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# Employee attendance system based on facial recognition

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**Abstract**--In this digital era, authentication plays a vital role in almost every sector. From every office related employee to students in educational institutions, authentication is widely used and practiced regularly. Some of the widely used authentications are face recognition, fingerprint recognition, card validation, etc. Face recognition is one of the most used bio-metrics. It can be used for security, authentication, identification, and has got many advantages over other authentication. The current method that institutions and corporate companies uses is the attendance sheet which is signed by the employees and students in their respective institutions. This method sometime disturbs the discipline of the work environment. It is quite a tedious and time- consuming process. There is a need to implement better biometric verification in these institutions that can solve the issue of proxy and time management. But the systems are currently not popular. The solution to these problems is machine learning. Machine learning has attracted huge attention due to its exemplary unique performance and solving a number of complex problems. Due to its training techniques, this technology gained a lot of attention. By using machine learning training method, the image processing has been introduced. Researchers have been using face detection and recognition for various purposes including security, gender classification, and human computer interaction in the last few years, which has gained a lot of popularity in the field of image

processing. This paper aims towards another successful implementation of attendance system using face detection and recognition. The automated system for attendance designed in this project prevents the extra proxies and manipulation of the data. The project of face detection using machine learning utilizes the principle of One-shot learning. In computer vision, one shot learning relates to object categorization. Unlike most machine learning based object categorization algorithms, one shot learning about object categories from a few or one training sample or image.

**Keywords**---One-shot learning, Machine Learning, Face recognition.

## I. Introduction

The introduction of face recognition in the field of pattern recognition has impact the range of applicability particularly for cyber investigation. This has been possible due to advanced training technique and progression made in analysis. Due to increased demand of security day by day verifying identities, internet connection, online communication led the researchers to find ways for the problems. Along with the facial recognition system are main part in finding solution to these problems.

Identity of any person is incomplete without facial recognition. Just like any other form of biometric identification, face recognition requires samples to be collected, and stored for recognition. Face recognition is broken down into the following modules are face capture, face train, face recognition. Face detection is the fundamental step in any of the operation carried out in the face recognition process. Face detection is made easier using the Haar feature-based cascade classifier. A classifier can be trained to detect faces by construction two sets of large images: one containing faces, and another without. Classifier models are then generated based on these images. A classifier is generated by extracting Haar features from the images.

## II. Future Scope Of Facial Recognition

The world is using facial recognition technology and enjoying the benefits of this technology. There is a huge scope of this technology and it can be used to improve various aspects in a country. The technology and its applications can be applied across the various segments in the country.

- ❖ Preventing the frauds at ATMs machines. A data base of all customers with ATM cards can be created and facial recognition system can be installed.
- ❖ Whenever and wherever a user will enter an ATM, his photograph will be taken to permit the access after it is being matched with stored image from the data base.
- ❖ Reporting duplicate voters to ensure fair and free elections across the world.
- ❖ Passport & visa verification, driving license verification can also be done using this technology.
- ❖ Surveillance can be upgraded in local places as airport, bus stands which can help the defense ministry to implement better security.

- ❖ It can also be used as a biometric test for students before attending examinations such as Civil service, and others to identify a candidate.
- ❖ This system can be deployed for verification, validation and tracking attendance at various government offices and corporates.
- ❖ For access control verification and identification of authentic users, the system can also be installed in bank lockers and vaults.
- ❖ For identification of criminals the system can be used by police force as well.

### **III. Existing Attendance System**

Traditional method of attendance marking is a tedious job in many companies and institutions. It is also an extra burden to manage the employee attendance data regularly. Also, the traditional methods are slow and time consuming. There are many institutes that started deploying many other techniques for recording attendance online. Many methods like Radio frequency identification (RFID), Iris recognition, fingerprint recognition and so on. However, these systems are queue based which consume more time and are intrusive in nature.

The traditional systems that require employees to fill in their attendance sheets manually. These are generally used by small scale companies where there is a smaller number of employees. However, such attendance systems require fair and consistent execution. Besides, HR managers face enormous pressure when it comes to collecting details about employees working hours with these systems.

#### **3.1 Types of existing recognitions attendance system**

##### **Fingerprint based Recognition system**

The existing attendance system uses fingerprints. A portable fingerprint device needs to be configured with the employee's fingerprint earlier. Later, either during lecture hours or before, the employee needs to record their fingerprint on the configured device to ensure their attendance. This approach can distract students during lecture time, and this may distract their attention.

##### **Radio Frequency based recognition system**

To record their presence for the day, the employee needs to place their Radio Frequency Identity Card on the card reader using the existing system based on RFID. The system is capable of registering attendance on RS232 lines and saving it as a saved database. There is the possibility of the system being abused. On the RS232 lines, the system is capable of registering attendance and saving it as a saved database. There is the possibility of abuse.

##### **Iris based recognition system**

With Iris-based attendance systems, employees need to stand in front of cameras so that they can have their iris scanned. This reduces the workload on paper and pens by matching the scanned iris with employee data stored in the database and updating the attendance on their presence.

