

Facial Emotion Recognition Using Deep Learning (CNN)

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Abstract—The emotions, can be defined in simple words are what people feel. The face is probably the simplest approaches to separate the individual personality of one another Face recognition is a personal identification system that uses personal characteristics of a person to identify the person's identity and its Facial expressions. There are methods to identify expressions using machine learning and Artificial Intelligence techniques, this work attempts to use deep learning and image classification method to recognize facial expressions and classify these expressions according to the images. Various datasets are traversed for training expression recognition model are explained in this paper. We have used for expression recognition with FER2013 (Facial Expression Recognition).

Keywords—*Face Emotion Recognition, Face Detection, Feature Extraction, Classification, Convolutional Neural Network*

I. INTRODUCTION

Facial expressions or feelings are methods for passing on non-verbal emotions or opinions of an individual. Facial expression recognition (FER) is a strategy to perceive expressions all over. There are numerous approaches to examine the recognition of human expressions, going from facial expressions, body pose, voice tone and so on. This paper has been focusing on Facial Emotion Recognition. Facial Emotion Recognition is a prospering examination region where a lot of progressions like programmed interpretation frameworks, machine to human collaboration are going on in organizations. Many applications like human-computer interaction (PC reacting/associating with people in the wake of examining what human feels), computer forensics (in the case of lie detection), pain detection, the field of education (i.e. distance learning, here teachers determine whether the student is Interested or not), games and entertainment (for asserting persons experience) find its base in facial expression recognition systems. There are several traditional FER methods that require manual feature selection mainly Histogram of Oriented Gradients(HOG), Local Binary Pattern(LBP), Scale Invariant Feature

Transform(SIFT), and many more and then feed to a custom designed classifier to classify the expressions. However, such strategies neglect to deliver exact outcomes since the features are manually extracted and furthermore it becomes unwieldy when dataset is enormous. This is where Deep learning wins. Deep learning keeps away from the unpredictability of manually extracting features. In deep learning we attempt to imitate brain framework with layered model structure to extract features from input information bit by bit thereby resulting in more abstract high-level feature representation. In contrast this paper is focusing on Convolutional Neural Network, emotion databases, classifier algorithms and so on.

II. RELATED WORK

A. Facial Recognition

Face recognition is a strategy for distinguishing or checking the character of an individual utilizing their face. Face recognition frameworks can be utilized to distinguish individuals in photographs, video, or continuously Facial Emotion Recognition. Face classifier is utilized for facial recognition. a face classifier is utilized to test each sub window in a subset of these pictures. At each scale, faces are identified relying upon the yield of the classifier. The recognition results at each scale are projected back to the info picture with the suitable size and position.

B. Facial Emotion Recognition

Facial Emotion Recognition is research territory which attempts to distinguish the emotion from the human facial expression. The overviews expresses that advancements in emotion recognition simplifies the perplexing frameworks. FER has numerous applications which is examined later. Emotion Recognition is the challenging undertaking since emotions may differ depending on the climate, appearance, culture, face response which prompts questionable information. Survey on Facial emotion recognition helps a great deal in exploring facial emotion recognition.

C. Deep Learning

Deep Learning is AI procedure which models the information that are intended to do a specific assignment. Deep learning in neural networks has wide applications in the zone of image recognition, classification, decision making, pattern recognition and so on. Other deep Learning procedures like multimodal deep learning is utilized for feature selection, image recognition and so forth.

III. PROPOSED METHODOLOGY

This section explains the proposed methodology, emotion database used for research, Inception model.

A. Facial emotion database

The dataset used here comprises of 48x48 pixel grayscale images of faces. The faces have been consequently enrolled with the goal that the face is pretty much focused and involves about a similar measure of room in each picture. The task is to categorize each face based on the emotion shown in the facial expression into one of these five categories (Angry, Happy, Sad, Surprise, Neutral). The FER-2013 dataset consists of labelled images 28,000 in training set and 3,500 images in the development set, and 3,500 images in the test set. This dataset was made by social occasion the aftereffects of a Google image search of every emotion and equivalents of the emotions.

