FACE DETECTION USING DEEP NEURAL NETWORK FOR BEHAVIOR ANALYSIS

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OUTLINE

- Introduction
- Face Detection
- Face Recognition
- Image Processing
- Convolutional Neural Network
- Literature Review
- Proposed Architecture
- Conclusion
- Reference

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FACE DETECTION :

- Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene.

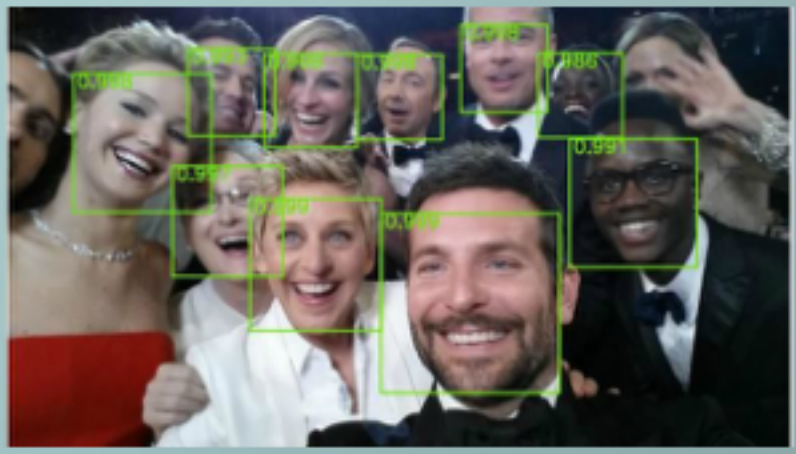


Fig. Face Detection in Images

source : http://aerometrex.com.au/blog/wp-content/uploads/2013/01/AR_aero3dpro-1024×664.jpg

FACE RECOGNITION :

- A facial recognition is a technology capable of identifying or verifying a person from a digital image or a video frame from a video source. There are multiple methods in which facial recognition systems work, but in general, they work by comparing selected features from given image with faces within a database.
- Used to identify distinctive features on the surface of a face, such as the contour of the eye sockets, nose, cheekbones, and jaw.

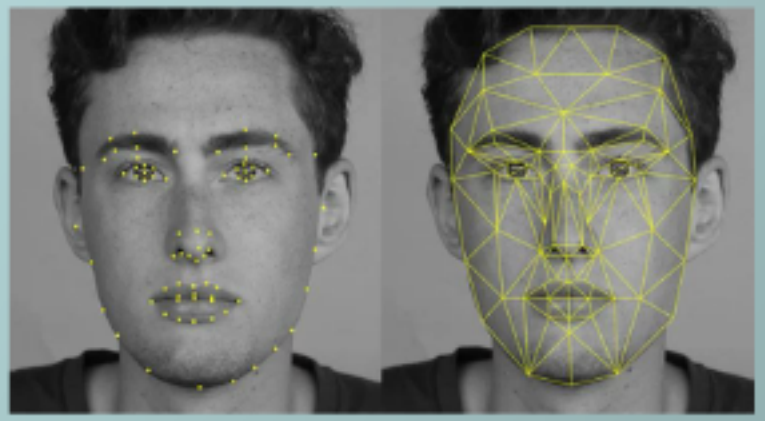


Fig. Face Recognition

CONVOLUTIONAL NEURAL NETWORK

- A CNN is composed of an input layer. However, for basic image processing, this input is typically a two- dimensional array of neurons which correspond to the pixels of an image. It also contains an output layer which is typically a one- dimensional set of output neurons.
- Convolution is a technique that allows us to extract visual features from an image in small chunks. Each neuron in a convolution layer is responsible for a small cluster of neurons in the preceding layer. It contains filters or kernel that determines the cluster of neurons.
- Filters mathematically modify the input of a convolution to help it detect certain types of features in the image Pooling, also known as subsampling or down sampling reduces the number of neurons in the previous convolution layer.

