through a certain fusion method.
3. Pandas data frame module
   We then create a Pandas DataFrame from these analyzed values and plot this dataframe. In this plot, we can see every emotion plotted along with the percentage.
4. Analyze different emotion values and find dominant emotion

PROPOSED METHODOLOGY:

Firstly we Import the required python libraries like numpy, seaborn, matplotlib, tensorflow. We have imported different modules from keras which is a wrapping on tensorflow. We have imported particularly that modules from keras which will help in building a CNN model. Now we will get the dataset on which our model will be trained and we will validate how good or bad our model has performed on that particular dataset, so that we can improve the accuracy score. Now after getting the dataset, using os library we get the train folder path and after that we are printing the total number and category of each expression folder. Then we will generate training and testing (validation) batches so that our model could be trained and evaluated/validated on the test data. This is a very important step as without this we can't have a accurate model and also without training the model also doesn't know what it has to look for and also predict for. As of now we have imported libraries, got dataset, and created train and test images. Now its time to move to another important step which is building the CNN Model. With the help from the keras module which is a great wrapper of the tensorflow library and helps to reduce our work. First of all we have initialized the CNN model by using sequential() function. After that we have created the first four layer of the neural network which are Convolution Layer. The convolutional layer can be added to our model by using model.add().

For train the model and evaluating the results, First of all We have set the number of epochs where One Epoch is when an ENTIRE dataset is passed forward and backward through the neural network only ONCE. Since one epoch is too big to feed to the computer at once we divide it in several smaller batches. As the number of epochs increases, more number of times the weight are changed in the neural network and the curve goes from underfitting to optimal to overfitting curve. we have done model.fit() which starts the

training and validation of our model. Its takes some parameters as input like x -> training dataset which is training_generator after that steps per epoch, validation data , validation steps and callbacks.

Then we have first imported model_from_json function which helps us to import the model from a json file. After the we have written a python class in which it has first a list of emotions which our dataset contained. After that we have defined the init method which takes the model.json file and the model weights file which is in .h5 format. After that in this we are reading the file and using the model_from_json function to load the model. After that we are loading the weights into the model. After this in the Class we have defined a method named predict_emotion which gives the prediction of the image. First it uses .predict method to give prediction after that we are using the numpy argmax to get a integer number b/w 0–6 representing the corresponding emotion in the list. And finally we return that particular emotion name.

