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Recognizing Students Through Surveillance System Using Different Recognition Techniques

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Abstract - *People now living in a world of corporate culture like workplaces and colleges, schools, hospitals. In particular educational institutions will ensure the students to maintain dress code to obtain uniformity among the students. It is a difficult task to the management to identify the students who doesn't follow the dress code. To observe manually it requires more human involvement and it is not possible for the entire day. To overcome across those issues, the proposed model presents a neural network based classification system to identify and differentiate the students. Systematic learning of analytics is becoming an essential topic in the educational area, in which requires effective systems to monitor the learning process and provides feedback to the staff. The software records the entire session and identifies when the students pay attention in the classroom, and then reports to the facilities. In this paper we want to deviate from the old approach and go with the new approach by using techniques that are there in image processing. Here in this paper we representing spontaneous presence for students in classroom.*

***Key Words*: — Convolution neutrals, Pooling, Flattened, Fully Connected, Visual attention, Digital Attendance.**

1. INTRODUCTION

From the survey of the current period we came across that Artificial Intelligence can plays a vital role in the computer technology. It can do all the work which can do by the human. It reduces the work of the human in different ways. It can map the behavior of the human in the computers. This technique can perform a large amount of data in a reduced period of time. The data can be classified based on the several parameters. It can interconnect various techniques such as linguistics, computer intelligence. The datasets that is trained already at the period of starting the program. ML is the branch of the artificial intelligence it does not follows the strict order performed by the program it follows the data in the training set. Recognition of face is the latest technique it can execute the data from the comparison, identification and classification. This also can be applied in the medical research where the medical report can collect the details of the patient including ID, kind of disease, and the medical diagnostics. The computer can maintain the all the kind of data. The AI can be applied and differentiate the data into two path one is the useable data and the other is the unusable data. The useable data can be separated and the data are stored by applying the face recognition method is useful method to pick the particular report of the patient from the overall report from the database.

The machine learning can undergoes the raw data extracting to find the patterns it will not follow the extraction of the data extraction. The structure of proficient algorithm comprised of bit by bit process which enables the network model to classify the ideal dress code and others. The proposed model is accomplished to differentiate the dissimilarities between the appropriately dressed individual and inappropriate dress code members. The proposed algorithm comprises of different layers such as convolution layer, pooling layer, flattening layer, and Full Connection layer. The figure 1 gives an illustration of convolutional layer. In this the feed in input consists of definite shapes which is formed based on laughing face and the area of the image is flagged as 1's and others are flagged as 0's.

2. LITERATURE SURVEY

The problems in detecting whether a person or a student dress code is overcome by employing a Convolution Neural Network (CNN) Image processing algorithm. Network model used in this algorithm is successfully trained with datasets consists of different images collected from random websites and college surveillance systems which will be recording all the student moments in the main entrance. All the collected images in database are trained with network model and the results are stored in multiple library locations which are present within the system. Some of these libraries will act as an operating system of network model which will provide permission to access various image data sets and file systems within the network model system. Once permission is granted the network model starts to read images present in training and testing directories. To ensure the performance of network model different types of students and their dressing styles are considered without any bias and selection of image is performed as a random function. Random functions lumber all the images in the datasets so that the network model will be able to learn perfectly each and every image from the Closed Circuit Television (CCTV) surveillance. [1]

Many factors affect a student's academic performance. Student performance and achievement depends on teachers, education programs, learning environment, study hours, academic infrastructure, institutional climate, and financial issues [1, 2]. Another extremely important factor is the learner's behavior. H.K. Ming and K. Downing believe that major constructs of study behavior, including study skills, study attitude, and motivation, to have strong interaction with students learning results and performance. Student perception of the teaching and learning environment influence their study behavior. This is more helpful to teachers to grasp the bad attitudes of students, they can make more reasonable adjustments to change the learning environment for the students. For the conclusion that whether good or bad behavior of a particular student is not an easy task to solve, it must be identified by the teacher who has worked directly in the real environment. From this teachers can track student behavior by observing and questioning them in the classroom. This method is not difficult in a classroom which consisting of few students, butit is a big challenge for a classroom with a large number of students. This method is valuable to develop an effective tool that can help teachers and other roles to collect data of student behavior accurately without spending too much human effort, which could assist them in developing strategies to support the learners to performances could be increased. [2]

The camera captures the face images and compared to the data in the database. Here the captured images does not possess high quality and resolution. This poor resolution is due to the camera limited specifications. In this wild environment the face image is captured is subjected to query algorithm. Super resolution algorithm is used to increase the resolution of the images at the time of resolution the size of the image is increased when it is small. From this paper they propose the state art algorithm for the super image resolution. The images from the wild database are used for applying the 3D face alignment two cases are consider which is the before and the after alignment. The functions of the proposed algorithm are featured. The results of the images are considered for the test in a recognition protocol by the use of the unsupervised learning algorithm. This unsupervised algorithm which posses the high level of extracted features. On the analysis of the recent results rate of recognition is increased that is extracted from the unsupervised algorithms. [3]

