A Deep Neural Network for face Recognition

K. Sai krishna, G. Sreenivasa Raju, P. Praveen Kumar

Abstract— Face recognition is used to biometric authentication method to analyze the face extract and photographs useful to reputation formation from them, which can be usually called as a characteristic vector this is used to differentiate the organic features. In this paper to detect the suspect by extracting facial features from the captured image of the suspect from CCTV and match it with the pictures stored in the database and also to achieve an accuracy rate of 100 %, negligible loss using deep learning technique. For extracting the facial features, we are using deep learning model known as Convolutional Neural Network (CNN). It is one of the best models to extract features with the highest accuracy rate .

Keywords— Face recognition, Convolutional Neural Network, Principal Component Analysis, Support Vector Machine.

I. INTRODUCTION

Nowadays, in practice, identification of criminal is made thru thumbprint identity. This device will be able to discover the face and apprehend face robotically. It may help the apprehend suspect of the case if no thumbprint gift on the scene. The consequences display that about 90% of input

a picture may be matched with the data within the database.

Through the years, a whole lot of security processes have developed that help in keeping confidential data secured and restricting the possibilities of a security breach. It's far, one of the few biometric methods that own the low intrusiveness and high accuracy is computer software. It identifies the face of the man or woman too robotically and verify the individual from a digital image.

It looks at chosen facial highlights from the picture and a face database. This innovation is a broadly utilized biometrics framework for confirmation, approval, check, and distinguishing proof.

A great deal of organization has been utilizing face acknowledgment in their surveillance cameras, get to controls, and some more. Facebook has been utilizing face acknowledgment on their site to make an advanced profile for the general population utilizing their site.

II.FACERECOGNITION

The face recognition starts with the securing of face from a video flow or nevertheless photo pursued through spotlight extraction. The esteems of real pixels highlights, carefully assembled additives, as an instance, HoG features, etc.[2]

Deep learning, is the require to highlights in face recognition of the truth that the capacities are observed out from making ready statistics, finally making profound learning an effective device for looking after complicated mapping troubles.

Face acknowledgment contrasted with picture preparing is unmistakably increasingly perplexing, and there are a few methods being used today as recorded beneath. A few strategies are, yet the instinct behind them may prove to be useful.

2.1 EigenFaces:

Eigenfaces comes from eigenvectors in mathematics. The P.C.A application is used to reduce the collection of faces and dimensionality representations. It can be linearly combined to approximate any given look.[4]

Template Matching:

The face recognition is based on layout can work well when suitably actualized as pixel format based methodologies.

Neural Networks:

xFace acknowledgment utilizing neural systems can extend from full-face preparing to confront milestone based handling. The full-face acknowledgment approach includes having a lot of the individual face pictures from a solitary individual. Try to prepare the system to fire effectively when a specific face is introduced utilizing the typical scenery calculation. In the milestone based methodology part finder, neural nets are prepared on face tourist spots, for example, right eye, left eye e.t.c, and the last identification or acknowledgment depends somewhat on the geometric connection between the landmarks. You can likewise check face identification utilizing neural nets.[9]

III. DEEP LEARNING LITERATURE SURVEY

In 2003, LSTM began to turn out to be aggressive with traditional speech recognizers on particular responsibilities. Later it becomes mixed with a connectionist temporal type (C.T.C.) in stacks of LSTM RNNs.

In 2006, it changed into shown how a many-layered feedforward neural community might be correctly pre-skilled one layer at a time, treating every layer in flip as an unsupervised confined Boltzmann device, then satisfactory-tuning it the usage of supervised backpropagation the papers mentioned studying for deep belief nets.

