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Facial Emotion Recognition using CNN

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Abstract: Facial expression recognition is a trending topic in most of the fields. In the proposed work, there are classification of human faces into 5 basic emotions takes place. The proposed work gives the technique of facial emotion recognition using convolutional neural network which is the goal of the work. The work is based on two parts convolutional network. The first section is the recognition of the emotion using database and the next part focuses on the facial features of the pictures using live video. The FERC is different from single level CNN, the improve of accuracy can be obtained. The FERC Facial emotion recognition can be useful in many applications such as driver alertness, lie detectors, etc.

Index Terms **- CNN, Emotion recognition, Facial features.**

I. INTRODUCTION

Individuals interface with one another within the sort of speaking, signaling and feelings. Countenance are the crutial identifiers for individual's feelings, because it corresponds to the feelings. Facial emotion recognition is that the process of finding human emotions from facial expressions. Facial identifiers are the essential identifiers for the emotions of human, because it correlate to the emotions. Mainly the facial expressions focusses on facial investigation by keeping entire background and hence increase tons of misleading features that confound CNN training process [1]. CNN work greater for face recognition job since they're ready to catch spatial features of the inputs thanks to their sizable amount of filters [2]. Including facial emotion, Biometric also comes have an important role, Biometrics refers to the physical and behavioral features which will be utilized in recognition of citizenry [3]. The present paper mainly focuses on five countenance namely anger, sad, happy, feared/scared and surprised [4].

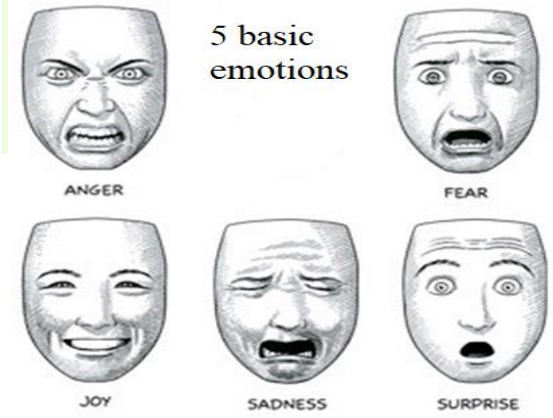

Figure 1: Basic Facial Expressions

Not long ago there has been getting bigger curiosity in the better interaction between individuals and computers. It's contended that to realize effective individual-computer brilliant functioning, there's a requirement for the pc to function natively with the user, almost the same way like individuals function. Individuals function with one another mostly through speaking, but also through body movements to stress a particular a part of speaking and projection of feelings. There's greater and greater proof emerging that exhibit that affective skills are a section of what's called 'intellectual'. Individual interface with one another within the sort of speaking, body movements and feelings. Intrinsically computers which will identify an equivalent are in great demand in different fields. With reference to AI, a systems are going to be ready to influence with individuals far more unaffectedly if they're having the ability of absorbing individual's feeling.

II. LITERATURE REVIEW

The author Ninad Mehendale [1], proposed a technique called facial feelings identification using neural networks (FERC). The given technique is predicated on 2 sections of convolutional network. Gurudutt et. al. [2] divided images of individual's faces into seven basic feelings. This technique work greater for face identification duty since they're ready to catch spatial characteristics of the details. The totally pre-programmed pose and expression invariant 3D face alignment algorithm is proposed by Ratyal et al. [3] to handle frontal and profile face images which is predicated on a two pass course to fine alignment strategy. Facial expressions is that the common signal for the citizenry to fetch the mood. The author Roberto et al. [5] firstly defines the salient areas on the faces and therefore the author also proposes and applies the thought of normalizing the salient areas to align the precise areas which express the various expressions. Since in 21th century, defined the seven basic emotions like anger, scared, happy/smile, sad, disrespect, disgust and surprise. During this paper the author Ekman P and Friesen [8] presented a system for recognizing emotions through facial expressions displayed in live video streams and video sequences.