CONVOLUTIONAL NEURAL NETWORK

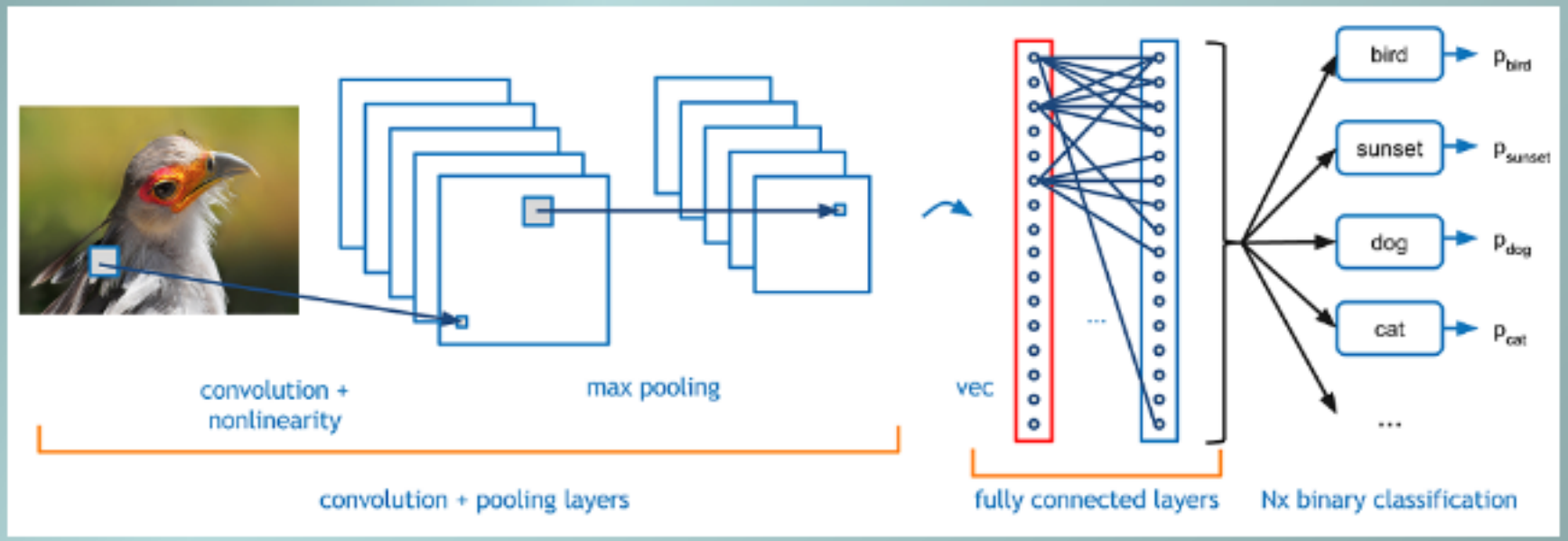
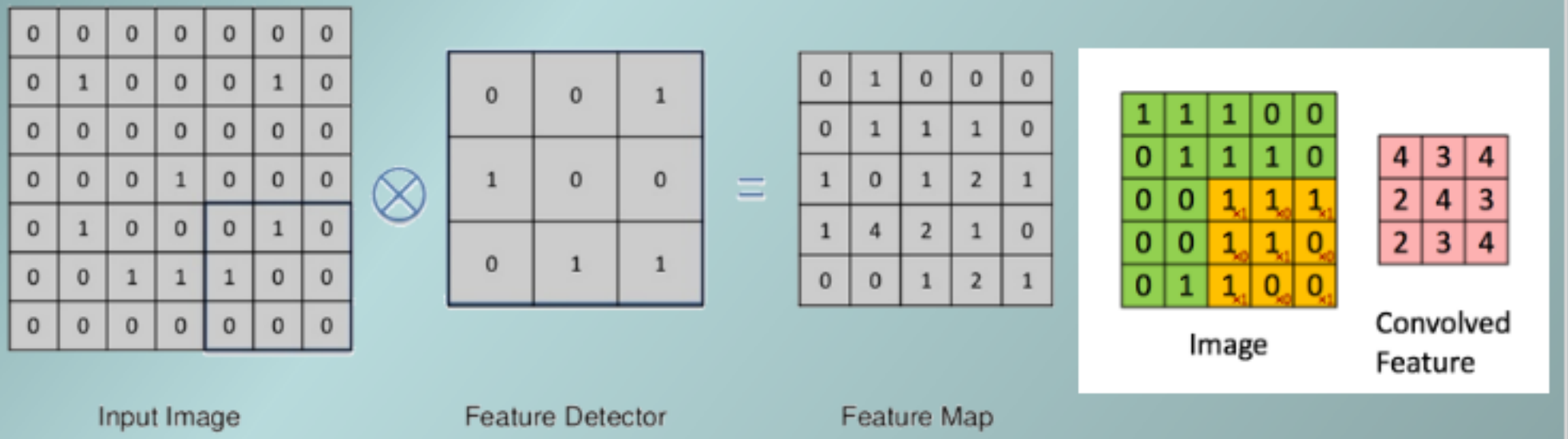


