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Artificial Intelligence Based Students Attendance Monitoring System

Premkumar Murugiah[1], Vidhya Kandasamy[2] , Santhosh. R.S[3], Selvamoorthy[4], M, Soundararajan A[5], Vignesh kumar. B[6]

[1,2,3,4,5,6]*KPR Institute of Engineering and Technology, Coimbatore*
premkumarmurugiah1395@gmail.com [1], vidhyakandasamy@gmail.com[2] ,santhoshsargunam99@gmail.com[3],soundarun22@gmail.com[4],vickybskar71@gmail.com[5], selvamoovendran@gmail.com[6]

Abstract

Emerge of Artificial Intelligence facilitates the automation of world in all aspects. So utilizing the AI benefits is an intelligent way of reducing the burden of day-to-day life and requirement of man power. Especially the advancement of Artificial Intelligence is highly important in education institutions for effectively monitoring their student. Specifically the attendance monitoring system is an important system in all kind of organizations including schools and colleges. Monitoring the presence or absence of students in a college or university is a highly tedious task. Particularly the conventional method of attendance monitoring involves roll call by their register number during every session. This traditional method involves much time and manpower. Such a manual process needs an automation system for accurate timeless tracking of students time to time in a vast atmosphere without any duplication and deputation attendance. The proposed Face Recognition based Attendance Monitoring System overcomes the foreseen complexities by applying Convolution Neural Network (CNN) algorithm. The student's presence or absence in the class room, laboratory or in the hostel is identified by the system and is notified to teachers, student and also his/her parents through SMS. The system mines the student identification in two basic steps as feature extraction and pattern classification. The system obtains 77.15 % of accuracy in face recognition.

1. INTRODUCTION

The emergence of Artificial intelligence (AI) has led to applications which are now having a profound impact on our lives. This is a technology which is barely 60 years old. Artificial Intelligence has been witnessing a monumental growth in bridging the gap between the capabilities of humans and machines. In the past few years, the field of AI for making machine as intelligent to learn and act has undergone major developments. One important advancement is a technique known as "deep learning" that aims to model the high-level data abstractions by employing deep networked architectures composed of multiple linear/non-linear transformations. Deep learning systems are intelligent systems that mimic the workings

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of a human brain in representing complex data from real-world scenarios, and help in making intelligent decisions. Deep learning, also known as deep structured learning or hierarchical learning, belongs to the family of machine learning methods which are based on understanding data representation. It has made a remarkable impact in computer vision performance previously unattainable on many tasks such as image classification and object detection [1].

Face recognition is the process of recognizing the face of a relevant person by a vision system. It has been a crucial human-computer interaction tool due to its usage in security systems, access-control, video surveillance, commercial areas and even it is used in social networks like Facebook as well. After rapid development of artificial intelligence, face recognition has once again attracted attention due to its non-intrusive nature and since it is main method of person identification for human when it is compared with other types of biometric techniques. Face recognition can also be easily checked without the subject person's knowledge in an uncontrolled environment[2].

Especially all the parents and institute administration are always concerned about their ward's or student's irregular attendance, their tendency of bunking the classes / labs and safety & where about of their ward or student. The problem is day by day increasing. At the same time, the conventional method of taking attendance in every lecture or laboratory session by calling student's name or roll numbers or signing on paper is very time consuming, unsecured, inefficient, difficult and monotonous for faculty. Their valuable time is wasted in taking attendance. Therefore many times proper attendance is not taken by the faculty. Also proxy attendance is always a problem in most of the campuses. If the educational institutes do not have a full proof attendance automation & monitoring system, there is a tendency of missing the classes by students which affects his academic performance seriously. To solve the above issues and to manage students attendance in a most efficient way the proposed system implements Convolutional Neural Network based face recognition and attendance monitoring process[3].

2. METHODOLOGY

2.1 Convolutional Neural Network Model

In the field of image recognition and classification, the CNN plays vital role nowadays. These Convolutional Neural Networks are kind of Feed Forward Neural Network which consists of many layers. It consists of set of filters or kernels with parameters or weights and biases. The convolution is performed on each filter as shown in below Figure 1.

