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Smart Attendance Management System using Face Recognition

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Abstract: ***Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. In human interactions, the face is the most important factor as it contains important information about a person or individual.***
All humans have the ability to recognise individuals from their faces. Now following system is based on face recognition to maintain the attendance record of students. The daily attendance of students is recorded subject wise which is stored already by the administrator.
As the time for corresponding subject arrives the system automatically starts taking snaps and then apply face detection and recognition technique to the given image and the recognize students are marked as present and their attendance update with corresponding time and subject id. We have used deep learning techniques to develop this system, histogram of oriented gradient method is used to detect faces in images and deep learning method is used to compute and compare facial feature of students to recognize them.
Keywords: Deep learning, Face Recognition, React JS, HOG, FaceApi.js, opencv4nodejs, javascript, node js, socket.io .

I. INTRODUCTION

Every organization requires a robust and stable system to record the attendance of their students. and every organization have their own method to do so, some are taking attendance manually with a sheet of paper by calling their names during lecture hours and some have adopted biometrics system such as fingerprint, RFID card reader, Iris system to mark the attendance. The 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. While in other biometrics such as finger print, iris or voice recognition, they all have their own flaws and also they are not 100% accurate.
Use of face recognition for the purpose of attendance marking is the smart way of attendance management system. Face recognition is more accurate and faster technique among other techniques and reduces chance of proxy attendance. Face recognition provide passive identification that is a person which is to be identified does not to need to take any action for its identity. Face recognition involves two steps, first step involves the detection of faces and second step consist of identification of those detected face images with the existing database.
There are number of face detection and recognition methods introduced. Face recognition works either in form of appearance based which covers the features of whole face or feature based which covers the geometric feature like eyes, nose, eye brows, and cheeks to recognize the face. This system is a website based management system, uses face recognition approach to reduce the flaws of existing system with the help of machine learning, it requires a good quality camera to capture the images of students, the detection process is done by histogram of oriented gradient and recognizing performs through deep learning. Both front-end and back-end is consists of same programming language (JavaScript). React Js is used for front-end GUI. Node Js is used for back-end. The main feature of this system is to capture the faces at server-side using the IP based camera and send it to client-side along with their faces features, for further analysis, the input image is then analysed for each student and system mark their attendance

II. MOTIVATION

The motivation behind this research work is to reduce the time consumption and manipulation of attendance in traditional method. To reduce time and error we merge the manual system with the image processing and Deep learning. Unlike biometric and RFID system, facial recognition does not require individual scanning and can perform just with a single picture of students. Also it cannot be manipulated by fake attendance, every person need to be physically present at the time of attendance.

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III. PROBLEM IDENTIFICATION & CHALLENGES

In today's era, technology is getting advance day by day, from our banking systems to food ordering systems. Since technology is changing very rapidly we also require change in the traditional attendance management system which consists of pen, paper and human. Manual time and attendance management systems totally rely on highly skilled persons but the problem being that humans are not perfect. With manual systems, it is a great pressure on management to be correct in all details of employees work at all times. It can be easy to accidentally switch details and end up with false entry of data or in hand written briefings. This error might not end up only with false information but also create problem in payroll system. Reporting and checking that data can be time taking and expensive. It takes more physical and mental effort to keep track of paper documents, to find information and to keep details correct. After these unintentional mistakes, corrections are needed. Often a manual transaction must be completely recreated rather than just updated. With these manual or partly automated systems information often has to be written down or entered more than once.

1) *There is a Risk of Human Error:* When you rely on punched cards or time sheets, there is always a risk of human error. Employees may record their hours of work incorrectly in a time sheet or the information may be incorrectly entered into your payroll software. These errors often occur in the workplace when you use manual time tracking solutions. Your personnel department can spend a lot of time correcting these errors. Unrecorded errors can lead to incorrect employee payments and other payroll issues.
2) *Employees can Commit time Theft*: Manual time sheets and punched cards do not prevent time theft or punching by friends. With manual time recording, an employee can use another punch card to register for his or her shift. This is called buddy punching and is a common problem in large companies**.** A lot of time is spent on attendance time sheets. Your employees may have to queue to enter or exit and your human resources department may spend time dealing with time on time ticket issues. This may include replacing the scorecard, correcting time entry errors and errors, and other problems that occur when using manual time recording systems.
3) *Are Ineffective and Outdated*: Ultimately, the manual on clock piercing in systems is ineffective and outdated. They can have a significant impact on your company's performance. Clock errors can be costly to your business. These problems are growing with a big company. You can minimize the inconvenience of using manual drilling clock solutions when you only have a dozen employees. But with a thousand or more employees, you could lose thousands of dollars in payroll errors and time theft every month.
4) *Incorrect Entry of Times*: Teachers and staff get on and off and make their way through various time recording options, such as timers, touch screen kiosks, PCs, mobile phones, etc. Automatic time recording reduces administrative costs and improves efficiency. However, for this system to work properly, it needs to be integrated into your billing module. Biometric assistance is one of the safest methods of time recording. It avoids common time theft practices such as hitting a friend.
5) *Too Much Paperwork*: Managing this growing batch of data requires a system that ensures that information is archived, found, and retrieved quickly and efficiently. Paperwork can take up a lot of space if the presence is marked in the records. If your school has multiple offices, it will be even more difficult to access documents from each office in different locations. If you are still responding on paper based on the attendance system, you are more likely to choose attendance incorrect.

