FACE RECOGNITION BASED ATTENDANCE SYSTEM

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Abstract—**Face recognition-based attendance systemaims to deliver an end to endsolution which automates the attendance logging experience at University level. A system capable of markingattendanceinreal-time without the tediousmanualprocess and bycreatinganintelligent, efficient,andautonomoussolutionwith the help of machine learning and deep learning.This project aims to develop a cloud-based solution that is seamless and requires no additional infrastructure.**

Keywords — AWS, Attendance Tracking, Rekognition, Machine Learning, Deep Learning.

I. INTRODUCTION

Facerecognition-based attendancesystem, is groundbreaking product and the end-to-end solution to replace traditional tedious attendance logging system. Using the conventional method the administration is the critical content of the University. It also proves the method is inefficient at same time. The current alpha stage prototype handles a Faculty-Student input images to maintain and log the attendance via any camera device integrated with internet to upload the Images. These images are then categorized and matched to an existing saved image data and is passed to the database through the web application interface. Attendance is tracked and monitored seamlessly using this approach.

II. LITERATURE REVIEW

[1] A Counterpart Approach to Attendance and Feedback System using Machine Learning Techniques: In this paper, the idea of two technologies namely Student Attendance and Feedback system has been implemented with a machine learning approach. This system automatically detects the student performance and maintains the student's records like attendance and their feedback on the subjects like Science, English, etc. Therefore, the attendance of the student can be made available by recognizing the face. On recognizing, the attendance details and details about the marks of the student are obtained as feedback.

[2] Automated Attendance System Using Face Recognition: Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detect the student face when he/she enters the class and the system is capable of marking the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detects human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves time and also helps to monitor the students.

[3] Student Attendance System Using Iris Detection: In this proposed system the student is requested to stand in front of the camera to detect and recognize the iris, for the system to mark attendance for the student. Some algorithms like Gray Scale Conversion, Six Segment Rectangular Filter, Skin Pixel Detection are being used to detect the iris. Ithelpsinpreventingtheproxyissuesanditmaintainstheattendanceofthe student in an effective manner, but in one of the time-consuming processes for a student or a staff to wait until the completion of the previous members.

[4] Face Recognition-based Lecture Attendance System: This paper proposes that the system takes the attendance automatically recognition obtained by continuous observation. Continuous observation helps in estimating and improving the
performance of attendance. To obtain the attendance, positions, and face images of the students present in the classroom are captured. Through continuous observation and recording the system estimates the seating position and location of each student for attendance marking. The work is focused on the method to obtain the different weights of each focused seat according to its location. The effectiveness of the picture is also being discussed to enable the faster recognition of the image.

III. SYSTEM ANALYSIS AND DESIGN

The problem to be solved was the tedious man power used for tracking the attendance of students every hour. An easier, automated and most flexible way was to install and the modern technology and services available on the cloud.

The approach of AI and modern Web services was found to be the most ideal and doable replacement of the current existing manpower used in attendance tracking methodologies. The major existing attendance trackers currently in the market are Finger print based attendance system, RFID based attendance system, Iris based attendance system etc.All these options are not viable to the existing student base as the hardware requirements are huge and expensive to install in the university.Face Recognition method will be the most viable option as there is not much hardware involvement and no physical interaction with the system is needed too. The Functionalities behind AWS algorithms and frameworks help to track and manage our specific use case.

Amazon's webservices has a wide range of existing functionalities and a huge community of developers who work and keep the documentation updated regularly which makes new developers easy to work around AWS Rekognition library for face recognition.

A. *Tools Used*

- AWS Rekognition–It is a cloud service for facial recognition based on deep learning algorithms. This is used to add image analysis to our web application. This service is the heart of the application used to index,identify, count, and compare facesusing facial features.
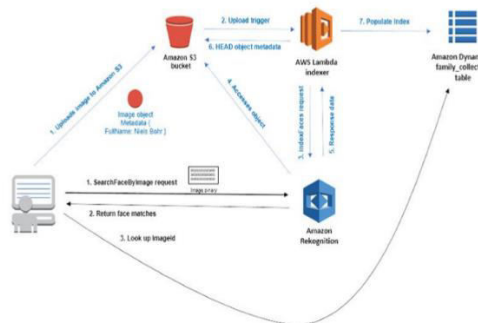

Fig (3.1) AWS Rekognition

- Amazon web services – It is a cloud based services platform which Amazon offers for developers to build and develop by using their cloud based infrastructure. The services used in development of Face Recognition based Attendance system from the AWS are AWS Collections and AWS S3 buckets.

- AWS Collections–It is a JSON format database that indexes and storesthefacialfeaturesusingthe AWS RekognitionAPI.The DescribeCollection API that allows you todiscover information about your face collections, such as the number of faces stored or the face model version you are currently using, to make it easier to manage collections of images from the trained model.

- Amazon S3–This has a simple web services interface that you can use to store and retrieve any amount of data, at any time, from anywhere on the web. It givesanydeveloperaccesstothe same highly scalable, reliable, fast, inexpensive data storage infrastructurethatAmazonuses to runitsownglobalnetworkofwebsites.