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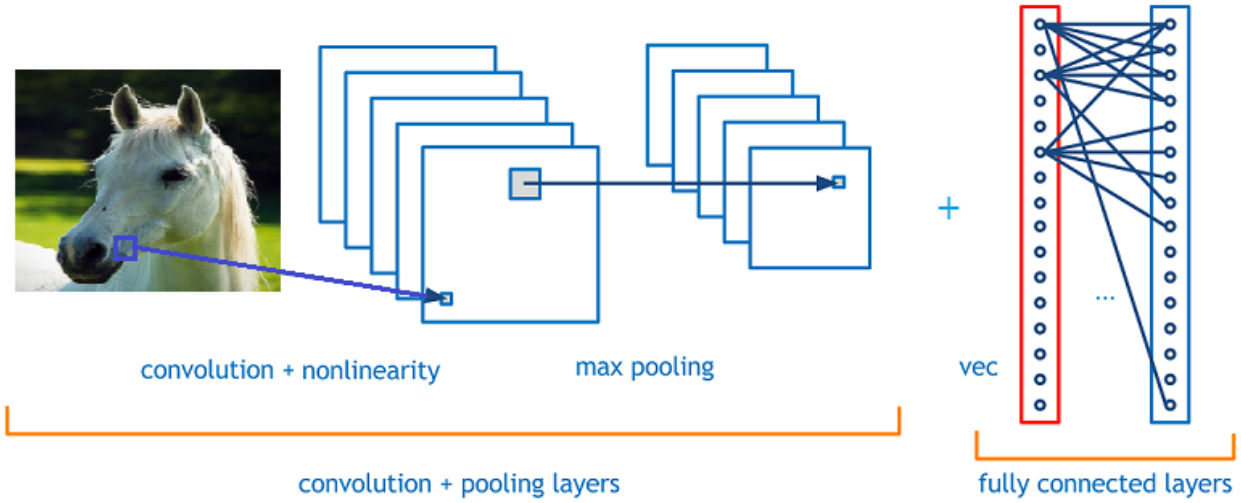

Figure 1: Structure of Convolutional Neural Network[2]

The structure represented in above figure consists of Convolutional layer, pooling layer, ReLU (Rectified Linear Unit) layer and fully connected layer as shown above. The basic element of CNN is Convolutional Layer. This layer will extract the features from the input image. The related feature is spatially preserved by the convolutional layer using set of learnable neurons. From these a set of feature map or activation map is developed and the current layer and the same is passed to the next layer as a n input. Likewise the process of feature extraction carried over the Convolutional Layer[3].

The second important component is pooling layer which helps to reduce the dimensionality of each activation map by down sampling each region of unleashed rectangle captures. Basically the pooling layers are placed in between the convolutional layers to provide better convergence. The Rectified Linear Unit(ReLU) is a rectifier which is most commonly used activation function in deep learning models. The function returns 0 if it receives any negative input, but for any positive value ‘X’ it returns that value back. So it can be written as

$$f(X)=\max(0,X)$$

Finally the Fully Connected Layer (FCL) is layer which is connected to every filter in the upcoming layers. It combines the output from convolutional, pooling and ReLU of given input setup. The FCL helps to classify the extracted features based on training dataset. The FCL would be the layer which feeds the features to Softmax function of the classifier. The classified output is tested with the testing image and it returns the matched an unmatched images.

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2.2. SMS Communication

The extracted facial features are verified with the database element and returns the identity as present or absent where the confusion matrix is formulated to disclose the True Positive, True Negtive,False Positive and False Negative features. By the way it ensures the accuracy of identification of concern images tested. The SMS API integrated with the server can populate the SMS to respective authorities.

3. PROPOSED SYSTEM

The general structure of face recognition system proposed in this system is depicted in Figure 2 below. Here the facial image is captured from the locations such as classroom, laboratory and also in hostel. Then the captured images are processed using Convolutional Neural Network (CNN) formulated in the allocated server machine in the following phases[4].

3.1 Preprocessing

The CNN models alone cannot produce highly accurate classification. So in order to achieve accurate identification of detected students in the class, the proposed system applies Zero Component Analysis(ZCA) techniques which plays a vital role in achieving the state of art on any dataset. Zero Component Analysis was first applied on training data. The ZCA transformation makes the edges of the objects more projecting and clear[4].

The convolutional layers perceive various features through the feature maps based on these detected edges. The below equation (1) specifies the method of preprocessing by ZCA. Initially image I is normalized in terms of its size. Then the singular value decomposition of the covariance matrix of the mean normalized data is calculated. Finally, the whitening is performed[5-7].

