"Gender Recognition and Age Estimator Using Deep Learning Techniques"

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Abstract— Gender is also a central feature of our personality still. In our social life, it's also a major element. Computing age predictions are often utilized in many fields, like smart human-machine, interface growth, health, cosmetics, electronic commerce etc. The prediction of people's sex and age from their facial images is an on-going and active problem of research. The researchers suggested type of methods to resolve this problem, but the factors and actual performance are still inadequate.

Age and gender that are the two key facial attributes play a foundational role in social interactions, making age and gender estimation from one face image.The elemental aim of this paper is to develop an algorithm that estimates age and gender of a personal correctly. One in every of the foremost widely used techniques is haar cascade. During this paper we propose a model which may predict the gender of someone with the help of Haar Cascade. The model trained the classifier with different male and feminine images as positive and negative images. Different facial expressions are extracted. With the help of Haar Cascade classifier will determine whether the input image is male or female.

We made use of Deep- Convolution neural network. It works efficiently even with limited data. For the age approximation task, the paper makes use of caffe deep learning framework. Caffe provides expressive architecture, extensible code. Caffe can process over 60M photos per day. This makes it one amongst the fastest convent implementation available.

Keywords — Gender recognition, Age classification, Haar cascade, Caffe deep learning framework, Convolution neural networks,OpenCV.

I.   INTRODUCTION

Human face could also be a storehouse of varied information about personal characteristics, including identity, emotional expression, gender, age, etc.. This plays a big role in non- verbal communication between humans. Age and gender, two key facial attributes, play an extremely foundational role in social interactions, making age and gender estimation from one face image a really important task in machine learning applications, like access control, human-computer interaction, enforcement & marketing intelligence.

It plays a very important role in an exceedingly wide variety of the real-world applications like targeted advertisement, forensic science, visual surveillance, content-based searching, human- computer interaction systems, etc. as an example we are able to use this method to display advertisement supported different gender and different age group. This method could also be employed in numerous mobile applications where there's some age restricted content so as that only appropriate user can see this content. However, gender classification and age approximation continues to be a difficult task. We propose a model which may first perform feature extraction on the input image which may classify eyes, lips, beard, hair, etc. We've used Haar Cascade for feature extraction purpose. Age is estimated with the help of Caffe Model.

II.   LITERATURE REVIEW

 A system in which a real time automatic facial expression system was designed was pro- posed by S. Turabzadeh et al. It was implemented and tested on an embedded device which could be the first step for a specific facial expression recognition chip for a social robot. The hardship of age and Gender Classification using convolutional Neural Networks An automated recognition system for age,in this image net data set is used.It gives the 86.80 accuracy and Deep Convolutional Neural Network, AdaBoost, Fuzzy-LDA

methods were used. gender and emotion was presented by A. Dehghan et al. that was trained using deep neural network. At the ImageNet LSVRC-2010 contest, A. Krizhevskyetal presented a paper which suggested segregation of 1.2 mil- lion images into 1000 different categories with the help of a deep Convolutional neural network. The results which were obtained suggested that supervised learning can deliver exceptional accuracies that is 81 percent.Also,the paper of Heterogeneous Face Attribute Estimation: A Deep Multi- Task Learning Approach,where CNN for deep multi-task learning (DMTL) network is used. This model gives the overall result of 86 percent face and age detection.

III.   EVALUATION OF RELATED WORK

We cross-validate between the first and our extracted age and gender of that exact person within the image.

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IV.   FEATURE EXTRACTION

To predict the age, we are visiting use a convolutional neural architecture of the network (CNN). This CNN uses 3 layers of convolution and a pair of layers with one final output layer. This problem is interpreted instead of regression as a classification problem. it's a difficult job to estimate the precise age by means of regression. just by gazing the face even people can't predict age. In an age range, like 20-30 or 30-40, we are going to therefore seek to predict the age. it's hard to predict how a person's age depends on many factors from one image

Fig. 1.   Class diagram

A.   Gender classification

   Images might not be perfect. There are many noises which are redundant. this may decrease system performance. To extend accuracy rate we've to create proper and effective feature extraction. this may be global or local which depends on shape, color, orientation.

1)   Edge detection: Edge feature is usually used for detecting the thing. It finds the discontinuities in gray level. we will say that edge is that the boundary between the regions.

2)   Haar– like features: Viola and Jones proposed an algorithm which is termed Haar-Classifiers for rapid object detection and pedestrian detection is applied. it's through with the haar like features which might be calculated efficiently by using Adaboost classifier and integral images in cascade classifier. . Haar cascade is generally used for face detection due to its easy calculation.

3)   Detector using haar -Like features: In face detection, the

image is first scanned, trying to find patterns with indicate the presence of a face within the image. This can be done by using haar like features.

Fig. 2. Working of haar features

There are separate intensity values of black and white pixels which supplies dark and lightweight regions. Any object may be detected by using haar like features. We just should adjust the dimensions of rectangle that we are able to proportion and down the image.