IV. PROBLEM SOLUTION

Due to *various* problems occur in the traditional attendance system we require the system which fulfil the requirement according to the modern need. As the management of attendance with the pen and paper require lots of human effort which also consists of human error. So, we require the system which store the attendance as well as contain minimum errors. No overhead of paper work it works automatically by reorganization of face of the student appearing in front of the camera.

There is also the more safety measure in this management system. What happened in the traditional system we are not able to store the data safely because when the one register is full of entries then we require new one and when we use used the new one we does not take care of the old one, which leads to the more serious problem when we require the old one then we are not able to find that and all the work we did in the past is lost.

1) *User Friendly*: The proposed system is very user friendly. The reason is the retrieval and storing of data is fast and data is maintained efficiently. Furthermore the graphical user interface is provided in the proposed system, which provides user to deal with the system very comfortably.
2) *Reports are easily generated*: Defaulter Reports can be generated very comfortably in the proposed system so that user can generate the report as per his/her requirement (monthly) or in the middle of the session. User can provide the notice to the students so as to be regular.

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3) *No Paper Work: The proposed* system does not require much paper work. All the data is fetched into the database immediately and reports can be generated very easily by the teachers. Furthermore work becomes very easy because there is no need to keep data on.
4) *Powerful data security:* Entries in hard-bound attendance registers can easily be tampered with and reports on paper spreadsheets are equally vulnerable to manipulation or destruction. Paperless operations are practically tamper-proof, if \the attendance management system provides for role-based access.
5) *Maximum Accuracy*: Since it is mostly run automatically or there is not more human effort which makes this more accurate, which is not possible in the traditional attendance management system that we are using in the past for the attendance management.

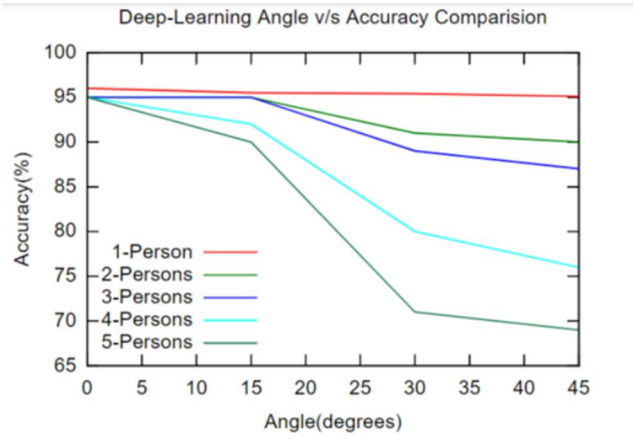

Fig. 1 Accuracy graph in terms of angles

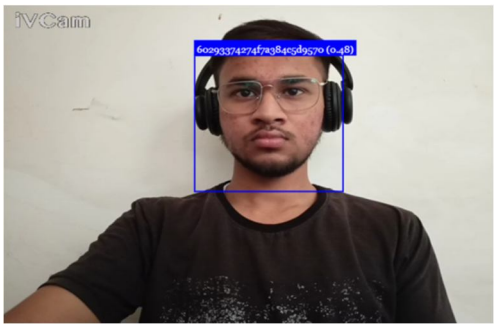

Fig. 2 Facial detection

V. RESULT

In this proposed approach, face recognition student attendance system with user- friendly interface is designed by using ReactJS (a library for web front end). An ERP based attendance system is designed for browser use.
At first the admin have to register the student with their respective names, roll numbers, class or department. As shown in fig. 3
at the time of attendance the system detect the faces of students and their respective ids which are given to them at the time of registration.
Then the system uploads their attendance in particular subject in portal and also provide a graph for their particular attendance data (as shown in fig. 4).
Also, the portal provides an excel sheet which contains the record of all students whether they are present in class or not. In fig. 5 the image of excel sheet is given.

