Verzeo Major Project (AI)

Facial Emotion Detection

Team Members :

NAME	**Task / Responsibilities**
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Github: Facial Emotion Detection

FAQs:

1) Which Neural Network and why?

Convolutional Neural Network is used in this project. CNN is very much used in analyzing visual imagery. It also helps us to get more accurate value and it is also very much proved that CNNs is very useful in image recognition and classification. Each image process results in a vote here after featuring the pixel with every weight connected to every convolutional layer to get an accurate value with the model.

| type)	Output Shape	Param #
1 (Conv2D)	(None, 32, 48, 48)	320
2 (Conv2D)	(None, 32, 48, 48)	9248
ling2d_1 (MaxPooling2	(None, 32, 24, 24)	0
3 (Conv2D)	(None, 64, 24, 24)	18496
4 (Conv2D)	(None, 64, 24, 24)	36928
ling2d_2 (MaxPooling2	(None, 64, 12, 12)	0
5 (Conv2D)	(None, 96, 12, 12)	55392
6 (Conv2D)	(None, 96, 10, 10)	83040
ling2d_3 (MaxPooling2	(None, 96, 5, 5)	0
7 (Conv2D)	(None, 128, 5, 5)	110720
8 (Conv2D)	(None, 128, 3, 3)	147584
ling2d_4 (MaxPooling2	(None, 128, 1, 1)	0
_1 (Flatten)	(None, 128)	0
(Dense)	(None, 64)	8256
_1 (Dropout)	(None, 64)	0
(Dense)	(None, 7)	455

2) Which optimizer and why?

- Adam – Adaptive Moment Estimation. It requires very little memory and it is the one of the most used in gradient descent optimization algorithms. It also updates parameters with individual learning rate and also it is the best optimizer and faster than SGD.
- SGD – stochastic gradient descent. We have also used SGD optimizer in this model and it is used for optimizing an objective function. In this few samples are selected and randomly instead of the whole dataset set for each iteration and with help of this it updates the weight and parameter values.

3) Which accuracy metric and why?

"Accuracy" metric is used in our project. It is used for evaluating classification models; it creates two local variables total and count that are used to compute the frequency. With our model we have been successfully able to achieve 91% training accuracy.

And also we have "confusion matrix" it is one of the easiest way to measure the performance of a classification problem in this the matrix compare the actual target values with those the predicted by the machine learning model and recall in confusion matrix is the ratio of the relevant result returned by the search engine to the total number of relevant result that could be returned.
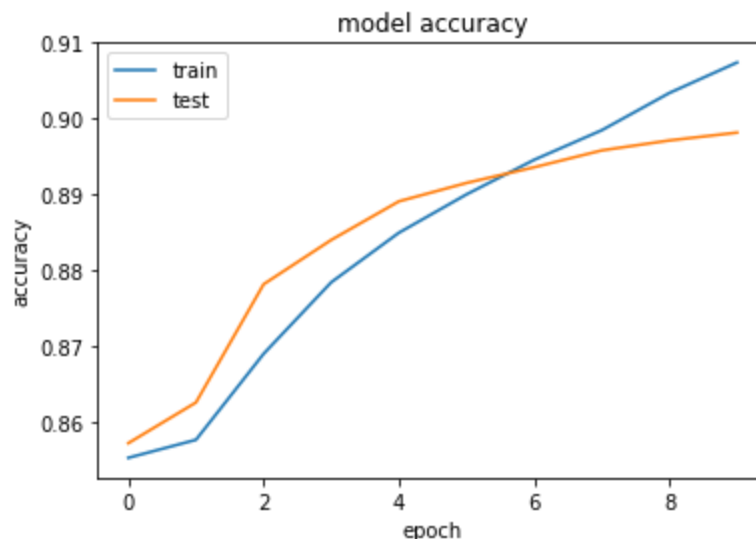
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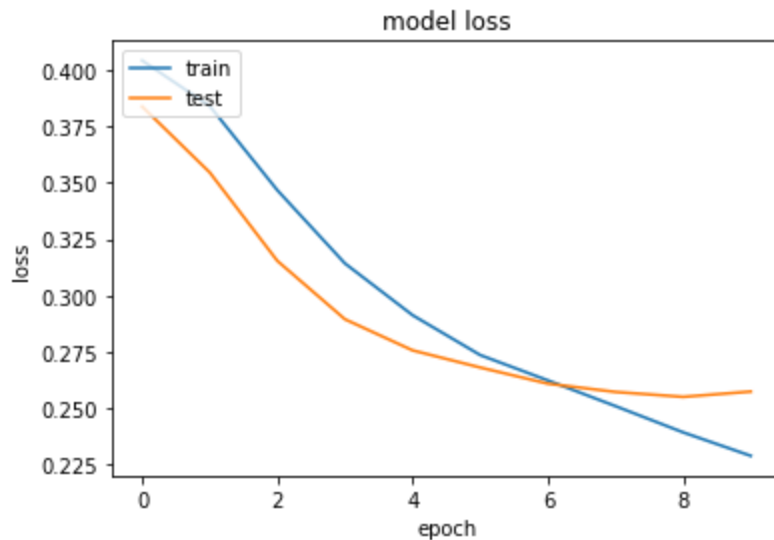
Final Training Accuracy: 90.74 %
Final Testing Accuracy : 89.87 %

4) Which loss function and why?