Organization requires a robust and stable system to record the attendance of their students. organization have their own method to do so, some are taking attendance manually with a sheet of paper by calling everyone by names during lecture hours and some have adopted biometrics system such as fingerprint, RFID card reader, Iris system to mark the attendance. This conventional method of calling the names of students manually is time consuming event. The RFID card system, each student assigns a card with their corresponding identity but there is chance of card loss or unauthorized person may misuse the card for fake attendance. When we observe in other biometrics such as finger print, iris or voice recognition, they all have their own flaws and also they are not 100% accurate Face recognition involves two steps, first step involves the recognition of faces and second step consist of identification of those detected face images with the existing database. We have several number of face detection and recognition methods. The Recognition of face works either in form of appearance based which covers the features of whole face or features like eyes, nose, eye brows, and cheeks to recognize the face. [4]

The automatic methods are available and one of them is the biometric attendance. This method is not good because it waste the student's time by standing in the queue to give

their thumb impression on the system. Actually this method is developed for identifying of the individuals. The proposed method examines the behavioral features and the physiological of the individuals based on plastic cards, pins and tokens to identify the person, and also it includes identification because of the physiological features such as finger prints, face, hand veins, iris it also had a geometry and features such as keystroke dynamics and the signature are used as the behavioral features for the analysis. Almost all the institutions follow these attendance systems to keep a record of the students and also to know in which department they are studied. The applied method is good benefit for the parents because the colleges will send the information student attendance to their parents via mail or system and there is also a chance that the student may delete the mail before their parents recognize it but with this method they will be having soft copy of image and can be directly sent to the parents mail. The first system that is successful based on the pattern matching is applied to the facial features providing a compressed face picture. [5]

The implementation and enforcement of dress codes are some of the steps that must be considered when it comes to security protocols of both public and private schools. Dress codes in such learning institutions are said to help socio1economic that affects the students who can't afford the latest trends especially at urban schools. This could also instill discipline and sense of community among the students. It also helps the school staff and security to quickly spot the intruders and any other individuals who do not belong to the institution. As school uniforms are considered as an indicator of safety from school crimes caused by intrusion, though uniforms alone cannot solve all the issues with regards to security, they can still be a positive element to discipline. School administrations are responsible for the safe, secure and productive learning environment. Proper implementation of policies and strategies for dress and appearance are within the scope of reasonable actions which can be done by school officials to promote a positive school environment. Schools may choose to include appropriate measures to enforce their dress code in their student engagement policy as these support to create a positive school culture, clearly articulating school-wide expectations and consistent processes to address concerns with regards to the dress code. [6]

Electronic gates or E-gates are progressively significant in developing a mere secured entry way of its users. E-gates requires all the users to disclose their biometric data to the device. It was discovered that security observations and advantages of exposure impacts affected revelation, while positive & negative feelings impacted user's impression and security. This concept is related to this design project but differ in totality because uniform recognition has an image processing to detect the proper dress code and also has an ID barcode scanner to add more security. The device is consisting of microcontroller, fingerprint and barcode scanner, camera and servo motor. The input is from the biometrics, barcode and camera or the image processing, all of this sensors should have the qualified input to operate the device. Biometric confirmation frameworks for example, electronic (e-) gates are progressively significant in air travel due to the developing voyager streams and security challenge. Such frameworks take into account exact validation and the improvement of the air travel involvement, while upgrading the security of the general travel framework. To verify, the travelers are required to reveal biometric data. [7]

The hardware is arranged to naturally open entryways or gates for vehicles while there are still empty parking spots. While is about the advancement of entryways to have a more secure workplace. The concept is almost related to the uniform recognition but they differ in terms of security ways as well as its major application. In study, biometric is used to recognized individuals and direct access to data. Uniform recognition used biometrics to recognize student and to be allowed inside the university. But the researcher's study is also requiring a proper uniform dress code to fully access the university gates. It introduce a programmed framework for controlling and ruling structure door dependent on digital image processing. The framework starts with a digital camera, which catches an image for that vehicle which means to enter the structure, at that point sends the image to the PC. Picture examinations performed to identify and perceive the vehicle, and coordinating the vehicle's picture with the stored database of the passable vehicles. At that point, the PC send a signs to the electromechanical parts that controls door to open and allows the vehicle to enter the structure in the event of the vehicle's picture coordinates any picture in the database, or sends an apology voice message if there should arise an occurrence of no indistinguishable picture. [8]