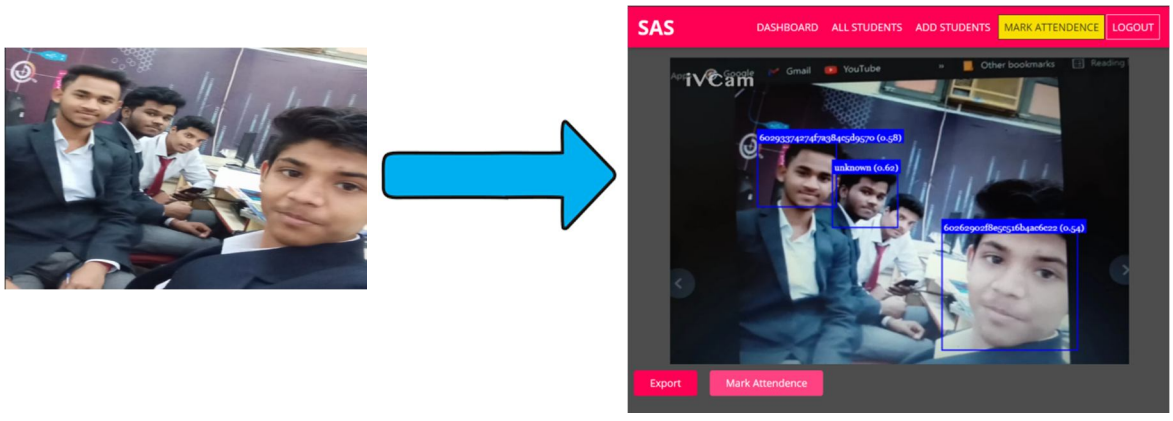

Fig. 3 Facial detection of students with their particular ids.

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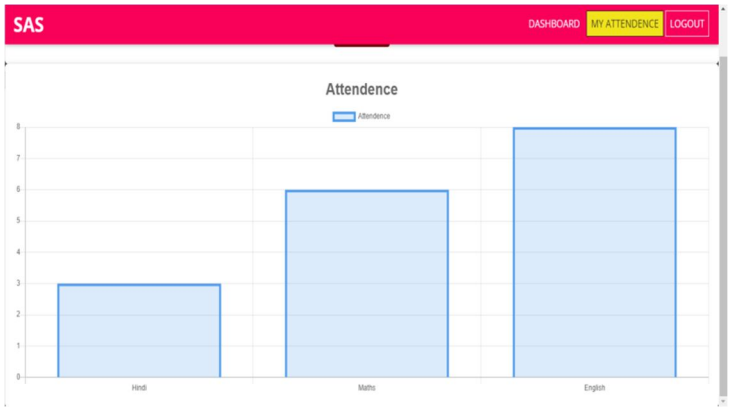
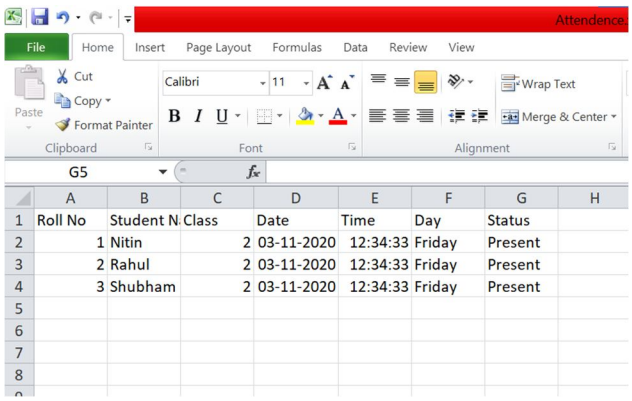


Fig. 4 Graph of attendance of students iin respective subjects



	A	B	C	D	E	F	G	H
1	Roll No	Student N	Class	Date	Time	Day	Status	
2	1	Nitin	2	03-11-2020	12:34:33	Friday	Present	
3	2	Rahul	2	03-11-2020	12:34:33	Friday	Present	
4	3	Shubham	2	03-11-2020	12:34:33	Friday	Present	
5								
6								
7								
8								

Fig. 5 Excel sheets of all students

VI. FUTURE SCOPE

Every institute needed attendance records and data. In order to manually attendance it can take more time consuming and error prone. Therefore automatic face recognition attendance system is more fast and less error prone. The future scope of this can be cloud storage of all students' attendance with their face images records. More deep learning algorithms and datasets can be included for 100% accuracy of system.