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K. Sai krishna, Asst Professor: Department of Electronics and Communication Engineering. Anurag Group of Institutions (1)(2)(3), Ghatkesar,Medchal (Dist), Hyderabad-500038, Telangana, India. (E-mail: saikrishnaece@cvsr.ac.in)

G. Sreenivasa Raju, Asst Professor: Department of Electronics and Communication Engineering. Anurag Group of Institutions (1)(2)(3), Ghatkesar,Medchal (Dist), Hyderabad-500038, Telangana, India. (E-mail srinivasarajuece@cvsr.ac.in)

P. Praveen Kumar, Asst Professor: Department of Electronics and Communication Engineering. Anurag Group of Institutions (1)(2)(3), Ghatkesar,Medchal (Dist), Hyderabad-500038, Telangana, India. (E-mail: pitcheripraveenreddy@gmail.com)

3.1 . In 2009, it was concerned a become known as the "huge bang" of deep getting to know, as deep-learning knowledge of neural networks had been trained with Nvidia snap shots processing gadgets (GPUs).

3.2 Yale Database

It contains 165 grayscale pictures in GIF configuration of 15 people. It contains 11 pictures of every subject, one for each unique outward appearance or arrangement: focus light, w/glasses, cheerful, left-light, w/no glasses, sound, right-light, tragic, sluggish, shocked, and wink. [5]

it is unfastened to apply the facts for research purposes. If experimental results are received that use photos from in the database, all courses of these outcomes must acknowledge using the "Yale Face Database." without permission from Yale, snapshots from inside the database can't be included into a greater tremendous database which is then publicly allotted.

3.3Convolutional Neural Network(CNN)

In deep learning, a convolutional neural system is a class of deep neural systems, most regularly connected to examining visual imagery. CNN's utilization is a variety of multilayers are required to preprocessing. It also called SIANN (Space invariant artificial neural Sysytems). It can be viewed to mutual loads and interpretation invariant attributes.

Convolutional systems are used to reduces the number of learnable parameters. Iindividual cortical neurons react to upgrades simply in a limited location of the field of regard known as the responsive discipline. The responsive fields of various neurons quite cowl with the quit purpose that they unfold the whole considerable territory. [10]

CNN's utilization is the preprocessing of the image contrasted of a grouping calculations. It implies the system learns to needs the channels that in customary calculations designed.

The fig3.1 have programs in the picture and video reputation, recommender systems, image category, medical photo analysis, and herbal language processing. A convolutional neural community includes an enter and an output layer, as well as more than one hidden layers. The hidden layers of a CNN commonly encompass convolutional layers.

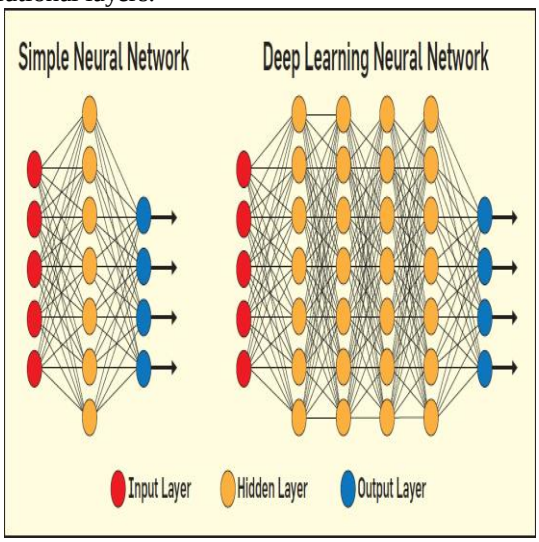

Fig: 3.1 Convolution Layers

3.2 Algorithm

STEP 1: Input image is taken from the database of the images and sent to the next layers.

STEP 2: Convolution is performed on these images, and this is also called a hidden layer.

STEP 3: Batch Normalization is performed on the convoluted images to achieve a faster rate of performance.

STEP 4: Maximum pooling is performed to reduce the size of the image.

STEP 5: Next layer is ReLu layer, which is used to make all the negative pixels to zero to avoid the noise in the image.

STEP 6: The above steps are repeated three times in our algorithm to improve the accuracy and allowing the model to learn through the previous validations.

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STEP 8: The output is obtained from the classification layer, where the accuracy is achieved.