Face pose appearance remains an enormous problem with detection of face, on a condition that the answer for changeability in face pose impression. The author Sajid et al. [9] had used the local derivative pattern (LDP) based approach for three-dimensional pose invariant approach using specific descriptors. In this method, the face images are registered by transforming their acquisition pose into frontal view using three-dimensional variance of the facial data. There are many issues like excessive makeup, to urge on with these artificial effects, within the paper Muhammed sajid [10] had used deep conventional neural network (dCNN) using augmented face data set which extracts features from face images containing synthetic structure. Support Vector Machine (SVM) classifier is trained on depth and texture features to acknowledge makeup wearing face images. During this paper, the author Zafar et al. [11] reported the asymmetric aging of the left and right sides of face images and its impact on accurate age estimation. Left symmetric faces were perceived as younger while right symmetric faces were perceived as older when presented to the state-of-the-art age estimator. Unique approach to encoding the relative spatial information for histogram-based representation of the BoVW model. This is often established by computing the worldwide geometric relationship between pairs of identical visual words with reference to the centroid of a picture. The Bushra [15] proposed thesis is evaluated by using five different facial emotions as datasets.

Comprehensive experiments demonstrate the robustness of the proposed image representation as compared to the state-of-the-art methods in terms of precision and recall values. An emotion recognition algorithm using frontal facial image is given. The author Moon Hwan Kim et al. [17] Proposed an algorithm consists of three main stages: image processing stage and facial feature extraction stage, and emotion detection stage. In image processing stage, the face region and facial component is extracted by using blurred color filter, virtual face model, and histogram analysis method. The features for emotion detection are extracted from facial component in facial feature extraction stage. The author Danisman et al. [18] presents a real-time automatic facial feature point detection method for countenance recognition. The proposed work is capable of detecting facial feature points (eyebrows, pupils, nose, and corners of mouth) from RGB to grayscale images extracted from a given video. Extracted feature points then used for countenance recognition.

III. FRAMEWORK OVERVIEW

CNN is that the hottest method of examining figures. The proposed methodology adopted within the present project work is depicted within the Figure 2 shown below. The proposed method consists of two levels, the primary level recommended is to spot face, wont to extract emotions from a picture. The next section finds the face characteristic such as eyes, mouth etc….

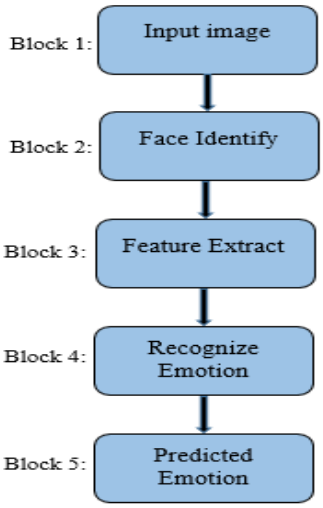

Figure 2: Block Diagram of Proposed Methodology

To make an efficient system that will be able to determine emotion from frontal face image is the main goal. In detail explanation of the each block is given below:

- Block 1 gives the information about input image, this is collection of database.
- Block 2 gives the face identify, this will identifies the face in the image.
- Block 3 gives the feature extract, facial features (like eyes and mouth) can be extracted.
- Block 4 gives the emotion recognition, recognition of the emotion can be done for the input image.
- Block 5 gives the particular emotion which has been detected from all the levels.

IV. CONVOLUTIONAL NEURAL NETWORKS

It is made up of several layers that process and transforms an input to produce an output.
There are 3 ways to train CNN

i. Local receptive fields: It is translated across an image to create a feature map from the input layer to the hidden layer neurons.
ii. Shared weights and biases: A CNN has neurons with weights and biases. The weights and biases are same for all hidden neurons in a given layer.
iii. Activation and pooling: The activation step applies a transformation to the output of each neuron by using activation functions. Pooling reduces the dimensionality of the featured map by condensing the output of small regions of neurons into a one output.

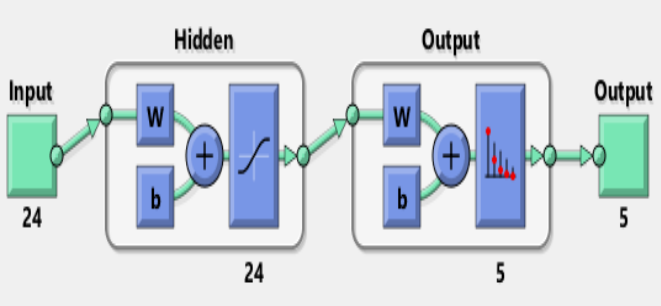

Figure 3: Architecture of CNN

By applying all the layers together by using the above concepts we can configure the layers which is shown in Figure 3. There are 24 hidden layers and 5 output layers which are considered in the proposed work. The first hidden layer gives how to detect edges and last layers gives how to detect complex shapes. The final layer connects every neuron from the last hidden layer to the output, this produces the final output.