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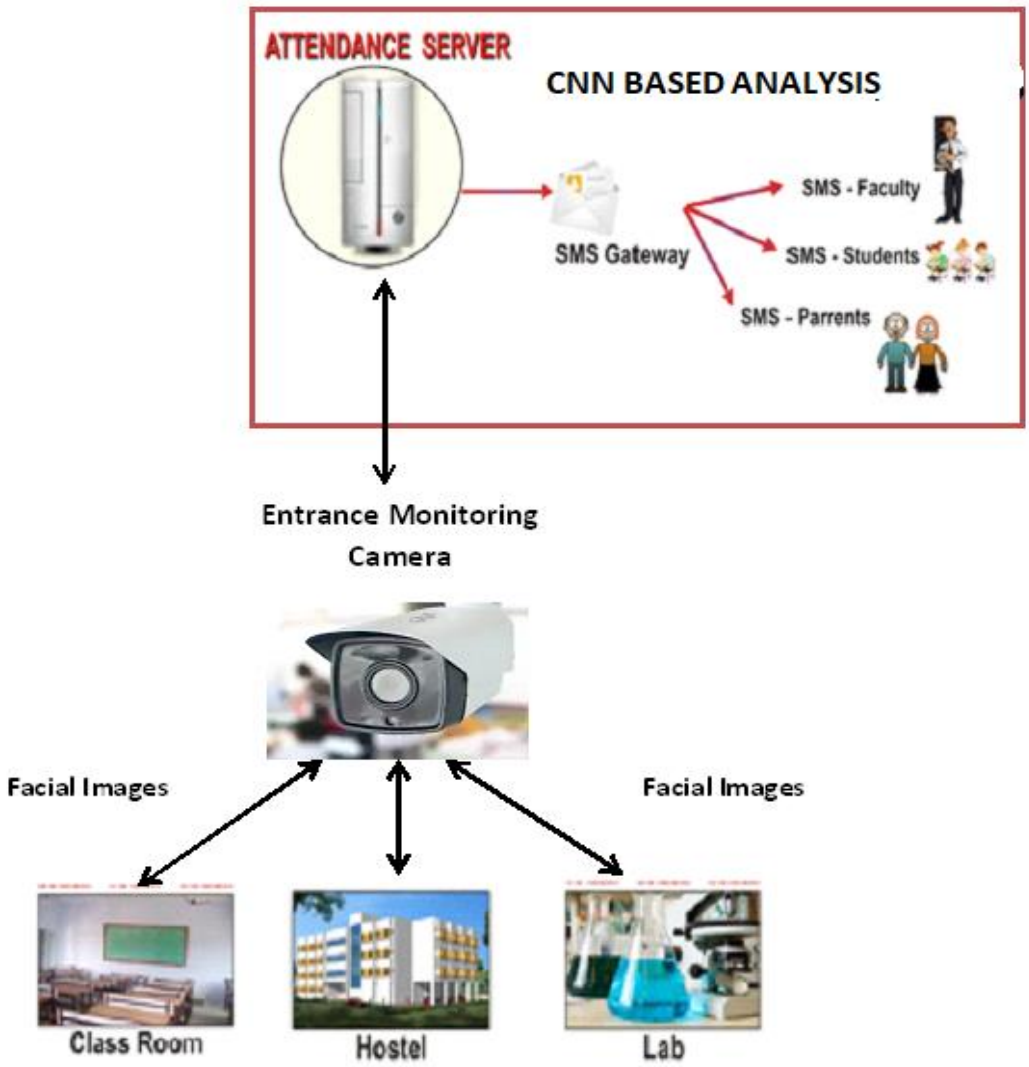

Figure 2: Students Attendance Monitoring System using CNN

3.2 Training and Testing

The training and testing method on CNN with ZCA preprocessing is executed with python 2.7 and theano with the images from Kaggle. The unknown parameters are known and during training process and is tested during testing process. In the proposed system, Softmax Classifier is used to classify the features extracted from CNN. Then the system predicts the output based on the match and mismatch. The randomized set of 3000 images is used to train the system. Here the Stochastic Gradient Descent with minibatch of 65 is applied to improvise. Due to the randomized parameter values the accuracy varies at each iteration. The dataset is tested with single network of three different feature maps in the layers of Convolutional Network with 80 epochs.