3.4 Sample Yale Database Images

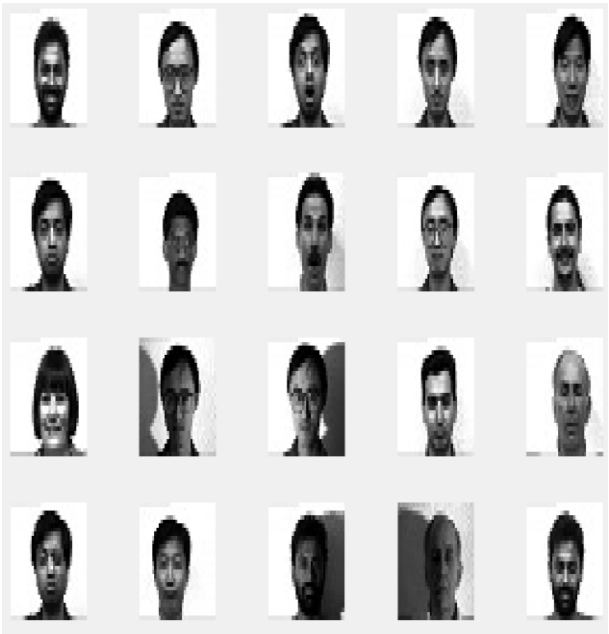


Fig: 3.3.1 Sample Images from Yale Database

IV RESULTS

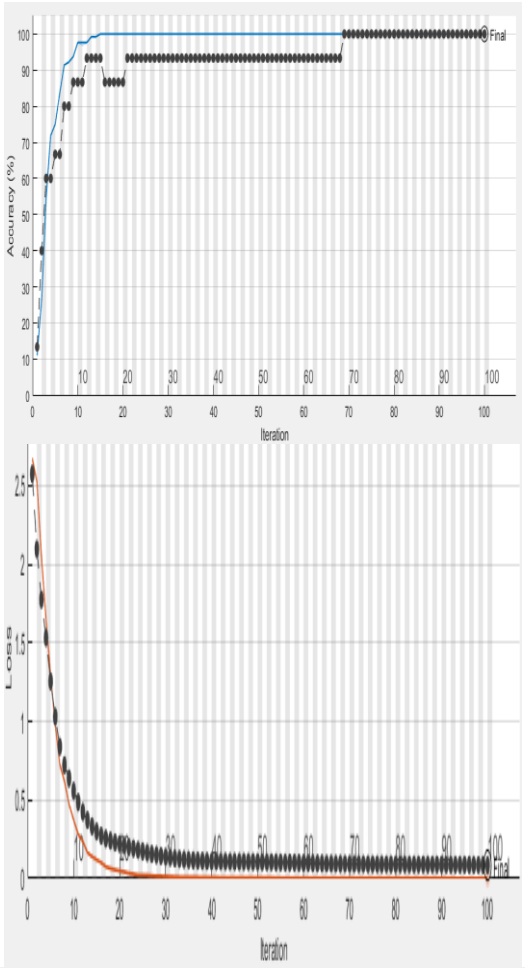
4.1 Test Result

The parameters to be compared are

1.accuracy **vs**. iteration

2.loss **vs**. iteration

As the number of iterations increases, accuracy also increases and loss decreases, the accuracy rate of 100% is obtained



Results

Validation accuracy:	100.00%
Training finished:	Reached final iteration

Training Time

Start time:	06-Apr-2019 20:14:34
Elapsed time:	38 sec

Training Cycle

Epoch:	100 of 100
Iteration:	100 of 100
Iterations per epoch:	1
Maximum iterations:	100

Validation

Frequency:	1 iterations
Patience:	5

Other Information

Hardware resource:	Single CPU
Learning rate schedule:	Constant
Learning rate:	0.01

Fig: 4.1 Accuracy and Loss curve

```
labelCount =
  15×2 table
    Label      Count
    _____      _____
      1          11
      10         11
      11         11
      12         11
      13         11
      14         11
      15         11
      2          11
      3          11
      4          11
      5          11
      6          11
      7          11
      8          11
      9          11

ans =
    28          36           3
```

Fig: 4.2 Size and Count of Images

Progress table as in table 4.2 in command window displaying parameters for 100 iterations are

- Time elapsed
- Iteration
- Accuracy
- Loss
- Learning rate, etc.…

Training on single CPU.
Initializing image normalization.

