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SURVEYING FACIAL RECOGNITION AND AGE DETECTION

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Abstract: Age estimation and facial expression recognition still remains as a notable problem in pattern recognition. We require massive face data in order to estimate one's age and facial expression. Due to lack of labelled face images we use novel learning schemes through deep convolution neural networks. Deep learning helps in extracting apparent features of face images, focusing on age classification task without depending on artificial features.

Keywords: Face perception, Deep learning, artificial learning, age estimation, face recognition ability.

I. INTRODUCTION

Age estimation and facial expression has attracted much attention due to its potential application in Human Computer Interaction (HCI), surveillance monitoring and many more. As the name indicates, deep learning is a subset of machine learning. It is an emerging area of computer science that is revolutionizing artificial intelligence, allowing us to build machines and systems for the future. It usually involves using of deep artificial neural networks to tackle machine learning problems. Facial expression can be determined by geometrical features or apparent features or the combination of both. Facial image conveys identity, emotional state, gender, age etc. Determining age related information is the key factor of facial expression determination. Various features involve HOG, gist features, geometric features, colour histogram, dense SIFT+PCA and is used for beauty prediction. Popular deep learning method used in facial expression detection is CDBN. Transfer learning has been widely used in this. Here its trained deep convents for face identification task with large scale data sets. The two ways of functional importance of adaptive norm based coding for face identity recognition namely, first, to be reduce in groups of peoples who have difficulty in recognising facial identity. Second, individual differences in typical face recognition ability. [1]

II. RELATED WORK

Recently, lots of work have been done using deep learning algorithms to recognise face or other face related tasks. Sun Yi proposed Deep ID structure to recognize face features [11]. In Deep ID, we have to take 60 patches from a face image and for an independent network we have to use an each patch as input [12]. By using the distinct face images, we have to train 60 independent networks. The structure of Deep ID shown in the Fig.1. To detect facial landmarks a deep multitask algorithm proposed by Zhanpeng Zhang. In this paper they formulate task constraints deep model. [12]

For improving Deep ID algorithms Yi Sun add a verification feature in loss function to get better result and this feature called as Deep Identification feature - DeepID2. The structure of this as shown in fig.2 [13]

There is another algorithm for recognizing face landmarks that is a cascade Deep ConvNet algorithm [14]. In this paper, they explain about 5 facial points that are left eye centre (LE), right eye centre (RE), nose tip (N), left mouth corner (LM),

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and right mouth corner (R-M). We cascade three levels of convolutional networks to make coarse-to-fine prediction.

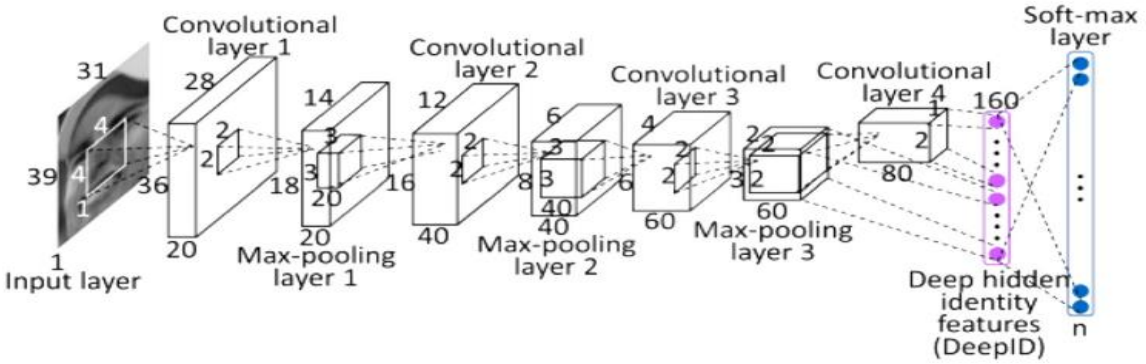

Fig.1 Deep ID's network structure

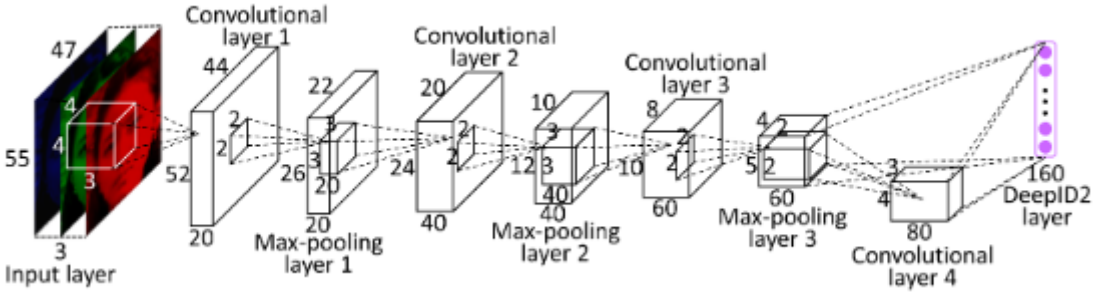

Fig.2 The Deep ConvNet for DeepID2

used Deep ConvNet to perform better age estimation[15].

A. Facial Expressions

Face recognition program began in 1990s in order to encourage commercial face recognition market. It involves creating a data base of facial images.

1. Kohenen demonstrated that a simple neural net could perform face recognition for aligned and normalised face images.
2. In 1989 Kirby and Sirovich introduced an algebraic manipulation which made it easy to directly calculate aligned and normalised face images
3. In 1991 Torke and Pentland demonstrated that the residual error when coding could detect faces in cluttered natural imagery and to determine the precise location and scale of faces and human images.