- Face.js – It's a JavaScript module, built on topoftensorflow.jscore,whichimplementsseveral CNNs (Convolutional Neural Networks) to solve face detection, face recognition, and face landmark detection, optimized for the web and for mobile devices.

- TensorFlow.js– An open-source library you can use to define, train,andrunmachinelearning models entirely in the browser, using JavaScript and ahigh-levellayersAPI.Thislibraryisapart of the Face.js library.

- Linux Apache Web Server – Apache is the most widely used web server software. Developed and maintainedbyApacheSoftware Foundation,Apacheisopen-sourcesoftwareavailableforfree.
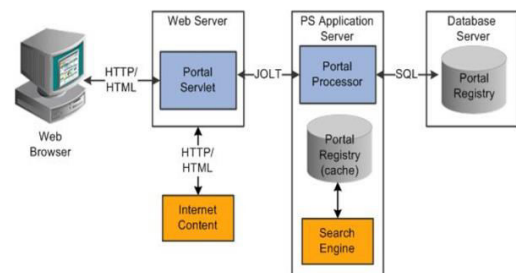

Fig (3.2) HTTP Web Server

- SQL Database –SQL is Structured Query Language, which is a computerlanguageforstoring,manipulating, and retrieving data stored in a relational database.

- PHP– is a server-side scripting language, that is used to develop Static websites or Dynamicwebsites or Webapplications.

- HTML, CSS, Bootstrap - HTML and CSS are used to design the front end of the web application as they are the most commonly used languages used for web development.

B. *Hardware Requirements*

- Mobile Camera
- Internet Enabled Wi-Fi Network
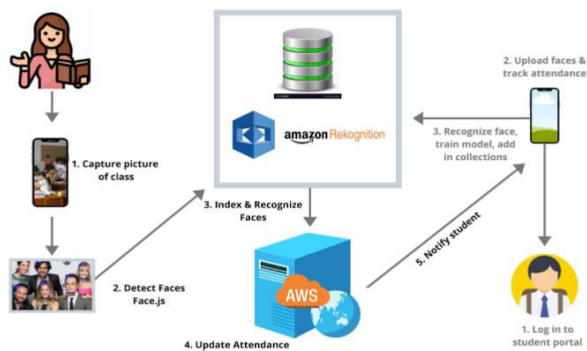
IV. SYSTEM ARCHITECTURE

Fig (4.1) System Architecture

The general flow of the systems is depicted above is a complete end to end process of all services and features. The system is broadly divided into two interfaces as follows:

1. Faculty Portal:
This portal can be used only by authorized personnel such as faculties and admin staff. This portal grants you access to the following features:

    a. Select Faculty
    b. Extract current class based on time and day
    c. Upload class picture
    d. View the attendance based on the picture
    e. Override and mark any absentee as present

2. Student Portal:
This portal is for the students to login and access their student profile where they can perform the following functions:

    a. Register / Login into classes
    b. Upload your faces and train the model
    c. View your attendance in real-time in the student portal.

The SQL databaseused to store the structured profile data, personal information, and security credentials of the students and faculties.
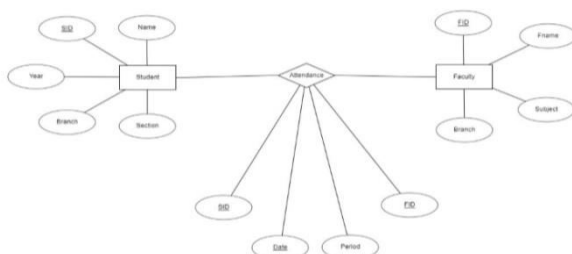Below is the ER Diagram of Database
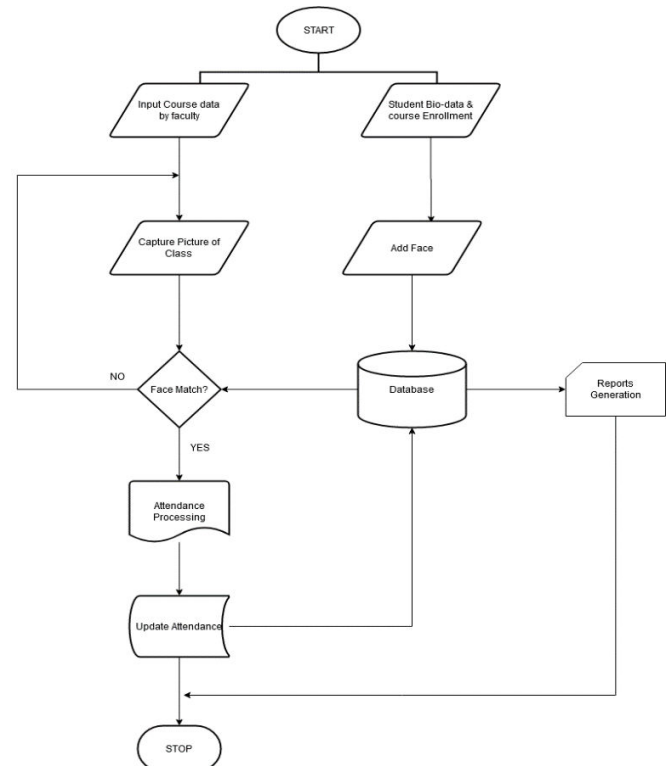

