



Novel face detection algorithm with a mask on neural network training

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(Communicated by Madjid Eshaghi Gordji)

Abstract

Discovering objects and knowing their number has been discussed in many works. Face detection technology is important for the visual scene, Deep learning theory using computer technology to discover the face, which is a wide field in marketing, traffic and security system control systems, in addition to photography. Facial recognition algorithms or face detection Include steps for the facial image to extract features to match them with a database. The face has a biometric feature. The facial feature consists of prominent and easily identifiable information that is responsible for distinguishing the objects that distinguish the face, the distance between the eyes, the shape of the nose, and The mouth for the device to perform a training group and record the data. Matlab program helps to dispense with training because MATLAB provides the instruction (CascadeObjectDetector) for facial recognition and the Viola-Jones algorithm with the result of separating the detection results in the form of subsets. In this work, a new algorithm is created for a group of elements in the unit picture And run a face detection code to highlight the background to store the information of each image in a specified folder and the face detection techniques by proposing a new algorithm to detect a face from among a group of faces, distinguish it and make it a file of its own, all of that using the Matlab program to train the neural network for face recognition.

Keywords: Neural Network, facial recognition, Convolutional Neural Networks (CNN), MATLAB

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1. Introduction

Face recognition technology with computer vision is difficult due to the difference that is on the face such as facial expression, [6, 15, 16]. Hiding information by using Discrete Laguerre Wavelet Transform with new algorithms, [17]. Study of neural network for image processing [12], Study on detecting violence using image processing [14, 8]. Skin color and sweating, with the help of neural networks in extracting features and skin color, all depend on the template and its match. There are two methods in face recognition technology, the engineering method and the first general method depends on the measurements of the eyes, nose, mouth, chin and other features, while the second deals with the entire face to discover the face. To find out the number of faces I used the method Viola [18]. Face detection for computers is difficult, unlike for humans, easy because changes to human faces occur over time [1]. The challenge in the field of face detection is the use of computers in face detection technology in which the size, shape and color of the skin were determined. The application of face recognition was discovered in the real world [2, 13, 5, 10, 7, 9, 19, 11]. in [3, 4] A face detection system has been developed that provides sensation of protection (Howard et al. In this work Detect a group of faces with one program and create a single algorithm by creating a convolutional neural network to detect the faces of the color image for analysis by the filter used into three layers: RGB, and with the help of the MATLAB program, the image data is trained and tested. Training the deep neural network for the data, testing it, then validating the validity through the average square error, which is the result of the training desirable or not. The lower the value, this means better performance and retraining to reach the best result. Training continues with changing samples to achieve better performance of the network and the goal is get results.

2. Literature Review

The development that has taken place in the work that is being researched on deep learning to facilitate face identification through neural network training (NNT)

2.1. Neural network

The huge amount of data led to the development of deep learning to recognize information and solve problems using deep learning, which helps to develop and improve neural networks consisting of neurons consisting of three layers, which are respectively the input, hidden and output. Deep learning helps to extract information from the network for the purpose of training it after that is selected. The best weights for those cells, so that deep learning is converted into information in a deep neural network.

Many of the papers discussed deep learning in identifying faces to solve many security problems in airports, institutes and colleges using neural networks In this work, the convolutional neural network (CNN) will be used to identify a number of faces simultaneously by proposing a fast algorithm using the Matlab program. The sample was taken in which the network is used to face detection.

2.2. Convolutional Neural Networks (CNN)

Definition of a convolutional neural network: It is a type of artificial neural network that is characterized by the response to the overlapping areas in the visual field resulting from the juxtaposition of individual neurons and is intertwined through biological processes that begin with small quantities of pre-processing that leads to differences in the perception of multiple layers to luxury images and video.

CNN is distinguished from the neural network in relation to the images, the shape of the neuron is two-dimensional, which leads to the input data due to the topographic organization of the CNN

according to the dimensions in that data relative to the natural images Nat The same does not apply in Urals but in n-grams in particular the object identity can be recognized in the input. When applying CNN to images or natural strings using filters, a neuron bank is applied. Each filter performs a different wrapping as they become input channels. The second layer starts applying to the data. The warp layer begins with using a nonlinear ReLU which is basically the $\max(0; x)$ function. Clustering in CNN takes place upon sampling to implement the max-pooling and average-pooling functions respectively.

The convolutional neural network has proven successful in visual image analysis as the supervision of image segmentation and compression.

3. Interpretation Face Detection with CNN Mathematically

A convolutional neural network can be defined as a series of convolutional layers and grouped together to extract the features of the image to reach the best results to achieve the goal.