VII. CONCLUSION

This paper introduces the best and efficient method of attendance management system in the classroom environment that can replace the old manual methods. This method is more fast, accurate and efficient.

This paperless method can be save a lot of papers and trees as well as the precious time of teachers and students. It can be simply implemented with just a mobile camera and mobile application. Hence teachers just have to click a picture of whole class with each every student's face clearly visible in that picture, and then just have to upload the picture in application and the system automatically attach the attendance of each and every student with accuracy. At last it saves the most important things i.e., time and paper.

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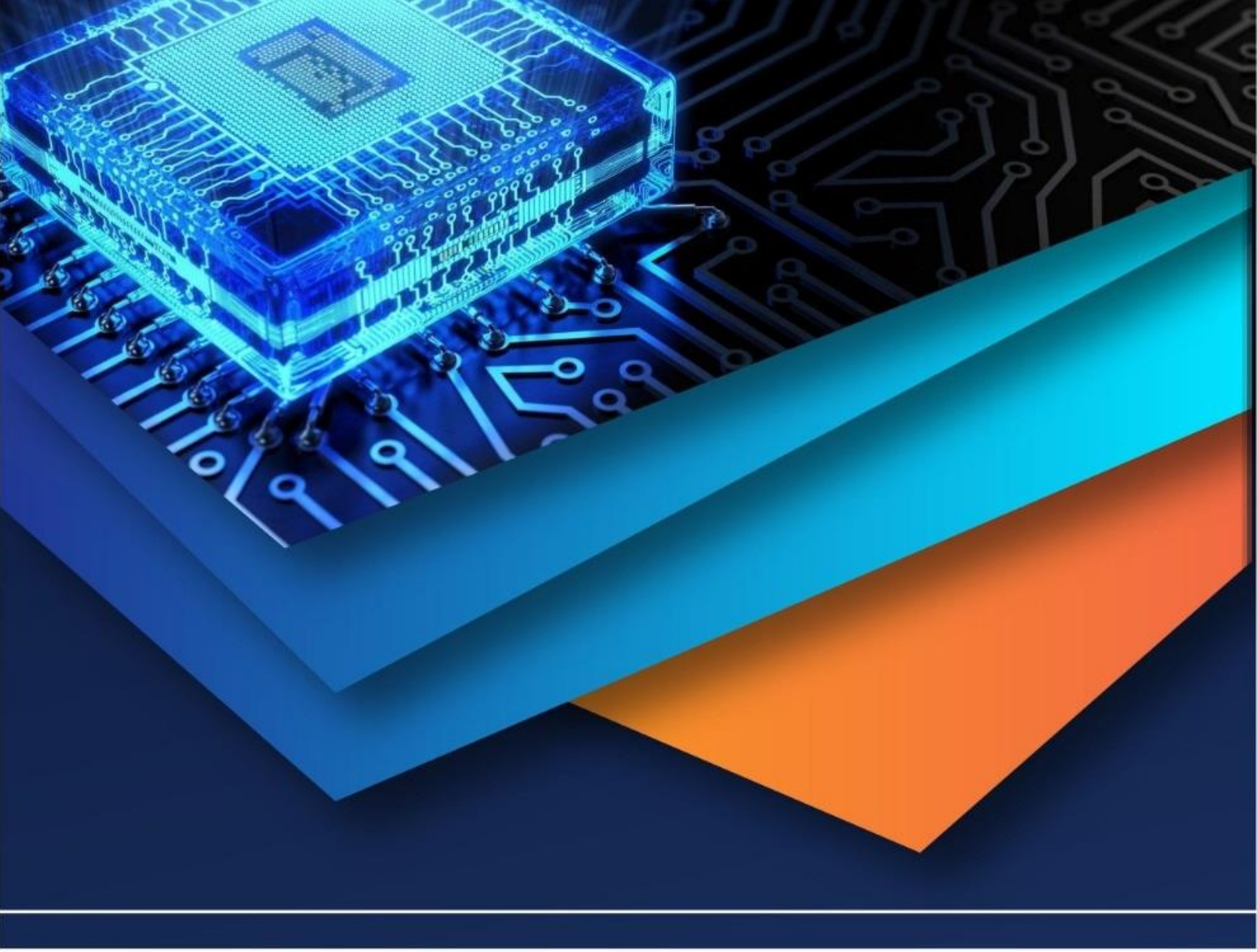

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