The overall process is follows:

1) Dataset preparation:
Capturing the image from the camera. Converting the captured image from RGB to grayscale. Cropping the image for a specific length and width by using bounding box. Saving the cropped image into datasets.
2) Build the model using convolution:
Firstly, training the images using CNN (by using convolution, Relu, pooling).
3) Testing the model:
After all these process, have to test the model, initiate camera, clicks image, resizing and recognition emotion.

IV. RESULTS AND DISCUSSION

The datasets considered in this proposed work all are author's images. We kept 70% of dataset images as training and 30% dataset images as testing images. In all 29 iterations were carried out, with the different sets of 70% training data each time.

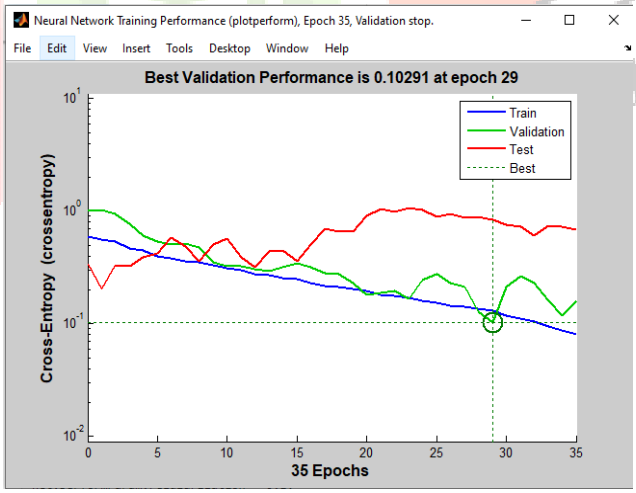

Figure 4: Performance

Cross entropy: calculates a network performance given targets and outputs, with optional performance weights. Performance weights are an optional argument defining the importance of each performance value, associated with each target value, using values between 0 and 1.

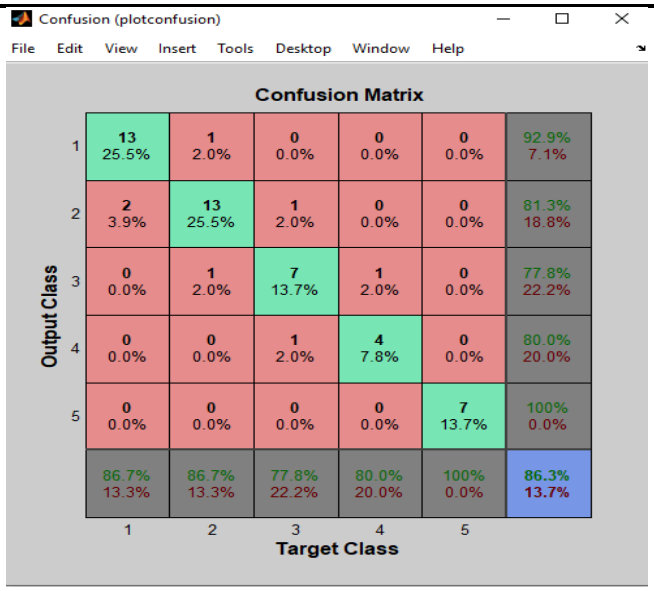

Figure 5: Confusion matrix

The confusion matrix displays the entire number of observations in each cell. Both the amount of observations and therefore the percentage of the entire number of observations are shown in each cell. The rows correspond to the anticipated class (Output Class) and therefore the columns correspond to truth class (Target Class). The diagonal cells correspond to observations that are correctly classified. The off-diagonal cells correspond to incorrectly classified observations.

CONCLUSION

In order to detect Emotion from an image have to use multiple images as datasets. There is an emotion recognition problem to handle that we need a frontal facial images. The recognition of 5 different emotion can be obtained using the images stored in database. All the basic emotion such as anger, fear, joy, sad and surprise is recognized. The performance analysis has been done for the proposed work and obtained around 86% of accuracy.

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