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Smart centralized attendance management system

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ABSTRACT

The management of the attendance can often be a good burden on the lecturers if it is done manually. To resolve this problem, smart and auto attendance management system is being utilized. But authentication is a crucial issue in this system. Biometrics are generally used to execute smart attendance system. Face recognition is one of the biometric to be used. Human face being a vital authentication parameter, it has many applications in other fields such as video monitoring and CCTV footage system, access systems present indoors and network security, identification of people, electronics and validation of identities. By using the similar framework, the problem of proxies and students being marked present even though they are not physically present can easily be solved. The important implementation steps used in this type of system are face detection and recognizing the detected face. This paper proposes a model for implementing an automated attendance management system for students of a class by making use of face recognition technique, by using Convolutional Neural Network (CNN). After these, the connection of recognized faces ought to be conceivable by comparing with the database containing student's faces. This model will be a successful technique to manage the attendance and records of students.

Keywords— *Attendance System, CNN (Convolutional Neural Network), Deep Learning*

1. INTRODUCTION

The purpose of the smart centralized attendance management system is to automate the attendance marking of students in a class. Traditionally, we take a roll-call to determine whether the student is present in the class, which leads to wastage of a lot of time. In recent years, with the development of convolutional neural network, face recognition has made great achievements, which leads to a new way of thinking to solve the problem of class participation enrolment. In order to save time, we have an idea to mark attendance of students automatically based on face recognition. Usually, face recognition system needs to be installed in a specific platform, since android application is easy to develop, and do not need other hardware support, so we choose android as a platform for face recognition. The automatic enrolment system proposed in this paper is mainly composed of face detection and face recognition.

Obviously, a reliable face detection system has an important role in our automated attendance management system. In recent years, face detection has become a popular research field, which includes a number of disciplines, and researchers has put forward some successful face detection methods. While with the deepening of the research, especially the emergence of convolutional neural network, face recognition has made great achievements. For the above reasons, we know that it is feasible to implement an automated attendance management system based on face detection and face recognition. In this paper, we use convolutional neural network for face detection and face recognition.

2. RELATED WORKS

2.1 FaceTime: Deep learning-based face recognition attendance system

Nowadays, various attendance and monitoring tools are used in practice in industry. Regardless the fact that these solutions are mostly automatic, they are still prone to errors. In this paper, a new deep learning-based face recognition attendance system is proposed. The entire procedure of developing a face recognition component by combining state of- the-art methods and advances in deep learning is described. It is determined that with the smaller number of face images along with the proposed method of augmentation high accuracy can be achieved, 95.02% in overall. These results are enabling further research for the purpose of obtaining even higher accuracy on smaller datasets, which is crucial for making this solution production-ready. The future work could involve exploring new augmentation processes and exploiting newly gathered images in runtime for automatic retraining of the embedding CNN [2]. One of the unsolved areas of this particular research is the analysis of additional solutions for classifying face embedding vectors. Developing a specialized classifying solution for this task could potentially lead to achieving higher accuracy on a smaller dataset. This deep learning-based solution is independent of GPU in runtime. Thus, it could be applicable in many other systems as a main or a side component that could run on a cheaper and low-capacity hardware.

2.2 University Classroom Attendance Based on Deep Learning

Based on the deep learning, MTCNN combines face detection with face landmark and Center Face algorithm based on deep learning to achieve non-interference automatic and whole

process of class attendance [3]. Absence, lateness, leaving early the three classroom attendance indicators are highlighted in this method. It's a very promising university classroom attendance technology.

Execution of this model is one – time consuming model because others have to wait for the previous person to complete it' process.

2.3 Convolutional neural networks for class attendance

In this paper, we propose a class attendance method, which achieved through the Convolutional Neural Network (CNN). CNN needs a large amount of data for training, so we design a strategy for facial data collected. The strategy of face collection solves problems of the traditional method which cannot collect facial data with high efficiency and high quality in the actual attendance. It can collect a large number of facial data by shooting video, which avoids collecting one by one and save a lot of time. At the same time, a large number of face images in the actual environment of complex and changeable are used to train the model of deep learning (CNN), the model can learn new features by training automatically, the new features can remove the inter-class difference as much as possible, such as light, noise, gestures and facial expressions, etc. [4]. In addition. The method using deep learning overcomes the effect of the change of external condition, the recognition rate in the actual situation is improved efficiently. With the improvement of recognition rate, the result of attendance will be more reliable and accurate.