Upon increasing the technology there is a vast usage of using embedded devices by humans. All our lives are more contingent on embedded devices. In this digital environment these devices provide security and safety. Over 97% of processors are using in embedded systems. These processors cannot be visible to users. New processors, sensors, actuators, communications and infrastructures are developing which provides a significant role in pushing the economic growth. In these recent times "vision" challenges to researchers in development. This development impacts on several aspects like context-awareness, intelligence, natural interaction, restricted resources, hard real-time applications, Automotive, Medical Devices, military services, etc. In this ongoing technology there is a large requirement of applications for text recognition, object recognition, face recognition, navigation which helps to assist people to provide them safety and security. Deep learning has become one of the leading surge for object detection. Many algorithms like YOLO, faster RCNN and SSD are developed to recognize object but SSD method provides more accuracy in recognizing objects. The detecting frames in SSD framework is more than Faster RCNN. We have different datasets like

PASCAL VOC800, MS COCO and GOOGLE Nets are having thousands of images but 'Mobile Nets' which was developed by Google researchers have millions of images with in a less storage and are designed for the applications of smart phones effectively for object detection, face attributes and large scale geo-localization. [9]

3. PROPOSED METHODS FOR FACE RECOGNITION, UNIFORM IDENTICATION AND FOR MOBLE PHONE DETECTION

The main aim of this system is to recognize the face of the school/college student and to recognize the color of the uniform through the color identification which is under algorithm method. Recognition of face follows the identification, pattern segmentation and classification, comparison and extraction. The input is image is trained in the training set and the following process takes place. Once after the stage of face recognition, the color identification is made by the RGB and neural network method which measures the edges of the images and color of the images. The edges are measure when the image shows identical color.

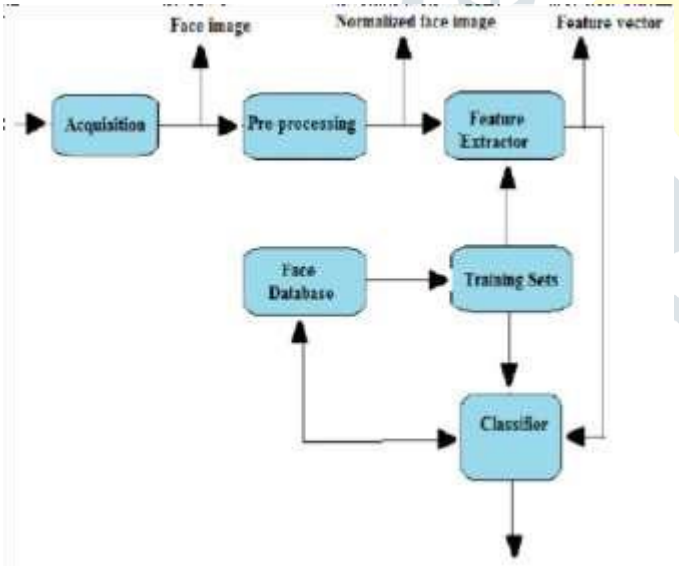


Figure 1: Face Recognition Block Diagram

As our model will be given more and more passages it will start to turn out to be more and more precise as it will learninvestigate every single Data1set and use it for future entries. To isolate the pictures into two sections have takenthe states of dress code like the individual should wear Identity Card and should take care of his Shirt and any picture which isn't having the above is considered as the individual isn't in dresscode.

The sample images which were taken below are from different sources including Google images, Fashion blog websites and university surveillance cameras.

The presence deposited system that all right to use administrations or blood relation the learners can use for them only. The device is used to take picture that is attached

to that of the system takes the pictures endlessly to identify and also to find the students those who are sitting in the classroom .For avoidance of false recognition of images skin classification method is used.[20]This skin classification method progresses the proficiency and the correctness that acknowledgement procedure. Mainly it is considered all other images recaps the other images then kept as black in skin classification method, it expressively improves truthfulness face tracking procedure. In the experimental arrangement show in figure1 two databases are shown. Assembling of face images and the images that are mined geographies at period procedure of registration is done by using of the face database .The data around instructors and learners take presence the second attendance of database is used.

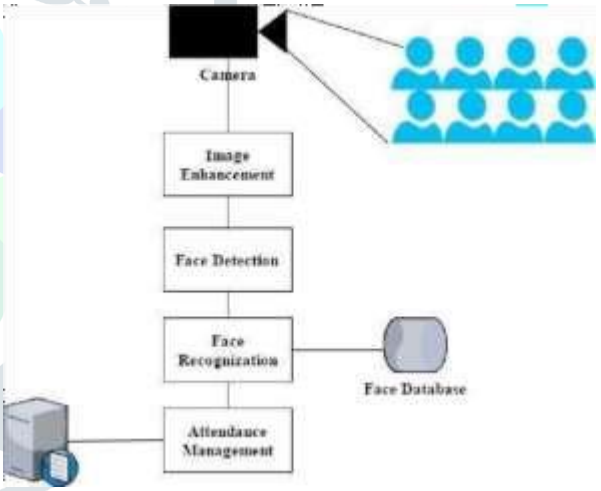


Figure 2. Experimentation setup

To initialize this system, the administrator first register their student data along with their name roll number and department. We have created a training dataset of 6 students (total of 120 images for each) for testing purpose.