Binary Cross Entropy: Binary cross Entropy works with binary classification. Binary classification in most cases boils down to a true/false problem, where you want to classify new samples into one class or another. This also means that in your training set, each feature vector out of the many that your set contains belongs to one of two targets: zero or one, or 0,1. The binary cross entropy is computed for each sample once the prediction is made. That means that upon feeding many samples, you compute the binary cross entropy many times, subsequently.

5) Brief information on how cleaning was done.

Having clean data will ultimately increase overall productivity and allow for the highest quality information and with a clean dataset we can get the highest quality information. And your dataset has the quality and mostly no required cleaning in this because everything is as important as it is to predict the dataset.

6) How data got into the right shape?

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The chosen dataset was already in the right shape, so we went forward on training the model. This data set had all the images in the shape 48x48, also sorted according to their respective emotions. Hence, no cleaning was performed.

7) Which functions / features of OpenCV are used ?

1- The functions of OpenCV used in Image section of the project:
1. cv2.imread - Used for reading images from pathname.
2. cv2.cvtColor - Change the color of the frame/image.
3. cv2.CascadeClassifier (detectMultiscale)
4. cv2.normalize - Used to change the image pixel image values.
5. cv2.rectangle - Used for drawing rectangle on image.
6. cv2.putText - Used to add text on image.
7. cv2.imshow - Used for showing the image,
8. cv2.waitKey - It is a keyboard binding function whose argument is in milliseconds. The system waits for that amount of time for keyboard action.

2- The functions of OpenCV used in Video and Real-time section of the project:
1. cv2.CascadeClassifier (detectMultiscale)
2. cv2.VideoCapture - Used for capturing the video using the webcam.
3. cv2.cvtColor - Change the color of the frame/image.
4. cv2.rectangle - Used for drawing rectangle on image.
5. cv2.resize - Used for resizing the images,
6. cv2.putText - Used to add text on image.
7. cv2.imshow - Used for showing the image,
8. cv2.waitKey - It is a keyboard binding function whose argument is in milliseconds. The system waits for that amount of time for keyboard action
9. cv2.destroyAllWindows - Closes all the open windows.

8) Which dataset have you used?

A data set is fer2013.csv of [287.13mb] with 7 emotions and 34034 unique values- emotion detection dataset is used [here](#).

This drive link consists of 28710 train set .png files and 3590 test set .png files of seven different emotions.

This fer2013.csv file contains the train and test images of the google drive folder above in the form of a single .csv file as pixels matrices.

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Supported Emotions:
      0 - denotes angry
      1 - denotes disgusted
      2 - denotes fearful
      3 - denotes happy
      4 - denotes sad
      5 - denotes surprised
      6 - denotes neutral

Prerequisites For The Project :

Instructions to run the emotion detection app

All the folders like the models, audio_files, images folders should be present as this script requires all those folders to run.

In the command prompt run:

> ### ***streamlit run emotion_detection.py***

To understand this thoroughly you should have some basic knowledge of :

- Python
- OpenCV
- Convolution Neural Network (CNN) and the various layers used to make it
- Numpy
- Tensorflow

Libraries of python used in this project:

- Numpy
- Matplotlib
- Pandas
- OS
- Sys
- Gtts
- PlaySound
- Streamlit
- Threading
- OpenCV
- Tensorflow / Keras

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<u>First</u> - Import all libraries and modules that are needed in this project and describe all the values and variables which you have in dataset, i.e. -

        -- number of classes
        -- size of the image
        -- batch size and more.

<u>Second</u> - Take the dataset which we have selected is fer2013 in kaggle with 7 classes namely - Angry, Disgust, Fear, Happy, Sad, Surprise and Neutral.

The training set consists of a total of 28,709 examples. Now import the validation and training data . This model is trained on the training dataset and validation dataset.

<u>Third</u> - Now that we have completed the dataset modification, it's time to implement CNN network on a sequential model. We have used some of layers from keras -

- Conv2D()
- Activation(activation_type)
- BatchNormalization()
- MaxPooling2D(pool_size, strides, padding, data_format, **kwargs)
- Dropout(dropout_value)
- Flatten()
- Dense()
- Activation layer

<u>Fourth</u> - Compile and train, now only left to compile and train the model.

<p align="center">THANK YOU !</p>