Fig : CNN Architecture

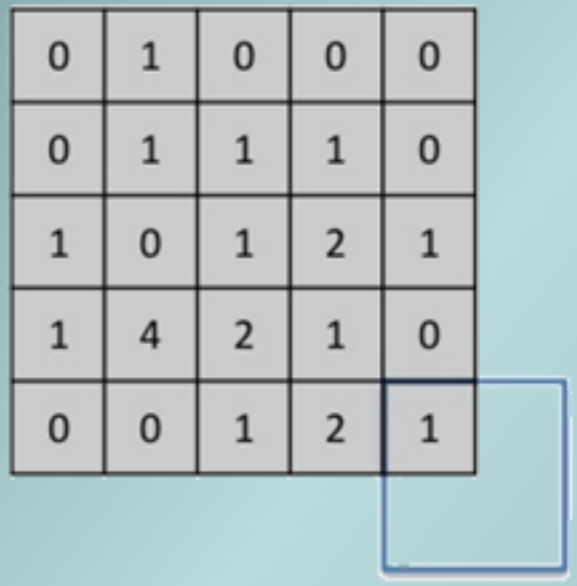
[2]

CONVOLUTIONAL NEURAL NETWORK



Convolutional Layer

CONVOLUTIONAL NEURAL NETWORK

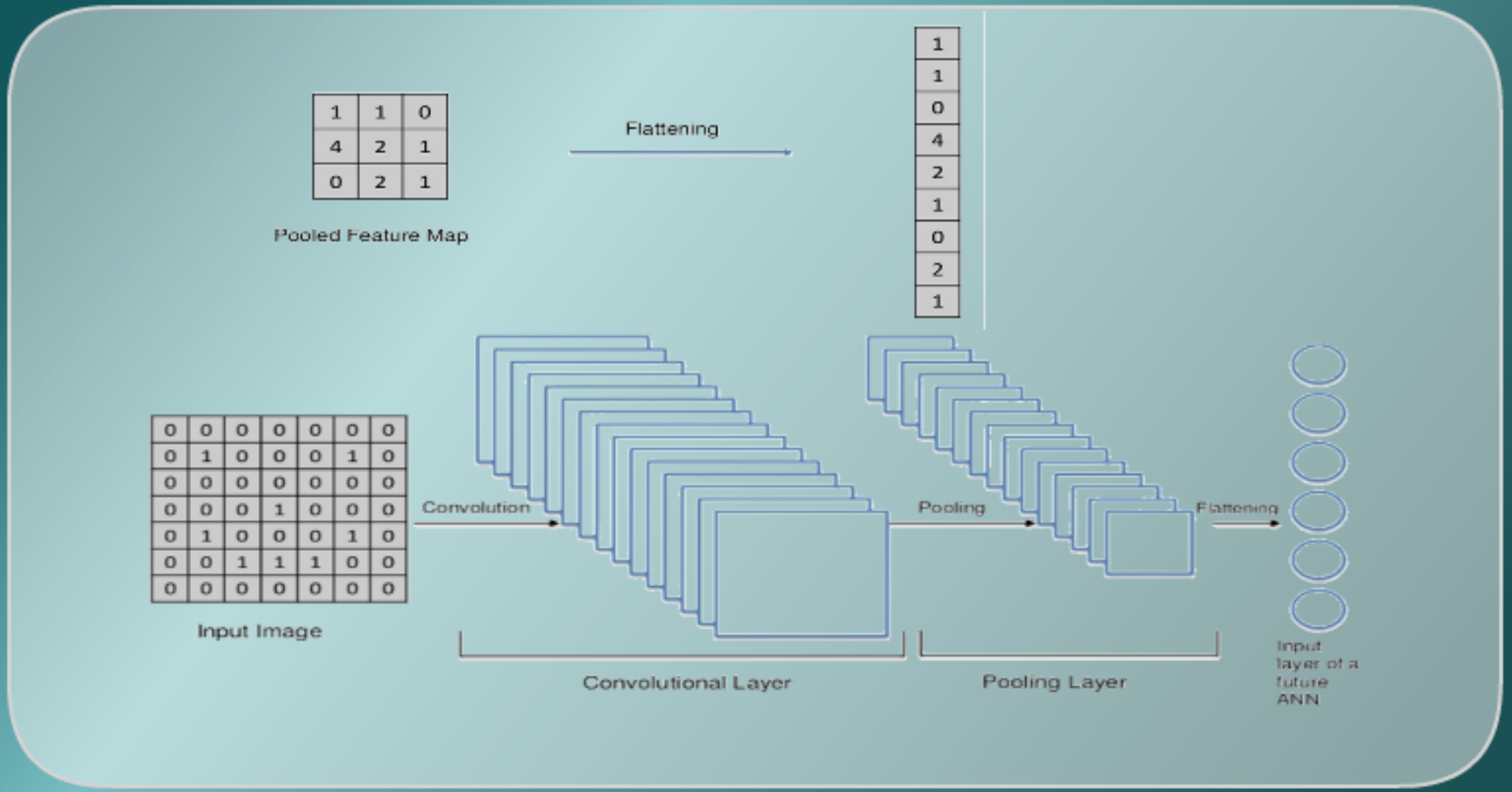


Feature Map

Max Pooling

Pooled Feature Map

Max Pooling Layer


1 1 0
4 2 1
0 2 1
Pooled Feature Map
Flattening
1
1
0
4
2
1
0
2
1
0 0 0 0 0 0 0
0 1 0 0 0 1 0
0 0 0 0 0 0 0
0 0 0 1 0 0 0
0 1 0 0 0 1 0
0 0 1 1 1 0 0
0 0 0 0 0 0 0
Input Image
Convolution
Pooling
Flattening
Convolutional Layer
Pooling Layer
Input layer of a future ANN

LITERATURE REVIEW

Paper 1 : DeepFace : Closing the Gap to Human-Level Performance in Face Verification
Authors :~ Yaniv Taigman, Ming Yang, Marc'Aurelio Ranzato, Lior Wolf
Year :~ 2014 IEEE

Description:~
In this paper author states that, how this DeepFace algorithm is helpful for face recognition. DeepFace is a deep learning facial recognition system created by a research group at Facebook. It identifies human faces in digital images. It employs a nine-layer neural net with over 120 million connection weights, and was trained on four million images uploaded by Facebook users. The system is said to be 97% accurate, compared to 85% for the FBI's Next Generation Identification system.
In modern face recognition, the conventional pipeline consists of four stages: detectalignrepresentclassify. They revisit both the alignment step and the representation step by employing explicit 3D face modeling in order to apply a piecewise affine transformation, and derive a face representation from a nine-layer deep neural network.