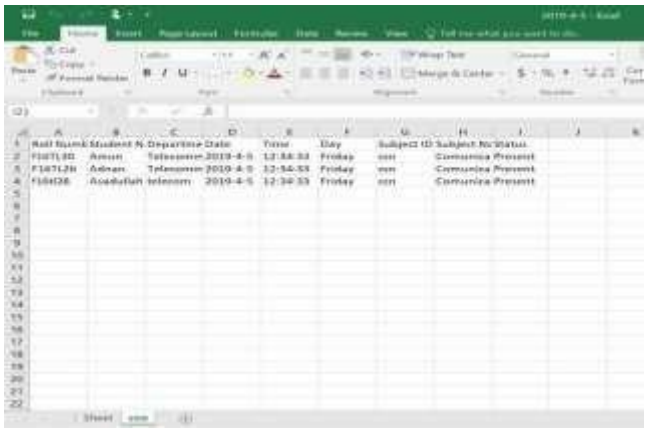
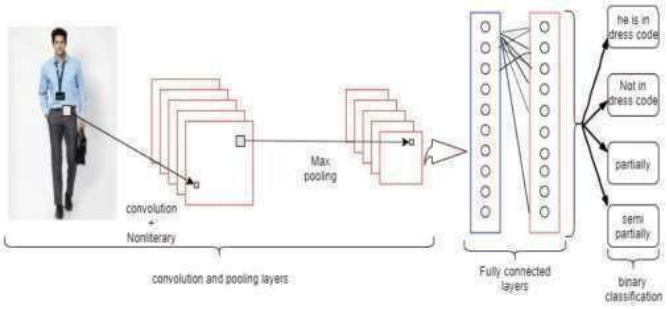


Figure 3. Excel sheet

The attendance system has proved to recognize images in different angle and light conditions. The faces which are not in our training dataset are marked as unknown. Attendance of recognized images of students is marked in real time, and import to excel sheet and saved by the system automatically. First part in determining the RF system as potential detection point was carried out by looking for the internal oscillators necessary to operate the microprocessor and RF synthesizer. The found results were not satisfactory and it was established that the cell phones had been designed to meet the electromagnetic interference specifications. The second part of the experiment was carried out to detect the cell phone by detecting the RF transmitted. This was done by the use of an RF signal strength meter, an amplifier, a mixer and a filter, they found out that since the mobile phone keeps a continuous communication with the tower, this technique was successful.

4. IMPLEMENTATION

The complete process of proposed model is depicted figure5 as a convolutional neuralnetwork.



So far the building blocks for building the network model with the help of Convolution neural network has been shown above. Let us move to the next face that is constructing ournetwork module as every model has a few steps for its implementation our model has four basic steps to train our network model.

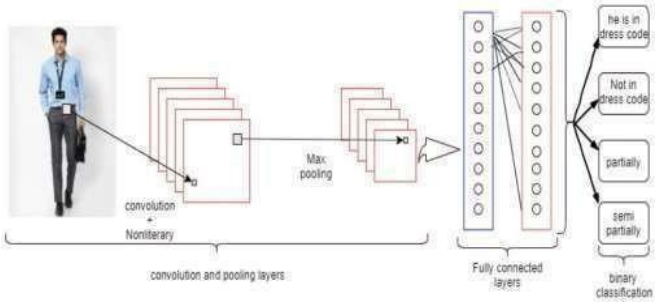


Figure 4: Convolution Neural Networks

So far the building blocks for building the network model with the help of Convolution neural network has been shown above. Let us move to the next face that is constructing ournetwork module as every model has a few steps for its implementation our model has four basic steps to train our network model.

- The implication of data-Sets into our Model
- Validating our data sets
- Training our Model
- Processing the acquired data from Model

DESIGN:-

Analysis:-

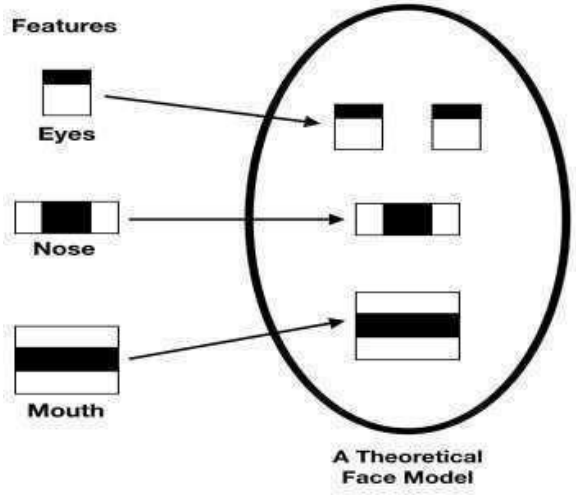
- The developed system will provide an automatic classification system to identify and categorize the students.
- This system helps to instill discipline and a sense of community among the students.
- Manual observation requires more human involvement which can be avoided by making use of advancedtechnology.

This device uses biometrics, a barcode scanner of the Identification (ID) card, and image recognition for uniform.