Fig (4.2) ER diagram of database

V. WORKFLOW

Fig (4.3) Workflow of System

The workflow diagram of web application represented in the above figure is as follows:

1. The Application starts with respected user whether it isFaculty portal or Student portal.
2. Faculty captures the student's photo in classroom and uploads it with some additional details.
3. Students can enroll online with their relevant branch and their biodata.
4. Face detection and Recognition happens after uploading and within no time, all the attendance logs and saves in database
5. Reports can be generated accordingly using the database.
6. After the attendance logs in all Administration records, Ends the process.

API Development

As mentioned in the above system design the most vital part of the application is the Ajax API routes which perform facialrecognitionoperations based on a RESTful architecture.

The image manipulation operation such as cropping images into each face is done by anopen-source library called Gumlet.Gumlet a cloud-based image optimization and deliveryservice. Gumlet helps thousands of websites and mobile apps deliver the most optimized images to their users. Gumlet automatically converts images to the best format and size forthe user browser and device. AJAX is the most viable Rich Internet Application (RIA) technology so

far.AJAXisanew technique for creating better, faster, and more interactivewebapplicationswiththehelpof XML, HTML, CSS, and JavaScript. AjaxusesXHTMLforcontent,CSSforpresentation,along with Document Object Model and JavaScript for dynamic content display.
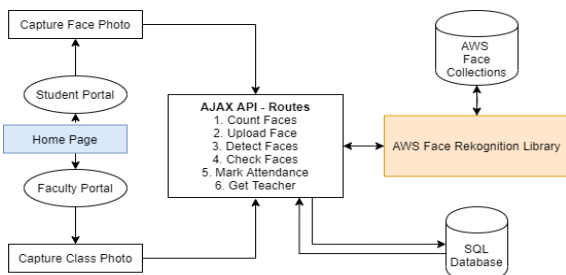

Fig (4.4) System Design

The Ajax API routes perform different functions based on the request and response to eachroute. The API has the following routes:

1. Count Faces
2. Upload Faces
3. Detect Faces
4. Check Faces
5. Mark Attendance
6. Get Teacher

The Ajax API routes perform different functions based on the request and response to each route. The API has the following routes:

1. Count Faces: This route sends an image as requested in the student portal and counts the number of faces present in it. If the faces counted are more than one or zero, it gives appropriate responses for each.
2. Upload Faces: This route takes an image as a request after counting the faces in the student portal and if it has exactly one face then it uploads the image to the AWS Collections and indexes the facial features to train the model.
3. Detect Faces: This route takes the class image as a request from the faculty portal and detects all the faces in those images. It returns the bounding boxes of all faces detected in a classroom.
4. Check Faces: This route is called after the detect face route. The previous result i.e. the bounding boxes of all the faces are used in this call. The bounding boxes are sent to a function where the library Gumlet is used to crop the image to the bounding box. This cropped image which contains the face is sent as bytes to another function where it is searched against the facial features collection to find a match. This operation is performed for all the bounding boxes. The result returned from this call are the matched face i.e. the present students and along with absent student details as well.
5. Mark Attendance: This route uses the result from the previous call of check faces i.e. the list of present

and absent students. The attendance table is updated based on the present student details. And also given an option to override the absentees' attendance.
6. Get Teacher: This route is called in the faculty portal when the teacher is selected. The teacher ID is taken along with the current time and day to extract the current class going on for that particular teacher from the JSON timetable.

VI. RESULTS AND DISCUSSION

This project met the requirements which were intended to accomplish, however, it can be improved and enhanced. Due to the health and security concerns, this project lacks rigorous testing in a classroom environment to test the accuracy and reliability of the application.

Over the years, the process of attendance management hasn't been revamped. The Face Recognition based Attendance System is a proof-of-concept to a significant paradigm shift. This technology and application are progressing at an exponential rate and this project provides a demo on the feasibility of the application of Face Recognition in attendance management.

VII. CONCLUSION AND FUTURE WORK

Face Recognition based attendance system is an automatic attendance management system aims at solving the issues of manual methods of existing systems. They use the concept of face recognition to implement a system that tracks and records the attendance of a particular person by detecting and recognizing the face. Thesesystems perform satisfactorily with different facial expressions, lighting, and pose of the person.
Thereisroomforimprovementsincethesesystemssometimesfailt orecognizeeveryface student present in the classroom. The speed at which the face recognition is done is aproblem. The privacy of the students whose images are stored in the databases must beconsidered so that it is accessible only to authorized people.

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