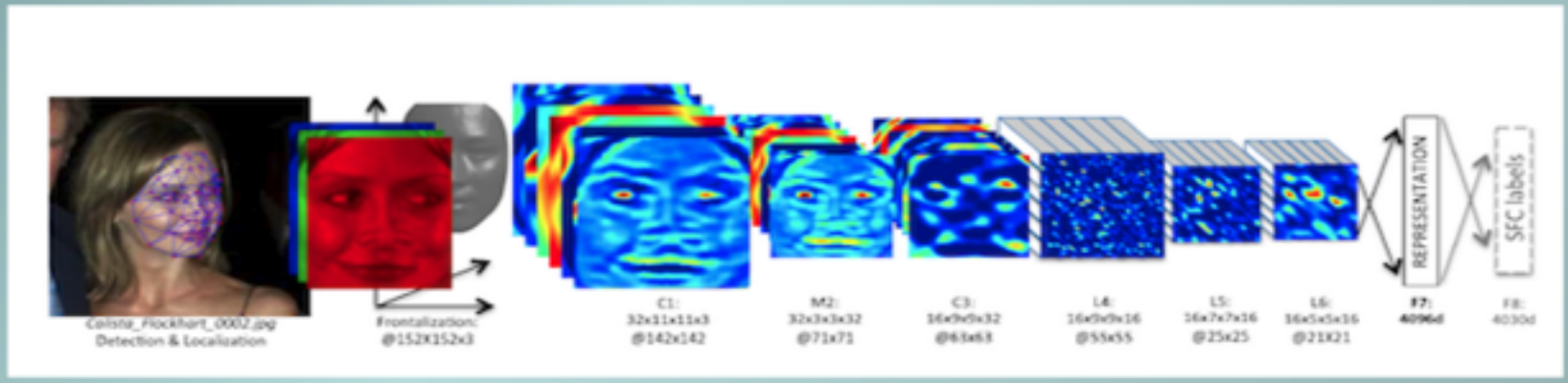
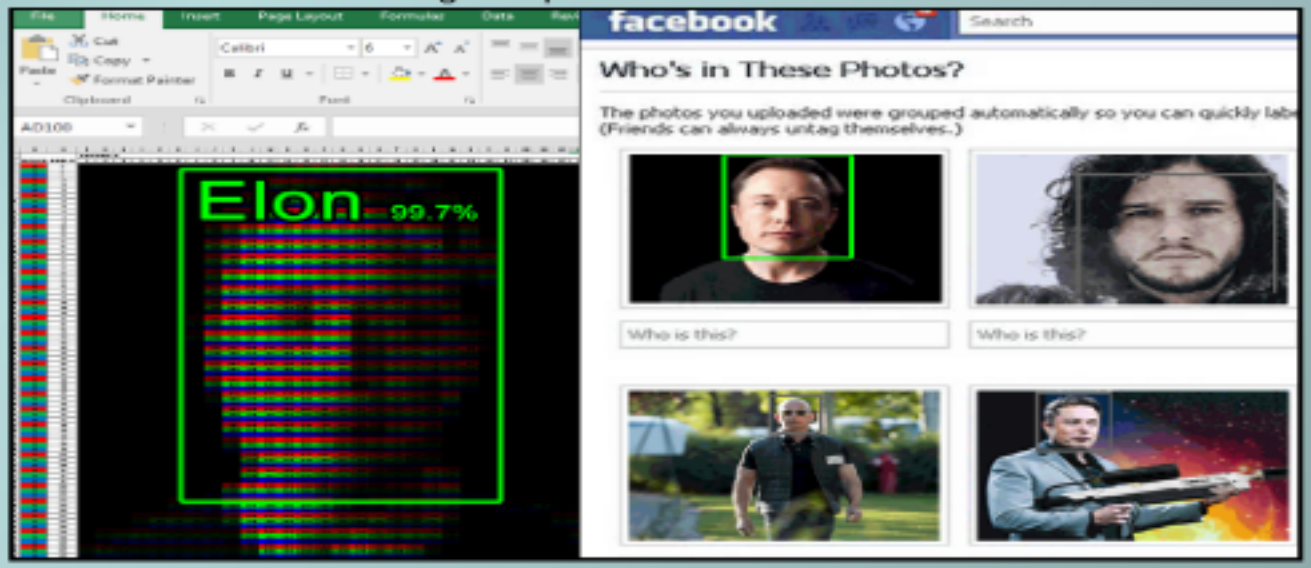


Fig : DeepFace architecture



LITERATURE REVIEW

Paper 2: FaceNet: A Unified Embedding for Face Recognition and Clustering
Authors :~ Florian Schroff, Dmitry Kalenichenko, James Philbin
Year :~ 2015 IEEE
Description :~

FaceNet is a Deep Learning architecture consisting of convolutional layers based on GoogLeNet inspired inception models. FaceNet returns a 128 dimensional vector embedding for each face. Having been trained with triplet loss for different classes of faces to capture the similarities and differences between them, the 128 dimensional embedding, returned by the FaceNet model, effectively clusters faces. Hence this vector would be closer for similar faces and farther apart for dissimilar faces. This FaceNet architecture is trained over a dataset with a very large number of faces belonging to numerous classes. Of course, you won't be re-training this architecture every time you have a new class of faces being added!!