Haar Cascade FrontalFace Algorithm

- It is based on the Haar Wavelet technique to analyze pixels in the image into squares by function.
- This uses machine learning techniques to get a high degree of accuracy from what is called "training data".
- This uses "integral image" concepts to compute the "features" detected.

Haar Cascades use the Adaboost learning algorithm which selects a small number ofimportant features from a large set to give an efficient result of classifiers.



Fisherface Recognizer :-

- Fisherfaces algorithm extracts principle components that seperates one individual fromanother. So, now an individual's Features can't dominate another person's features.
- Fisherface method will be applied to generate feature vector of facial image data used by system and then to match vector of traits of training image with vector characteristic of test image using Euclidean distance formula.

Figure 5: Fisherface recognizer

LBPHFaceRecognizer :

Local Binary Pattern(LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number.
It doesn't look at image as a whole, but instead tries to find its local structure by comparing eachpixels to its neighboring pixels.

LBPH uses 4 parameters

- **Radius** – to build the circular local binary pattern and represent the radius around the centralpixel it is usually set to 1.
- **Neighbors –** The more sample points you include, the higher the computational cost. It isusually set to 8.
- **X Grid –** the number of cells in the horizontal direction.
- **Y Grid** – the number of cells in the vertical direction

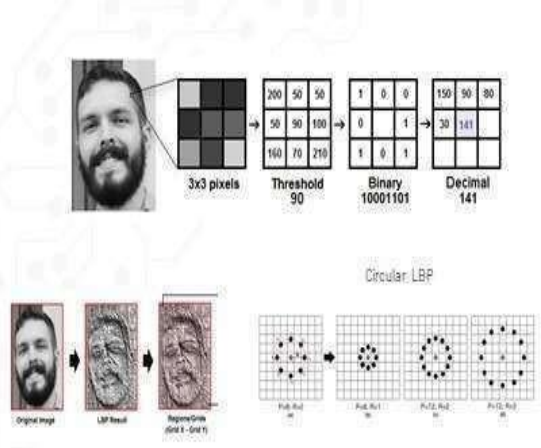


Figure 6: LBPH face recognizer

Traditionally, Face recognition system follows four primary phases, listed follows; also the basic face recognition diagram is shown in Fig. 1.

a) Face Detection
b) Preprocessing
c) Feature Extraction
d) Feature Matching

In this project, face detection algorithms are developed based on Local Binary Patterns Histogram (LBPH). The LBPH-based algorithm, the first step is to extract the image pattern with the LBPH algorithm. Then, two thresholds are setto calculate the probability of face in the image pattern. After that, the sliding window applied to identify the faces in given images and recognize those faces. From Fig. 10 we can understand well.

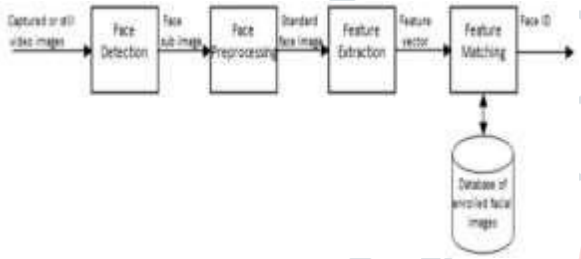


Figure 7. Basic Phases in Face Recognition.

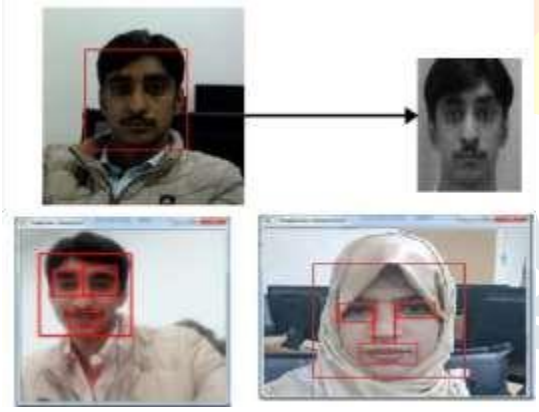


Figure 8. Image Preprocessing and Feature Selection.

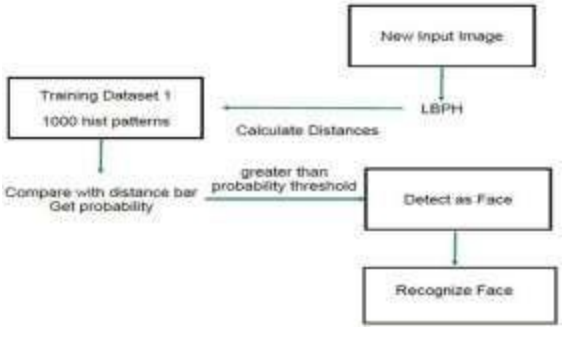


Figure 9. Face Detection and Recognition Methodology.