2.4 Convolutional neural network approach for vision-based student recognition system.

Our main mission is to perceive human individually by visual recognition. As a very first step, we have to recognize human facial images with the training data which are served the system externally. Using Deep Learning and Convolution Neural Network algorithm we have increased the accuracy of our system [1]. System is now ready to recognize the students individually.

2.5 Design of Intelligent Classroom Attendance System Based on Face Recognition.

This paper first introduces the overall design idea of the intelligent classroom attendance system, and then improves the Alex Net convolutional neural network. What's more, we verified the necessity and effectiveness of the improvement from multiple angles, then introduces the application of RFID in the system [6]. Finally, the function and description of the back-end attendance management system are carried out. The experiment proves that the smart classroom attendance system based on face recognition technology is efficient and stable, which effectively reduces the classroom attendance cost.

2.6 An android based course attendance system using face recognition.

Using an Android based attendance system face recognition, from this paper we have developed an application for users. To ensure the student's attendance in any course, QR-code contains the respective course information, is generated and displayed in front of the classroom [7]. The student only needs to capture his/her face by scanning the displayed QR code using smartphones. The image is then sent to server for attendance process, where facial detection and recognition will start matching the students face. If matched, the system will mark attendance of the student for respective subject.

3. PROPOSED MODEL

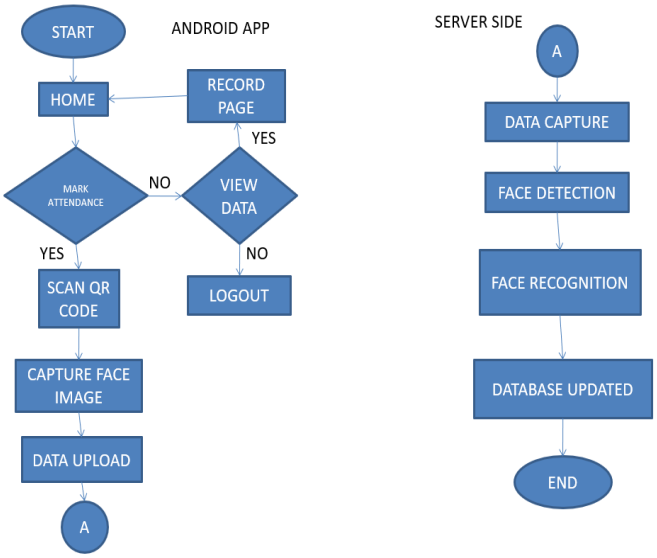


Fig. 1: Flowchart

The proposed system captures images using teacher's phone during the lecture. Faces are detected from the captured images. After detection by using Face recognition technique (convolution neural network) the system will recognize the faces and mark the attendance of the recognized students. The system consists of a database where the faces of students are stored with their respective registration numbers. The system will then match the faces of the captured images with the database and mark the attendance of the students whose face is recognized. New students can be added by the system administrator by taking sample shots of the student and then the system will extract the features of the face and save it in the database.

4. METHODOLOGY

4.1 Creating a data set

Facial data of a students from a particular class in different angle containing front profile, side profile (both left & right) and face profile looking up and down will be gathered to build our dataset. A video will be recorded and the best frames will be chosen by a program. Those images will be stored in folder which will be named by the name of the student and the images will be numbered 0,1, 2, … The registration of each student will be recorded as well.

4.2 Creating a Face Detection & Recognition Module

4.2.1 Face Detection: We don't require the color data to find faces, our primary step is to convert our image into black and white. Following this, next step is to perform pixel analysis. Pixel analysis will analyze every pixel in the image as well as the neighboring pixels. The process of figuring out how dark or light a particular pixel is as compared to nearby pixels is called arrow shadowing. This process results in an array, known as gradient. This gradient shows the flow of light to dark or dark to light of whole image. Then, we apply convolution neural network and start breaking the image into small squares of 16x16 pixels each. Then each of the square - count up the gradient points in each major direction (how many points up, point up-right, point right, etc.…)

4.2.2 Posing and Projecting Faces: Major problem we have to deal with is that the faces which face in different directions look totally different for our system. To deal with this we have to warp each picture such that the eyes and lips are always in

the sample place of the image. An algorithm called face landmark estimation is used here. This algorithm comes up with 68 specific points (called landmarks) that exist on every face, the top of the chin, the outside edge of each eye, the inner edge of each eyebrow, etc. Then a machine learning algorithm is trained to find these 68 specific points on any face. We know where the eyes and mouth are, we'll simply rotate, scale and shear the image so that the eyes and mouth are centered as best as possible. No matter how the face is turned, we are able to center the eyes and mouth roughly in the sample position in the image. This increases accuracy.