4) Texture feature: This feature was proposed by Robert M. Haralick in 1973. These features make use of the statistics which summarize the ratio distribution which describes how one gray tone is spatially associated with the gray- tone. Local Binary Pattern Algorithm is employed for extracting texture features. this can be simple but effective algorithm to extract texture features. For concept of window the parameters like radius and neighbors are used. The input facial image is gray-scale . This approach gets the block of this image as 3x3 matrix. The 3x3 matrix contains the intensity of every pixel (0-255).We now concatenate each binary value line by line or clockwise but the out are same. Then convert the binary value into decimal value. Likewise each pixel within the matrix is converted into decimal value.

Histograms are derived from each such matrix of image and every one the histograms are concatenated which show the higher characteristics of the initial image.

B. Age Classification Steps for feature extraction:

1. An input image or class of images.

2. Pre-trained model(.caffe-model)-binary file which has the weights, gradients and biases for every layer of the network.

3. Model definition (.prototxt) file which has the network structure that's used.

4. Target feature extraction layer

V. PROPOSED ALGORITHM

Recognition of gender is quite difficult when the image is captured from far distance by using haar-like features. For this problem we've got used simple but effective idea. We applied cascaded method. The paper uses ROI (Region

Fig. 3. Use case diagram

Fig. 4. Feature Extaction

of interest) as our face. We returned the ROI image to classifier. During this paper, we tried to detect the feminine face. We used frontal face images to coach that included external features like hairstyle, makeup, accessories like earrings and glasses. The item that this paper is trying to detect is positive in xml training.

Convolution Neural Network

The main building block of CNN is that the convolutional layer. Convolution may be a calculation to merge two sets of knowledge. In our case the convolution is applied on the computer file employing a convolution filter to provide a feature map. There are plenty of terms being employed so let's visualize them one by one. On the left side is that the input to the convolution layer, for instance the input image. On the correct is that the convolution filter, also called the kernel, we'll use these terms interchangeably. This can be called a 3x3 convolution thanks to the form of the filter. At every location, we do element-wise matrix operation and sum the result. This sum goes into the feature map. The green area where the convolution operation takes place is named the receptive field. Because of the dimensions of the filter the receptive field is additionally 3x3.

Caffe for Age approximation

Caffe may be a CNN framework which allows researchers and other practitioners to create a posh neural network and train it without have to write much code. The data-set

needs to be labeled and from social image database which has the private information of the themes i.e. age Network Architecture: The specification used for age approximation in supported the paper of G.Levi and T.Hassner. This network is meant to be shallow to stop over-fitting. All the three colors i.e. Red, Green, Blue are processed directly. the photographs are scaled to 256 x 256 and cropped to 227 x 227.

3 fully connected layers.

Layer 1: Here, filters of size 3x7x7 are convoluted with stride 4 and padding 0, which ends in output of size 96x56x56 which is followed by maximum pooling which reduce the scale and native response normalization.

Layer 2: 256 filters sized 96x5x5 are convoluted with stride 1 and padding 2, that results in output of size 256x28x28.

Layer 3: 256 filters of size 256x3x3   are   convoluted with stride 1 and padding

The fully connected layers:

1. the primary fully connected layer which gets the results from the last convolution layer and contains 512 neurons, followed by ReLU and dropout layer.

2. The second fully connected layers gets the output from the previous layer of 512 dimension and again contains 512 neurons, followed by ReLU and dropout layer.

3. The last fully connected layer maps to the ultimate classes for age.

The output of the fully connected layers is fed to soft-max layer that assigns probability for every class. The given test image is tested with maximum probability and therefore the prediction is created.

Technical Details:

Local Response Normalization (LRN).: LRN may well be a way that was first introduced in because the thanks to assist the generalization of deep CNNs.. If $a(x,y)$ is that the activation of a neuron by applying kernel i at position (x, y), then it's local response normalized activation $b(x,y)$ is given by where k,n,, and are

all hyper-parameters. The parameter n is that the amount of "adjacent" kernel maps (filters) over which the LRN is

run, and N is that the overall number of kernels therein given layer.

Softmax:

At the best of the proposed architecture lies a softmax layer, which computes the loss term that's optimized during training and also the category probabilities during a classification. While some loss layers. That is, if we've got z_i is that the score assigned to class i after the last word fully connected layer, then the softmax function is

V. APPLICATIONS

Among these features, age and gender classification can be especially helpful in several real-world applications for below:

1. Security and video surveillance

2. Electronic customer relationship management

3. Biometrics

4. Electronic vending machines

5. Human-computer interaction 6.Entertainment

7.Cosmetology 8.Forensic art

9. Online forms(aadhar card, pan card, exam form and so on)

VI. TECHNOLOGIES

Image Processing:

Image processing could be a method to perform some operations on a picture, so as to induce an enhanced image or to extract some useful information from it. Image processing basically includes the subsequent three steps:

Importing the image via image acquisition tools; Analyzing and manipulating the image; Output during which result is altered image or report that's supported image analysis.

SOFTWARE DESIGN

Fig. 5. Data flow diagram

VII. RESULTS

Following are the results that we obtained after testing the important time images on our algorithm together with the accuracy.

Fig. 8. The overall accuracy of the results is 93.5.

VIII. CONCLUSION

I foresee future directions building off of this work to include using gender and age classification to assist face recognition, improve experiences with photos on social me- dia, and much more.

• Computer Vision : Computer vision could be a field of computer science that trains computers to interpret and understand the visual world.

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