Local Binary Patterns Histogram

The goal of face detection is to detect and locate facesin the image, to extract human face to use in other areas. Nowadays, there are many different algorithms to accomplish face detection or recognition, such as Fisher faces, Eigenfaces, Scale-invariant Feature Transform (SIFT) and Speed-Up Robust Features (SURF). In this section, LBPH-based face detection algorithm is introduced. LBPH algorithm is the combination of Local Binary Patterns (LBP) and Histograms of Oriented Gradients (HOG) descriptor. LBP is an easy but powerful way to extract and label the pixels of an image. Using the LBPH, we can easily represent face images with just a straightforward vector.

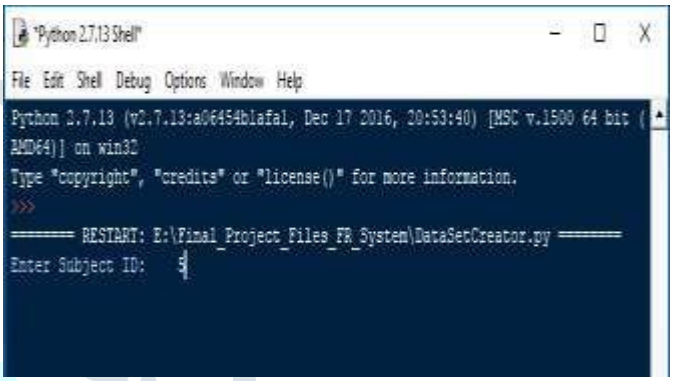


Figure 10. Image Acquisition.

Figure 11. Face Detection

Figure 12. Subject ID with Sample Number.

A. *Experiments*

This part states that the experiments executed to match the performance of the facial recognition algorithm applied in this system. It is required to this part states that the experiments executed to match the performance of the facial recognition describe the experimental conditions that must be acceptable for the proposed system. So, the proposed experiments must be executed by changing certain factors that are significant in the learning and recognition method of the system. The following test was implemented to examine the efficiency of the operating system—identification percentage based on a threshold. To perform the experiments, besides my dataset images, I also have taken dataset images of my three lab mates from the school of Information & Software Engineering. The tests were executed, and the efficiency ratioswere examined in every situation. Fig. 7 displays the subjects with their corresponding IDs. After the execution of the training of the experiment subjects, facial recognition is executed. The expected results generated by the system are defined below.

B. *True Positive*

The real positive condition happens when the observed individual's data stored in the dataset folder and the recognized subject matches to the one that is available in the training dataset. Fig. 8 displays the result after applying facial recognition; in this situation, the result is accurate.

C. *True Negative*

The true adverse condition occurs when the tested subject's data is not stored in the database, and the system could not recognize that subject. Fig. 9 displays the result after applying face recognition; in this condition, the recognition result will be -Unknown,|| and hence the effect will be considered as correct.

D. *True Occlusion*

True occlusion condition happens when the subject's data saved in the dataset folder without occlusion condition and the recognized subject matches to the one that is available in the training dataset. Fig. 10 displays the result after applying facial recognition; in this situation, the result is accurate.

Figure 13. Test Subjects.

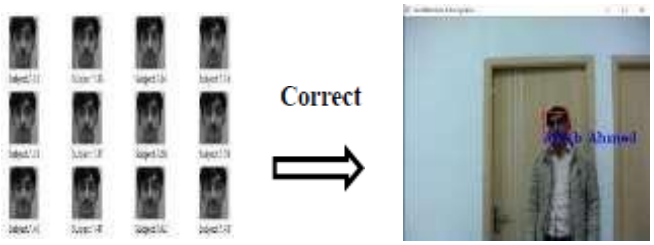


Figure 14. True Positive.

Figure 15. True Negative.

Fig. 16. True Occlusions

E. *True Pose Variation*

True pose variation occurs when the subject's position is at a different angle concerning the camera, and the system can recognize that subject even if in the dataset, only frontal view face images are stored as shown in Fig. 11.

We evaluate the parameters and different values of our model during the testing experiment which is given in the Table I.

The accuracy of model is shown in Fig. 12 the accuracy is taken against the Training and Validation dataset. We divided our dataset, such as 50% training dataset, 30% testing and rest 20% validation dataset.

F. *Setup*

To implement the above jobs subsequent Hardware and Software are required to grow the proposed the scheme. We used software tools: Windows/UNIX operating system, Python 2.7/3.6, OpenCV library, Numpy library, Matplotlib library, Pillow library.

Figure 17. True Occlusions.