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Thus the Convolutional Neural Network setup emits the identity result as either present or absent. Then the analyzed result is conveyed with data and time to SMS module. From the SMS module the message is passed through the provider of SMS Gateway to faculties of the respective class, to the students who were absent, and the parents of the corresponding student.

4. RESULT AND DISCUSSION

Thus the proposed system identifies the students presence in the classroom, laboratory or in the hostel accurately .The system obtains average of 77.15 % of accuracy with 80 epochs and feature sets of 20, 40, 60.

Table 1: Features Vs Accuracy

Number of Features	Percentage of Accuracy
20	72.46
40	78.53
60	80.46

The obtained result over Convolutional Neural Network models with varied feature map values are shown in Table 1.

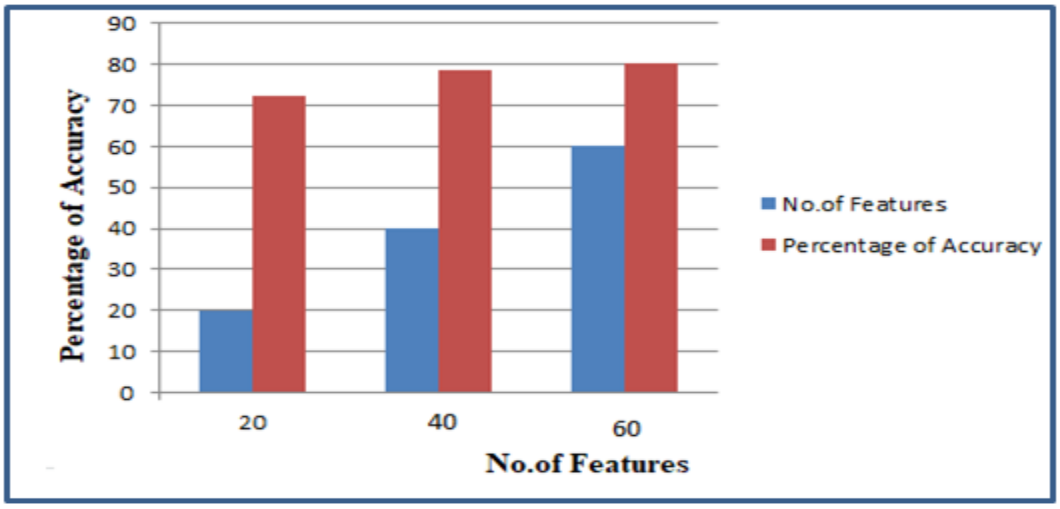

Figure 3: Number of Features Vs Percentage of CNN Accuracy

From the Table 1, it is observed that there is an increased accuracy in parallel with the increase in number of features extracted and evaluated. Thus the propose system obtains average accuracy of 77.15% which is as shown in Figure 3.

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5. CONCLUSION AND FUTURE WORK

From the results obtained the proposed Convolutional Neural Network with Zero Component Analysis recognizes the students with an accuracy of 77.15% and should be improved by increasing the number of layers of CNN and with increased feature maps. In future the accuracy will be improved with increased count of layers,epochs and also features. Also the system will be extended to support industries to monitor their employees and their movement.

REFERENCES

1. Soad Almabdy ,Lamiaa Elrefaei ,"Deep Convolutional Neural Network-Based Approaches for Face Recognition,Journal of Applied Sciences, 2019.
2. M. Coşkun, A. Uçar, Ö. Yildirim and Y. Demir, "Face recognition based on convolutional neural network," 2017 International Conference on Modern Electrical and Energy Systems (MEES), Kremenchuk, 2017, pp. 376-379, doi: 10.1109/MEES.2017.8248937.
3. https://www.iitms.co.in/rfid-based-attendance-system/necessity-of-rf-attendance/
4. Kuntal Kumar Pal, Sudeep K. S.," Preprocessing for Image Classification by Convolutional Neural Networks", EEE International Conference On Recent Trends In Electronics Information Communication Technology, May 20-21, 2016, India
5. Santana Fell "Ai To Mark Attendance" The Telegraph Online Edition Published On Wednesday, 25 September 2019
6. Chaitanya Reddy "Face Recognition Using Artificial Intelligence" Towardsdatascience.Com In April 2017.
7. Sulakshana Iyer "Facial Recognition Technology Is Too Great To Ignore" On Soft Web Solutions In March 6th, 2019

ISSN: 2233-7857 IJFGCN