LITERATURE REVIEW

Paper 3 : Emotion Recognition using Deep Convolutional Neural Networks

Authors :~ Enrique Correa Arnoud Jonker Michael Ozo Rob Stolk

Year :~ June 30, 2016 IEEE

Description :~

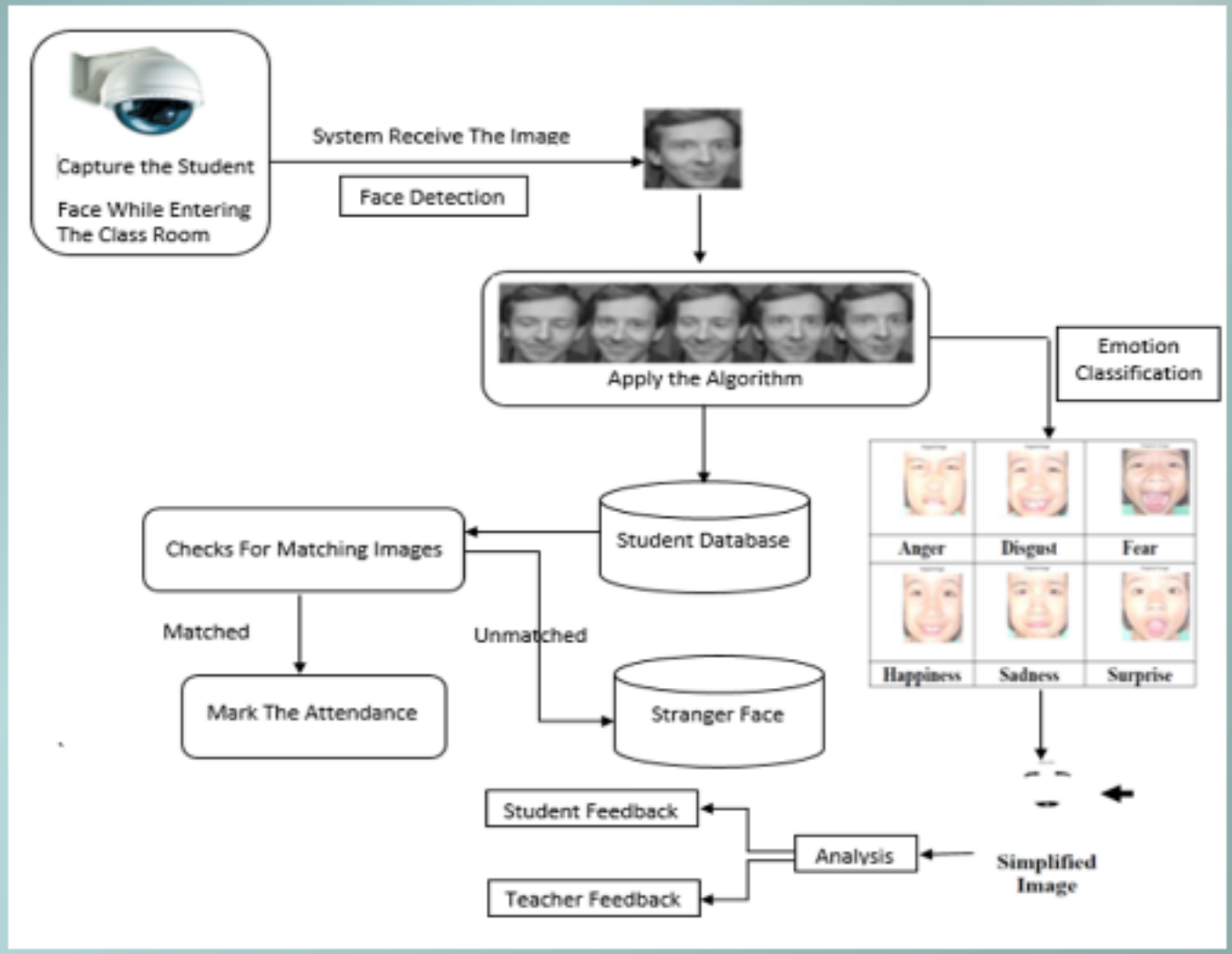
In this research paper, In this paper author present the design of an artificially intelligent system capable of emotion recognition trough facial expressions. Three promising neural network architectures are customized, trained, and subjected to various classification tasks, after which the best performing network is further optimized. The applicability of the final model is portrayed in a live video application that can instantaneously return the emotion of the user.