4.2.3 Encoding Faces: To encode faces we need to extract a few basic measurements from each input faces. Approximate measurements can be used to measure the unknown faces while comparing with the known faces. For example, we measure the size of each ear, the spacing between the eyes, the length of the nose, etc. Which features to collect, Deep learning understands better than humans at figuring out which parts of a face are important to measure for the system. Typically, 128 different features of the image are collected through deep learning.

4.2.4 Finding the person's name from the encoding: The last step is the easiest step in the whole process. In this step, we have to match the detected and recognized person's name from our database.

4.3 Creating front end

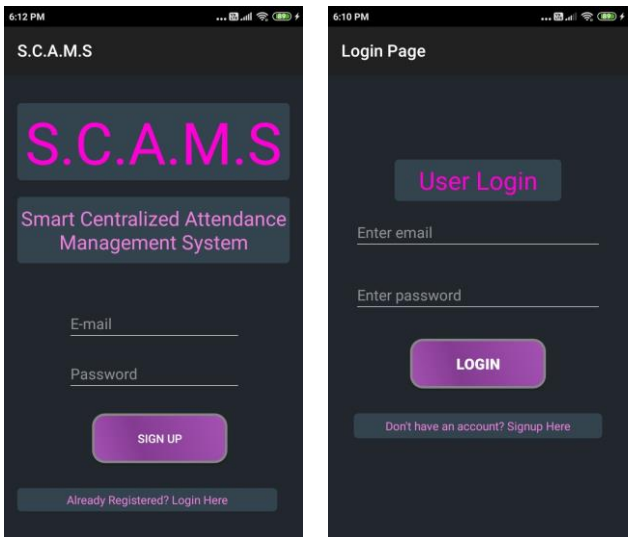
As per the requirements and features to be added, a front end is created with various functions like admin login, teacher login, student login, teacher's dashboard, student's dashboard, etc.

4.4 Creating Database :

A database will be created as per the time table for lectures and will be interfaced with the front-end system for storing the attendance result.

5. IMPLEMENTATION

In our proposed system, the teacher first logs in to the desktop application. After successful login the teacher enters the lecture details and generates a QR code which enables the student to mark their attendance. Students are required to register on the attendance system application first. Then, The student logs into their app in their phones.



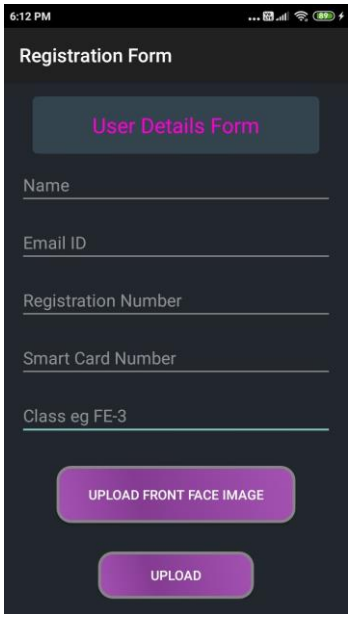


Fig. 2: Student Registration and Login

After successful login, student can mark their attendance by clicking on "Mark Attendance" option. After this the app will launch the front camera, using which student will scan the QR code projected by the teacher. This ensures that the student is physically present in the class. Once the QR code is scanned, it will again redirect the student to the front camera. The student captures their face and uploads it for marking attendance. This eliminates the risk of low light and bad capture of face. At the server side the Face recognition technique (convolution neural network) the system will recognize the face and mark the attendance of the recognized student. The server consists of a database where the faces of students are stored with their respective registration numbers. The system will then match the faces of the captured images with the database and mark the attendance of the students whose face is recognized After the attendance is marked student can also view his/her marked attendance by clicking on view attendance option.