. **TABLE I. PARAMETERS TO TEST THE EXPERIMENT**

Parameter	Value
Training	
Number of Subjects	4
Cam-Subject Distance(cm)	200
Recognition	
Threshold	<250;<500;<750;<100
times	80[5 each subject]

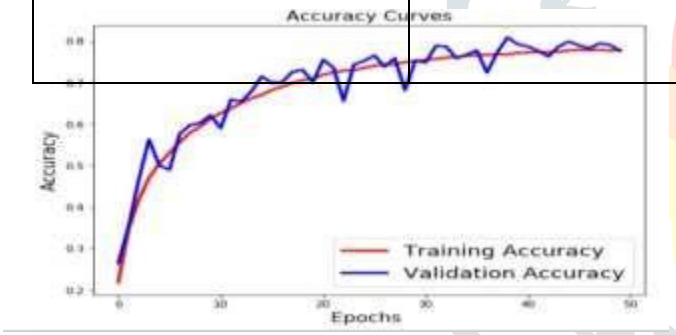
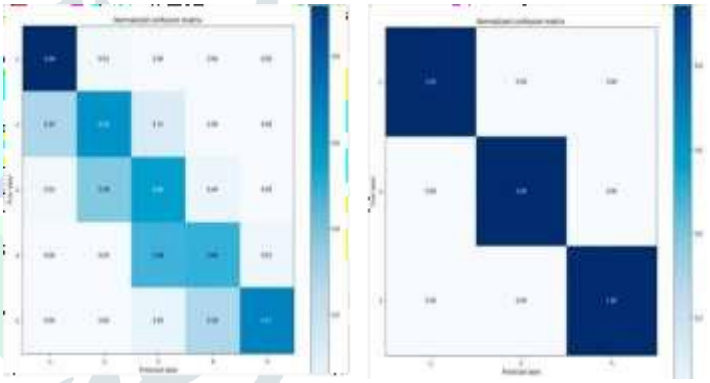


Figure 18. Training v/s Testing Accuracy Curve.

5. RESULTS AND DISCUSSIONS

We did the evaluation to verify the results in three main phases: student ID, the position of the student and gaze. First, it is the student ID that needs to be detected primarily.ID of a student plays an important role in this context. Onceall student IDs have been identified and located, the tracked data of individuals' behaviors will be attributed to them later. Student ID identification is evaluated through all the data of the dataset. Because the data are imbalanced, F1-scores are necessary. A confusion matrix is also plotted. The first column and row represent the label of "unknown," andthe other columns and rows show the results of corresponding student IDs. Secondly, row and column are evaluated. The row and column represent the current position of the student in the class which is going to be combined with the head-pose direction to denote the origin and the direction of the gaze vector. The row and column are evaluated with MAE (mean absolute error). Besides, confusion matrices are also constructed for thoseestimations; vertical and horizontal values of the matrices are matched with the ranges of parameters. Finally, the gazeplays the most pivotal role in the system, to check if the students are focusing on the board/slides, on laptops, or on other things. The summarized statistics of gaze could be exhibited for educators to observe the behaviors of attentionover the studying period. Gaze estimation is acquired through re-trained models. Hence, the dataset is divided intotraining and testing sets, and then one-third of the dataset (7556 rows) is used for evaluation. The F1-score is also applied to evaluate the result of gaze estimation.

We can observe from Table 1 that column estimation gets an infinitesimal mean error, which represents a reliable outcome. For row estimation, this difference is trivial. Moreover, the confusion matrices (Figure 7) have shown that the error is often one that is acceptable for the expectation of estimating an approximation of seat position.In this context, different positions have the same vision direction but may not look at the same object.



(A) (B)

(A) The confusion matrix of row seat estimation.

(B)The confusion matrix of column seat estimation.

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Figure 19: The pie chart shows the numerical proportion of gaze direction data during the class.

The amplifier was simulated. In the place of the current to voltage converter, a signal generator was used. An amplifierwas simulated at 50mV voltage and the voltage waveformsat the LED monitored.

Smart Attendance Management System is simple and works efficiency. Automatically the system works once the registration of individual student created by the administration.

The front page of our attendance system is based on HTML5, CSS3 & JS. It consist of the following modules,

- Student Registration
- Face Recognition
- Addition of subject with their corresponding time.
- An Attendance sheet generation and import to Excel (xl) format

Figure 20: Addition of subjects

This above image represents the subject folder, subjects are to be filled according to time table once the time arrives for the corresponding subject. The system starts capturing images, detects the faces, compares the faces with existing database, mark attendance and generate excel sheet for the recognize students.

Fig 21: Test image of students during ccn lab at TL-MUET

The Attendance system has proved to recognize images in different angle and light conditions. The faces which are not in our training dataset are marked as unknown. The attendance of recognize images of students is marked in real time. And import to excel sheet and saved by the system automatically.

Students of each year will have different color uniforms. Then we also do the object detection concept in which students who are not wearing ID card, Belt and shoes are been identified separately and database is maintained and given to the corresponding person. The following diagram shows the results obtained in all parameters.