1.DeepID
2.DeepID2
3.DeepID2+
4.DeepID3
5.DeepFace
6.Face++
7.FaceNet
8.Baidu

Method	Net. Loss	Outside data	# models	Aligned	Verif. metric	Layers	Accu.
DeepFace [97]	ident.	4M	4	3D	wt. chi-sq.	8	97.35±0.25
Canon. view CNN [115]	ident.	203K	60	2D	Jt. Bayes	7	96.45±0.25
DeepID [92]	ident.	203K	60	2D	Jt. Bayes	7	97.45±0.26
DeepID2 [88]	ident. + verif.	203K	25	2D	Jt. Bayes	7	99.15±0.13
DeepID2+ [93]	ident. + verif.	290K	25	2D	Jt. Bayes	7	99.47±0.12
DeepID3 [89]	ident. + verif.	290K	25	2D	Jt. Bayes	10-15	99.53±0.10
Face++ [113]	ident.	5M	1	2D	L2	10	99.50±0.36
FaceNet [82]	verif. (triplet)	260M	1	no	L2	22	99.60±0.09
Tencent [8]	-	1M	20	yes	Jt. Bayes	12	99.65±0.25

Learned-Miller, Erik, et al. "Labeled Faces in the Wild: A Survey.

PROPOSED ARCHITECTURE


Capture the Student
Face While Entering
The Class Room
System Receive The Image
Face Detection
Apply the Algorithm
Emotion
Classification
Anger
Disgust
Fear
Happiness
Sadness
Surprise
Student Database
Checks For Matching Images
Matched
Unmatched
Mark The Attendance
Stranger Face
Simplified
Image
Analysis
Student Feedback
Teacher Feedback

CONCLUSION

Based on the literature survey on this topic of Face Detection using Neural Network, different aspects of how face detection & recognition works are studied. Various survey papers are reviewed and anlaysis is done for each paper. The purpose of this research is to provide an overview of the functionality of Face Detection using Deep Neural Network for Analyzing the Emotion and Behavior of Student. This proposed work can enhance the overall performance of Face Detection process and moreover focus on students behavior thoroughly.

REFERENCES

1) Yaniv Taigman, Ming Yang, Marc'Aurelio Ranzato, Lior Wolf. ***"DeepFace: Closing the Gap to Human-Level Performance in Face Verification"***, 2014 IEEE Conference on Computer Vision and Pattern Recognition

2) Sanun Srisuk, Surachai Ongkittikul ***"Robust Face Recognition based on Weighted DeepFace"***, 5th International Electrical Engineering Congress, Thailand, 8-10 March 2017.

3) Gurpreet Kaur, Sukhvir Kaur, Amit Walia.***"Face Recognition System using Deep Face and Neural Network"***, IJSRD - International Journal for Scientific Research & Development| Vol. 4, Issue 05, 2016

4) Justus Schwan, Esam Ghaleb, Enrique Hortal and Stylianos Asteriadis, ***"High-Performance and Lightweight Real-Time Deep Face Emotion Recognition"***, 2017 IEEE

5) Florian Schroff, Dmitry Kalenichenko, James Philbin, ***"FaceNet: A Unified Embedding for Face Recognition and Clustering"***, 2015 IEEE

6) Adnan Firoze, Tonmoay Deb. ***"Face Recognition Time Reduction Based on Partitioned Faces without Compromising Accuracy and aReview of state-of-the-art Face Recognition Approaches",*** ICIGP 2018, February 24–26, 2018, Hong Kong, Hong Kong.

7) Enrique Correa, Arnoud Jonker, Michael Ozo, Rob Stolk **"Emotion Recognition using Deep Convolutional Neural Networks"**, June 30, 2016


thank you!

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