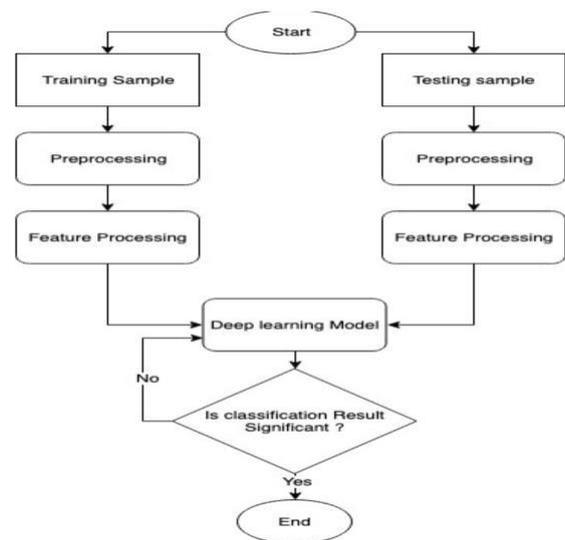
B. Preparation of Training dataset

Actually, most information is muddled or deficient. Snap a photo for instance. To a machine, a picture is only a progression of pixels. Some may be green, some may be earthy colored, yet a machine doesn't have a clue about this is a tree until it has a name related with it that says, fundamentally, this assortment of pixels here is a tree. On the off chance that a machine sees enough named pictures of a tree, it can begin to comprehend that comparative groupings of pixels in an unlabeled picture likewise establish a tree

C. Algorithm

Deep learning Facial Recognition General Algorithm – These days nonlinear neural network engineering has numerous secret layers and deep learning helps us to reenact the human mind learning and examination. For reproducing the information by layer, the component plan of the example in the genuine space is changed over into a more perplexing element space. So it is vital to describe the informational collection and copy the human cerebrum to comprehend the information like sound, picture and text. In this strategy look

acknowledgment has been finished.



CNN-A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an information image, assign importance (learnable weights and biases) to various aspects/objects in the image and have the choice to separate one from the other. The pre-processing required in a ConvNet is a lot of lower when contrasted with other classification algorithms. While in crude techniques filters are hand-designed, with enough preparing, ConvNets have the ability to learn these filters/characteristics.

The engineering of a ConvNet is similar to that of the network example of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex.

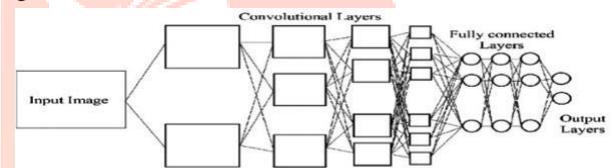
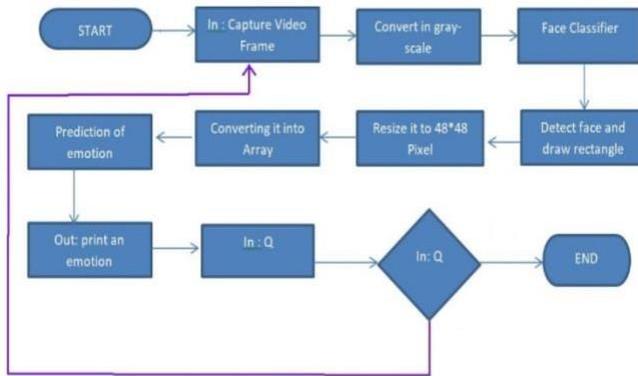


Fig. 2 : Convolution Neural Network [2]

D. FLOWCHART

In the given block diagram first it take input as a single frame from video and then that image is converted into grey scale. Face classifier detects the face and the rectangle will be drawn bounding the face. Resize that image into 48*48 for architecture mobile net and converting it into array for predicting emotion and then the emotion with higher prediction will be printed on the frame.



IV. LIBRARIES AND PACKAGES

We have used different python libraries and packages for facial emotion detection mainly

1) *OpenCV*

OpenCV is a cross-stage library utilizing which we can grow constant PC vision applications. It fundamentally centers around image processing, video catch and examination including highlights like face detection and article detection.

2) *Tensorflow*

TensorFlow is an open-source library created by Google fundamentally for deep learning applications.

3) *Keras*

Keras is an open-source programming library that gives a Python interface to artificial neural networks

4) *Numpy*

NumPy is a library for the Python programming language, adding support for huge, multi-dimensional arrays and matrices, alongside a huge assortment of undeniable level numerical capacities to work on these arrays.

V. HARDWARE AND SOFTWARE

1) *Hardware Requirements:-*

System Processor : Intel i5 or i7
 Hard Disk : 500GB
 RAM : 8GB
 Camera

2) *Software Requirements :-*

Operating system : 64 bit Windows 10

Design Constraint : Anaconda Spyder
 Programming Language : Python 3.8

VI. CONCLUSION

Numerous researches and studies about Emotion Recognition, Deep learning techniques used for recognizing the emotions are conducted. It is required in future to have a model like this with much more reliable, which has limitless possibilities in all fields. This project tried to use architecture mobile net for solving emotion recognition problem. FER2013 is used as dataset for carrying out the research. Tensor Flow is used to train the model.

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