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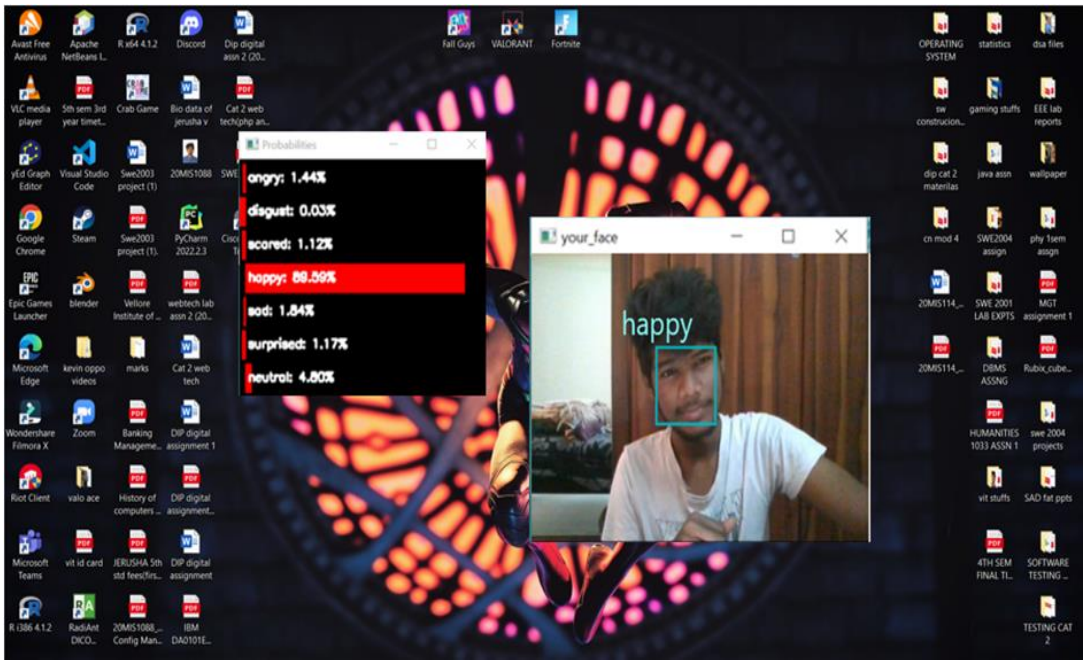
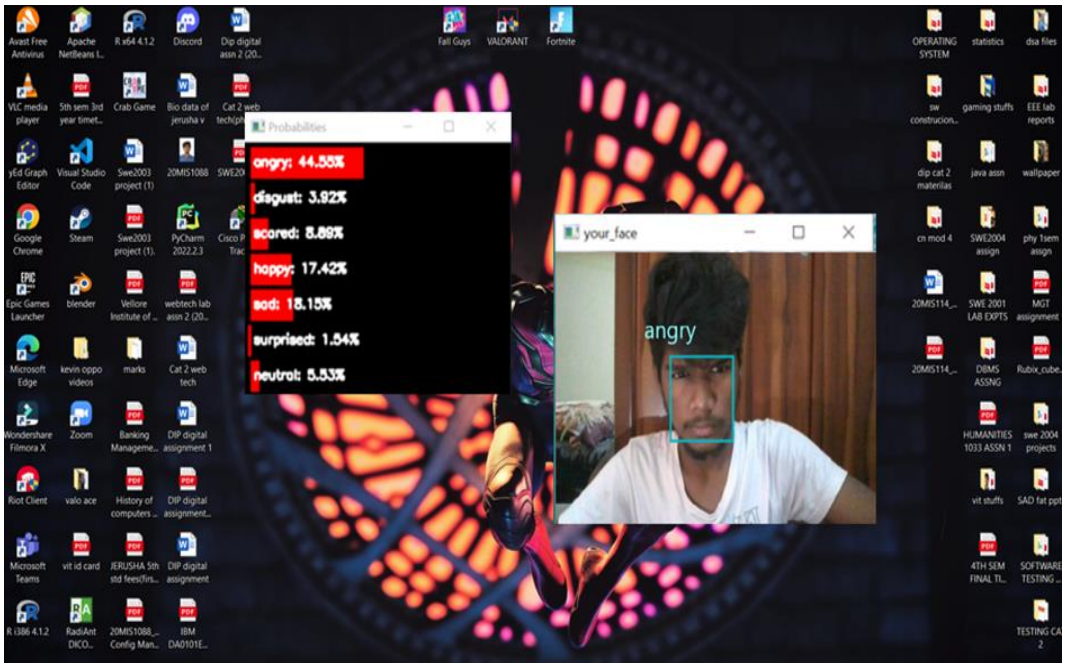
RESULT

- THERE ARE 2 WINDOWS THAT WILL APPEAR AS OUTPUT
- ONE WILL SHOW THE WEBCAM FEED ON WHICH IT WILL DETECT THE FACE AND TELL THE EMOTION ON THE FACE.
- THE OTHER WINDOW SHOWS THE PROBABILITY OF THE EMOTIONS THAT ARE PORTRAYED ON THE FACE FROM THE WEBCAM FEED.

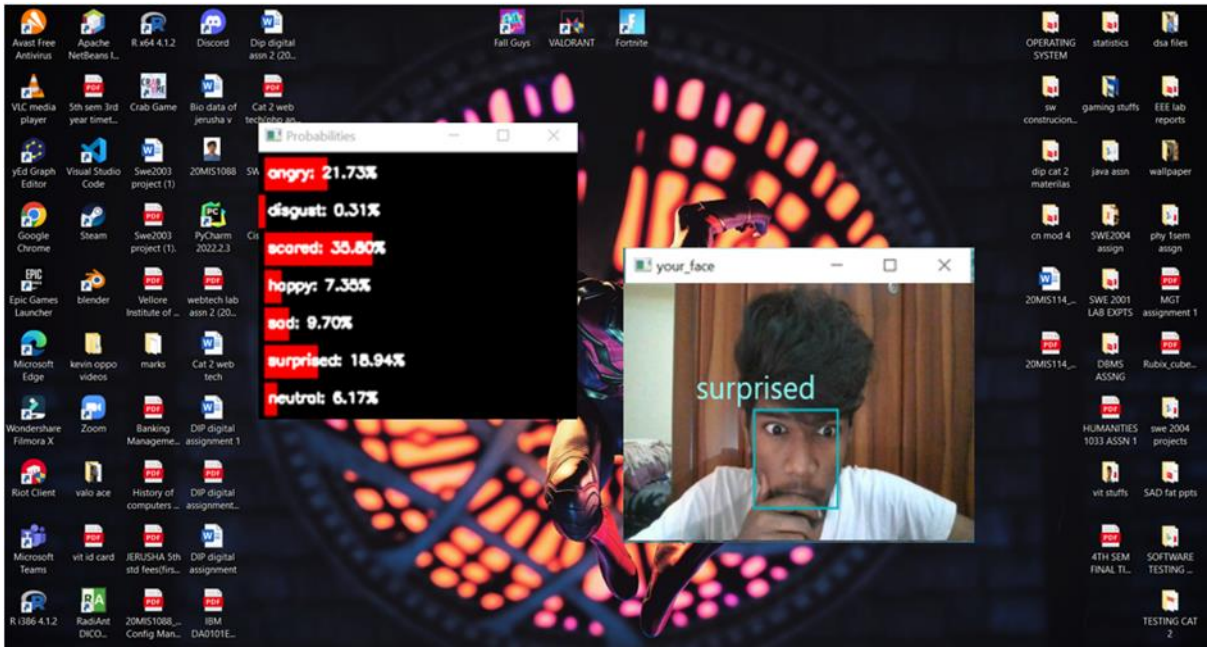
HAPPY:



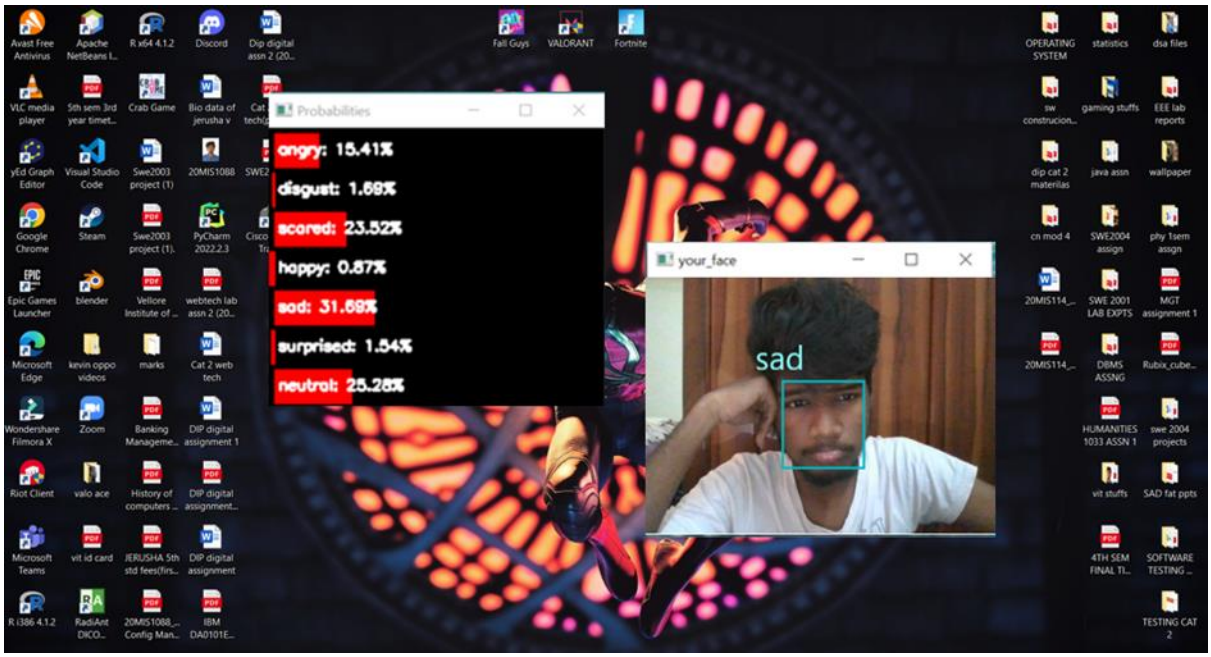
ANGRY:



SURPRISED:



SAD:



Conclusion:

OVERALL THE PROJECT GAVE AROUND 65% ACCURACY IN DETECTING THE FACIAL EXPRESSIONS

We can use the power of Artificial Intelligence to work on Cognitive Science and deal with human faces, this space is generally referred to as Computer Vision. We were able to extract emotions out of photos and videos of human faces. The accuracy of the emotion recognition from facial detection can be upto 60-65% from our methods. Because of its applications, there are constantly many machine learning models arising, aiming to gain the maximum accuracy when implemented in real-time applications. Through our project we learnt the importance of emotion recognition concepts in upcoming years.

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