Epoch	Iteration	Time Elapsed (hh:mm:ss)	Mini-batch Accuracy	Validation Accuracy	Mini-batch Loss	Validation Loss	Base Learning Rate
1	1	00:00:00	7.81%	46.67%	2.7021	2.3405	0.0100
2	2	00:00:01	49.22%	53.33%	2.2329	1.9867	0.0100
3	3	00:00:01	66.41%	53.33%	1.8756	1.7059	0.0100
4	4	00:00:02	80.47%	60.00%	1.4660	1.4516	0.0100
5	5	00:00:02	82.81%	73.33%	1.1491	1.2092	0.0100
6	6	00:00:02	85.16%	73.33%	0.9061	0.9968	0.0100
7	7	00:00:03	93.75%	80.00%	0.6759	0.8190	0.0100
8	8	00:00:03	96.09%	86.67%	0.4883	0.6929	0.0100
9	9	00:00:03	96.88%	93.33%	0.3835	0.5873	0.0100
10	10	00:00:04	98.44%	93.33%	0.3084	0.4978	0.0100
11	11	00:00:04	99.22%	93.33%	0.2205	0.4263	0.0100
12	12	00:00:04	98.44%	86.67%	0.2036	0.3691	0.0100
13	13	00:00:04	99.22%	86.67%	0.1760	0.3199	0.0100
14	14	00:00:05	99.22%	86.67%	0.1372	0.2811	0.0100
15	15	00:00:05	100.00%	93.33%	0.0970	0.2477	0.0100
16	16	00:00:05	100.00%	100.00%	0.0843	0.2186	0.0100
17	17	00:00:06	99.22%	100.00%	0.0731	0.1965	0.0100
18	18	00:00:06	99.22%	100.00%	0.0660	0.1786	0.0100
19	19	00:00:06	99.22%	100.00%	0.0540	0.1643	0.0100
20	20	00:00:07	100.00%	100.00%	0.0441	0.1515	0.0100
21	21	00:00:07	100.00%	100.00%	0.0404	0.1397	0.0100
22	22	00:00:07	100.00%	100.00%	0.0323	0.1288	0.0100
23	23	00:00:08	100.00%	100.00%	0.0272	0.1176	0.0100
24	24	00:00:08	100.00%	100.00%	0.0255	0.1065	0.0100
25	25	00:00:08	100.00%	100.00%	0.0235	0.0956	0.0100
26	26	00:00:09	100.00%	100.00%	0.0199	0.0855	0.0100
27	27	00:00:09	100.00%	100.00%	0.0192	0.0769	0.0100
28	28	00:00:09	100.00%	100.00%	0.0146	0.0701	0.0100
29	29	00:00:10	100.00%	100.00%	0.0135	0.0646	0.0100
30	30	00:00:10	100.00%	100.00%	0.0126	0.0603	0.0100

Table: 4.1 Learning rate

V. CONCLUSION

Face reputation structures used work today very well underneath restricted situations, although all orders work a lot pics and consistent lighting. All current face recognition algorithms fail under the vastly varying conditions below which people need to and may discover different people. Subsequent generation man or woman popularity structures will want to apprehend humans in real-time and in a whole lot much less confined situations.

Achieved an accuracy of 100% by using deep learning model with the help of MATLAB application. The problem of SIPPP (single image per person problem) is solved successfully. The deep learning model is very much useful in the field of face recognition without which whole process would have become much more complicated and also most importantly the convolutional neural networks(CNN) due to which we could be able to achieve an accuracy rate of 100%.

VII. FUTURE SCOPE

The above work can be extended an application that can be further used in the field of the police department and crime investigations to detect the criminals that are detected while or after committing the crime also can be used for high-level research purposes in the field of digital image processing and many more features and applications can be developed.

Cameras and microphones nowadays are tiny, light-weight and were efficaciously incorporated with wearable structures. sooner or later, researchers are starting to exhibit that unobtrusive image based totally identification of person can obtain excessive reputation costs without requiring the person to be in notably controlled environments.

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