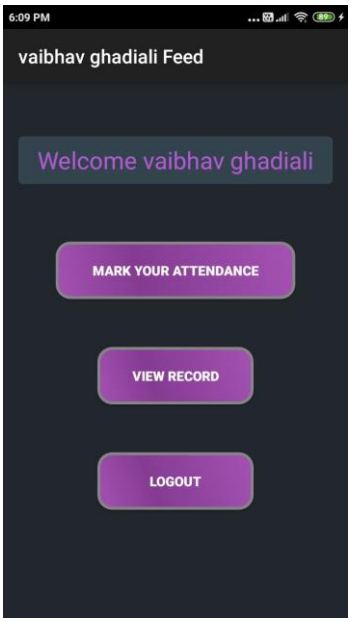
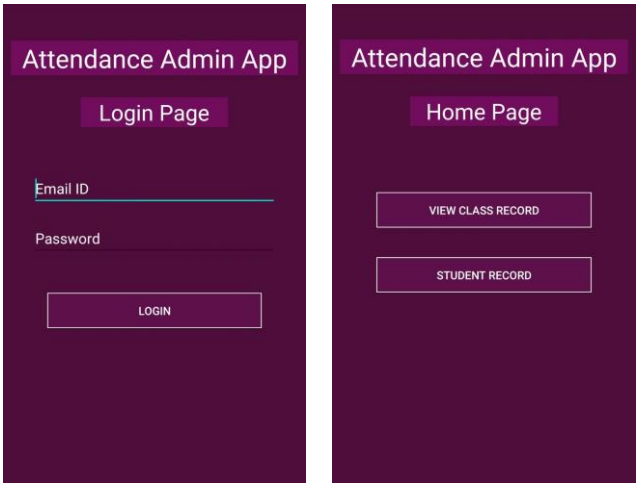


Fig. 3: Student account feed page

New students can be added by the system administrator by taking sample shots of the student.



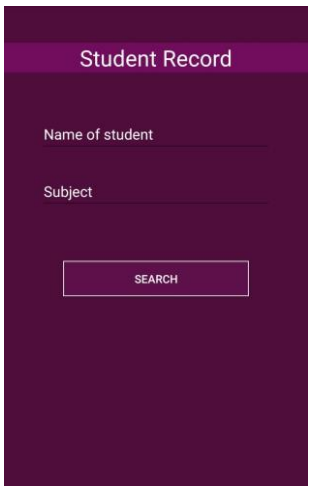


Fig. 4: Teacher application page

Teachers will also be given a login page to view attendance of their respective subject or student. Teachers can login and then view attendance of the respective class or any specific student by clicking on respective option.

6. RESULT

After the student uploads their pictures of faces to the server, their pictures are matched with images stored in databases. If matched, attendance is marked of that student to that respective subject. After clicking on view attendance students can view their marked attendances.

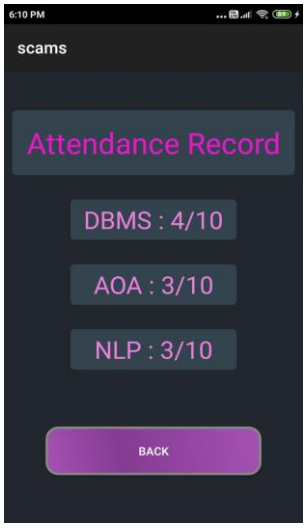


Fig. 5: Attendances marked after Facial detection & recognition.

Teachers after logging in the app will be able to see the attendance marked. After clicking into view class record, teacher will select which subject she wants to check, after selecting the subject, students who are were present for lecture will be shown.

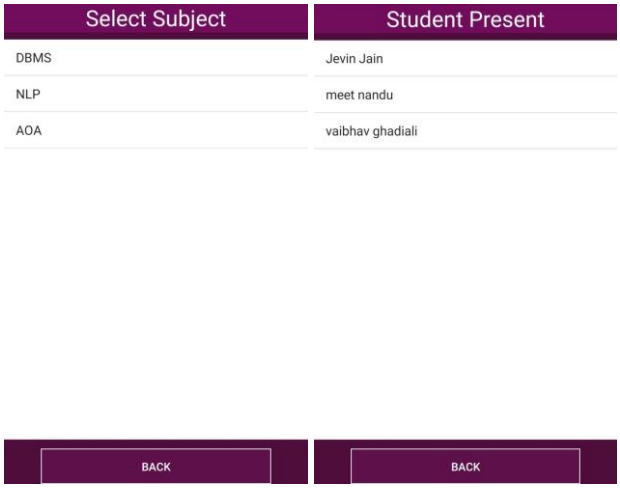


Fig. 6: Attendance of respective teacher's subject lectures.

Teachers are also provided an option to view attendance of a specific student. For this, they just have to click on student record. Enter the name of the student and subject, they will be able to see hat student's attendance.

Fig. 7: Attendance of a specific student.

7. CONCLUSION

The designed system meets all the necessary requirements to automate the attedance process for lecturers to keep records related to the student. The automated system reduces the cost of additional hardware, minimizes preparation time, and allows users to access the information at any time and anywhere. Students also benefit from this system. They can easily get their performance updates and parents can also view the performance of their wards. This reduces the teacher's time and job load.

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