Face detection is done with computer vision and deep learning that deals with large numbers of images with a process Convolution between the image and the filter. The wrapping process is shown in the Figure (1), which shows how the filter deals with the color image, following codes [11]

4. Multi Face Detection (MFD) algorithm

Algorithm of Face detection for number of faces by MATLAB

Input color image with multi face

Step 1. Input image

Step 2. The origin of the reagent component in Matlab

Step 3. Using the previous step in the input image. This returns the Bounding Box values of $[x, y, \text{Height}, \text{Width}]$ for the faces to be selected.

```
BB = step(FaceDetector, I);
```

Step 4. Faces in Box

```
B = insertObjectAnnotation(I, 'rectangle', BB, 'Face');
```

Step 5. The resulting faces

```
NO = size(BB,1);
```

```
str_NO = NO2str(NO);
```

```
str = strcat('Number of detected faces are: ', str_NO);
```

```
disp(str);
```

Step 6. Cut and save the resulting faces for analysis.

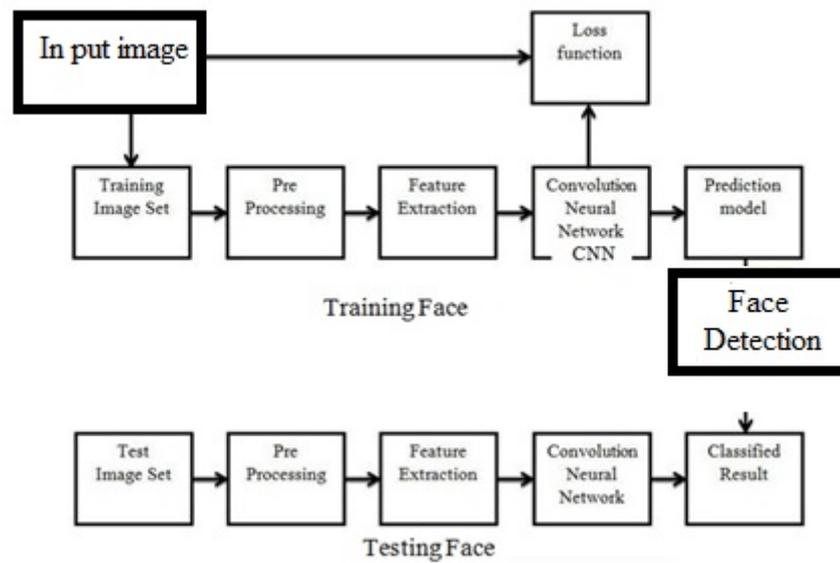


Figure 1: Represents the diagram of the steps of the proposed algorithm

5. Application of the proposed algorithm MFD

algorithm will be applied to a sample used is 11 players and the image is $(470 \times 780 \times unit8)$ with Boxing Faces is $(470 \times 780 \times 3unit8)$ faces_11.jpg. In the Table 1, values of x, y, h and w for result faces. Figure 2, displays the results obtained.

Table 1: Bounding Box values

BBOXES	X	Y	width	Height
Face1	410	35	44	44
Face2	282	36	46	46
Face3	535	36	47	47
Face4	156	22	48	48
Face5	696	27	47	47
Face6	646	136	49	49
Face7	75	26	48	48
Face8	101	140	50	50
Face9	244	142	48	48
Face10	517	144	50	50
Face11	379	133	50	50

The resulting color images using the algorithm Table 2 illustrates the features of the resulting images



Figure 2: Cropping All detected faces

Table 2: Facial features obtained

Image	Features				Extraction time(sec.)
1	175	183	187	184	0.0030
2	158	185	160	161	0.0060
3	125	116	121	131	0.0040
4	89	83	101	122	0.0040
5	73	87	124	158	0.0030
6	75	112	165	208	0.0050
7	125	181	218	236	0.0030
8	174	213	236	246	0.0040
9	228	242	246	246	0.0030
10	241	243	236	233	0.0090
11	247	237	232	231	0.0050
Average					0.0044

the features of a colored face are taken with a very short time, the arithmetic mean = 0.0044, which results in the execution of 1,000,000 faces that require 4400 seconds, which is considered a short time. The database of images is obtained .

6. Discuss the results

With the help of MATLAB, which is considered a computer programming language, researchers create a system for easy facial recognition and detection with built-in functions in mathematics that

help to process images in various dimensions.

$$B = 470 \times 780 \times 3 \quad \text{unit8}$$

Faces_11.jpg

$$BB = 11 \times 4 \quad \text{double}$$

$$I = 11$$

$$I = 470 \times 780 \times 3 \quad \text{unit8}$$

$$J = 51 \times 51 \times 3 \quad \text{unit8}$$

Using the MATLAB Neural Network Tool to test the data and conduct a training to use a three-layer neural network as part of the learning

$$MSE = \sum_{i=1}^R \frac{(t_i - y_i)^2}{R}$$

7. Conclusion

Detect a group of faces with one program and create a single algorithm by creating a convolutional neural network to detect the faces of the color image for analysis by the filter used into three layers: RGB, and with the help of the MATLAB program, the image data is trained and tested. Training the deep neural network for the data, testing it, then validating the validity through the average square error, which is the result of the training desirable or not. The lower the value, this means better performance and retraining to reach the best result. Training continues with changing samples to achieve better performance of the network and the goal is Get results.

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