Fig 22: Face recognition output

Object Detection Output

TABLE 2. GATE RESPONSE EVALUATION

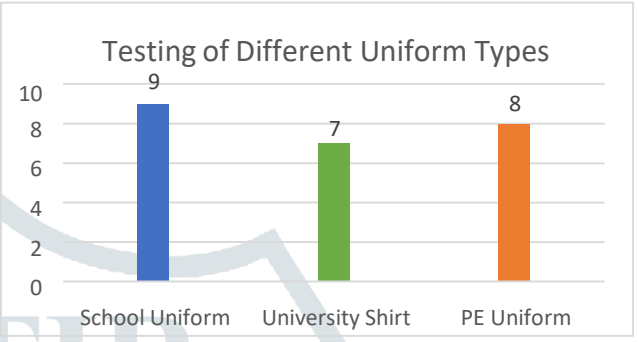
Condition	ID and Bio Matching	Uniform Scan	Target Response	Actual Response
1	1	1	1	1
2	0	0	0	0
3	1	0	0	0
4	0	0	0	0

Legend: For ID and Bio match: 1 for match, 0 for unmatched.

For Uniform: 1 for Pass, 0 for Fail.

For Target Response: 1 for Open, 0 for Close

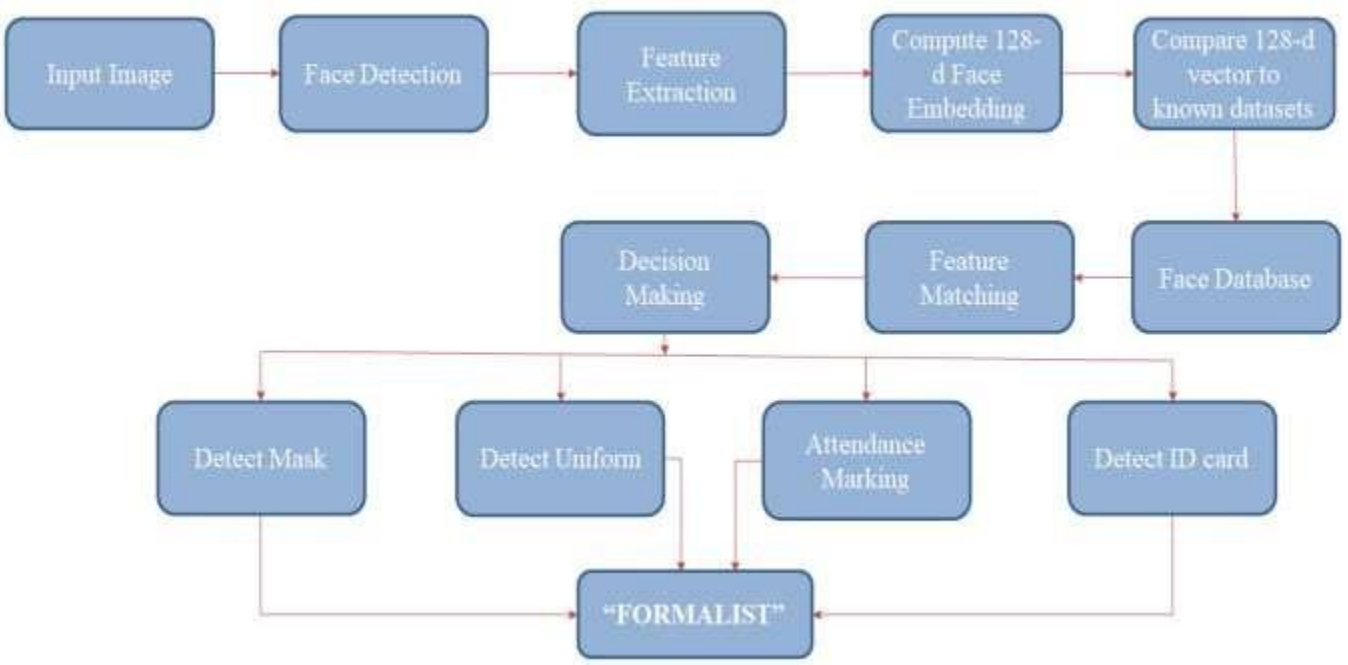
The system is tested for its accuracy for different uniform types. Table 2 shows that the School uniform detection rate is 90%, university shirt is 70% and PE uniform is 80%. These rates are evaluated from 10 trials of uniform detection. Factors that affect non-detection includes lighting and capture view problems.



6. CONCLUSIONS

The proposed model is developed to identify the dress code of the person in an institution. Based on 3 layer convolutional neural network architecture the images are classified to identify the formal and informal persons. Proposed model classifies the dress code percentage accurately. This research aimed to build a system that automatically supports teachers and related educational faculties with monitoring student behavior. Here mainly we focused on the observation targets of the students across time. Our proposed system works as an assistant for the decision-making process. This strategic information may be discovered and delivered to the decision-makers automatically. We accomplish the building of an entire system that supports recording Student behaviors, proceeding statistics, and visualizing the data. Mainly here detector could detect the signal in the frequency range of 0.9GHz to

It can be concluded that the project was successful. Smart attendance management system is designed to solve the issues of existing manual systems. We have used face recognition concept to mark the attendance of student and make the system better. This new method is proposed to be used as atool to make students follow the dress-code rules that improves a sense of professionalism in them.



Architecture of the project

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