Yuan Dong and Yinan Liu proposed to calculate age estimation by using age classification task and

B. Finding the Faces

1. In the beginning the image is made into black and white because coloured data is not needed to find the expressions.
2. Then by looking at each single pixel in the image we end up with every pixel being replaced by the arrows and these arrows are called Gradients.
3. To do this the image is divided into small squares of 16*16 pixels. End result is a very simple representation of the images is obtained.
4. To find faces in HOG method, find the part of the image which looks most similar to the HOG picture.

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C. Posing and Projecting Faces

Faces that are turned into different directions look totally different to the computer.

So, we try to warp each image so that the eyes and lips always in a same place. To do this we are going to use an algorithm called Face Landmark Estimation.

The basic idea is to come up with 68 specific points called Landmarks that exist on every face. Then we train a machine learning algorithm to find these specific points on these faces.

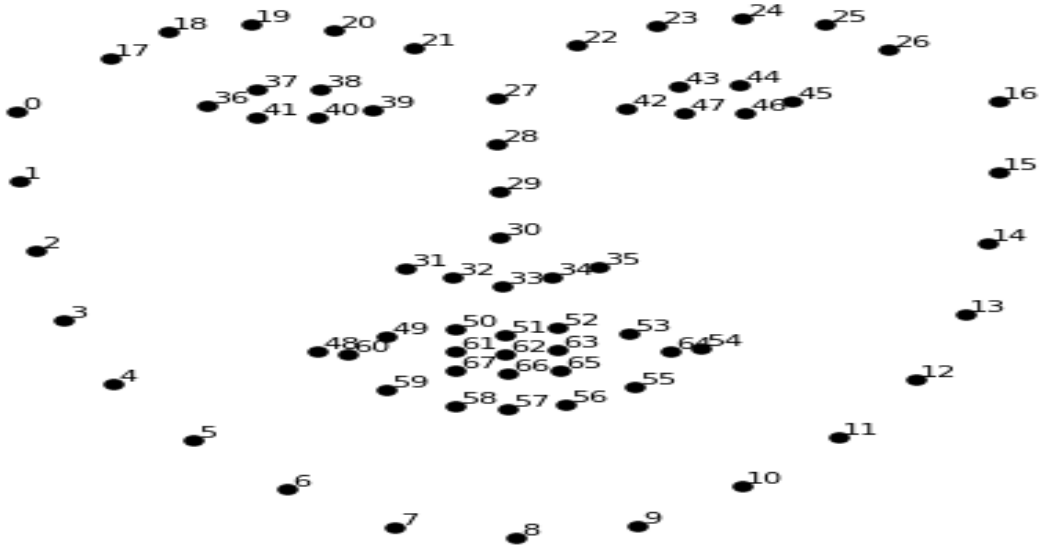

Fig.3 Point Allocation Technique

D. Encoding Faces

1. The simplest approach to face recognition is to directly compare the unknown face in step 2 with all the pictures we have of peoples.
2. Next step is to extract few basic measurements from each face. Then the unknown face is measured in the same way to find the known face with closest measurements.

3For example, measurement of size of each ear, the spacing between the eyes, length of the nose, etc.

4. 128 measurements are generated for each person by repeating the steps millions of times for different people approximately 10-12 different pictures of the same person roughly give the same measurement.
5. Those 128 measurements of each face are known as Embedding as suggested by the machine learning people.
6. It involves convolution neural networks. To produce the output of the embedding, it requires lot of data.
7. Once the network is trained, it can generate measurements for any face, even the one's not seen before.

E. Age Determination

Different algorithm have been employed. The hybrid model introduces many attractive features. [10].There exist two methods of using the network in order to predict age:

1. Centre Crop: Feeding the network with the image, cropped around the face centre.
2. Over-Sampling: We extract five cropped regions, four from the corners and an additional crop region from centre of the face. All the five images are represented by network. The average forecast value is assumed to represent its final prediction.

III. FACIAL AND AGE DETERMINISTIC TECHNIQUES

A. Deep Id Structure

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Among various prevalent processes, Sunet. al proposed Deep ID structure for extracting discriminative face that was based on Deep ConvNet to automatically estimate age.
In the proposed algorithm, the task could be implemented in two ways:
1 AGE CLASSIFICATION TASK: Face image is usually assigned to a class label representing age range.
2. AGE REGRESSION TASK: It predicts age number by focussing on assigning face image to an age range label.

B. Self-Taught Learning

It emerged due to difficulty in determining facial expressions because of limited number of face images. Transfers low level structures into useful features to be shared by labelled images. We utilise unlabelled samples to pertain Deep Networks.
As we know CDBN is used for facial expression prediction. It consists of 2 layers. Self-Taught learning is on the first layer and then Labelled Face Images on the other layer. The concatenation of two helps in prediction of facial expression.

IV. OUR PROPOSED WORK

We have studied both the topics i.e. Facial Expression Determination and Age Estimation. We found that the technology used here is Deep Neural Networks. A fully automatic approach to learning the personal facial attractiveness references of individual users directly, e.g., images. [8]. Facial expressions are determined by Transfer Learning and Deep ID Structure methods. Age determination uses Convolution Neural Networks. With the help of both the techniques we have proposed and idea for BABY IMAGING.

V. CONCLUSIONS

On the basis of Deep Convolution Neural Networks Face-age estimation is done. Since, there is shortage of labelled images therefore transfer learning strategies are used. Experimental result shows that the network trained in identification task are able to extract discriminative facial features. Labelled images are able used to tune the trained networks to extract the trained networks to extract the age-related features.
The experiment conducted here is widely used in the current scenario and to conduct more experiments for the betterment within the future work.

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BIOGRAPHY

Vandana Bharti is an Asst. Professor of Computer Science Engineering Dept. from NIET, Gr. Noida .He has 5 years of Experience in Teaching and research work.

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