### **IV. Proposed Online Attendance System**

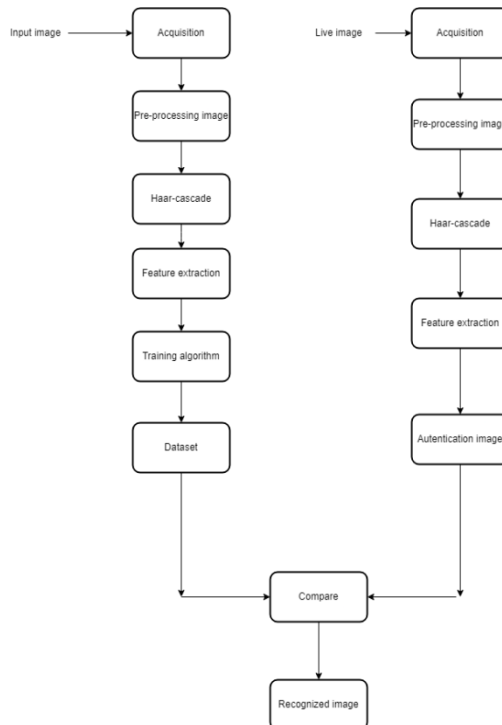
The main aim of the attendance system is to extract the face of the employee and perform comparison with the data stored in prior in the system database for

training algorithm. The system also authenticates the user that prevents the trespasser who is trying to operate it. The face of the employees can be captured in such a way that all the characteristics of the employee is identified uniquely and is possible to take in low resolution or low lightning environment. This project includes an application which can mark attendance of employees within a single capture to spot and mark attendance of employees using their device camera irrespective of their background. The application extracts the face of the employee and perform comparison with the data stored in prior in the database. The system also authenticates the user that prevents the trespasser to operate it using **one shot learning** algorithm. The results of the experimental evaluation of our system on real-world datasets (i.e., a face database) will be reported. By using this system, manual attendance will not be necessary as the system captures the image through the camera attached to the computer. By further procedures, the data is changed or updated.

The main advantage of the proposed system is that the application is faster when compared to the previous biometric recognitions. The reason is that, the existing applications takes the person's photo or image and compares with all the available photos or images in the database. Whereas, the proposed application has one trained image for every user and a real-time captured image for attendance. These two images are compared based on the patterns created by the algorithm, and attendance is marked based on the similarities. In case of another person trying to change training image, there will be a set of security questions that arerequired to be filled in order to change the trainer image. Using this method, a suspicious person will not be able to update or change the training image. The system also includes another feature that is a growing requirement for companies.

The online work can be very tedious and uneventful, as the employee is working completely by himself in a personal space without much interaction with other employees. This grows concerns for the companies about the employee's mental and physical health. The application includes the feature FITNESS AI which can help the employees to burn calories using some fun exercises and activities. It also helps them to calculate BMI of themselves with a small message to motivate them.

## Proposed System Block Diagram Proposed System Architecture



## V. Literature Review

[1] The above project was proposed by Smitha, Pavithra S Hegde, Afshin (2020). Their solution proposes a device that goals to construct an effective magnificence attendance gadget using face popularity strategies. The gadget can be capable of mark the attendance through face identification. it'll hit upon faces through webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized student and replace the attendance report. The system maintains the genuine report of each registered scholar. The users can have interaction with the gadget the use of a GUI. right here users will be specially furnished with 3 one-of-a-kind alternatives such as, scholar registration, college registration, and mark attendance. The college students are intended to enter all the desired information in the scholar registration form. After clicking on check in button, the internet cam starts robotically and window. pops up and starts detecting the faces within the frame. Then it mechanically starts clicking pics till 60 samples are collected or CTRL+Q is pressed. Those pics then will be pre-processed and stored in schooling pictures folder. Database is created by way of the photographs of the scholars in magnificence.

[2] The above solution was proposed by Shreya Dandavate, department of computer application, The M.S University, Vadodara (2019). The proposed solution is a resultant device named as Assistencia which is a face recognition

gadget a good way to take a couple of pictures from each person at some point of sign-in, to help educate the SVM set of rules to perform facial popularity. The machine is going to apply the 2d image of a human to educate the photo processor and use those statistics to understand man or woman faces. Marking includes manual attendance at the paper sheet, however is very time ingesting and chances of proxy also are one of the rising problems. A Biometric based totally attendance machine that makes use of primary concept of image processing used in many security programs like banks, airports, intelligence agencies and so on. Face recognition algorithm is extra correct than a fingerprint biometric. Failure to sign up fee is much less than zero.0001% while of fingerprint is round 5%. Experimental facts indicates that the accuracy fee of the video face popularity system is up to 82%. as compared with the traditional take a look at-in technique, the face recognition attendance gadget may be decreased with the aid of about 60%.

[3] Sakina Qutbuddin and SehrishLarik (2021)proposed automated attendance machine is based on face recognition. The use of the camera we will take an image of the pupil accompanied with the aid of detecting face inside the photograph, recognizing the scholars after which updating their attendance in database. An efficient face detection algorithm complements the overall performance of face popularity structures. A few of the algorithms proposed for face detection are Face geometry-based techniques and machine mastering based totally strategies. Face area is extracted and pre-processed for further processing. This pre-processing step includes with histogram equalization of the extracted face picture and is resized. Histogram Equalization is the maximum commonplace Histogram Normalization method. This improves the assessment of the picture by means of making it clearer as it stretches the range of the intensities in a photo.Histogram of orientated Gradients (HOG) is used to extract the capabilities from the face using our dataset to classify the students. finally, the detected face will be matched with the face in dataset and apprehend him therefore Haar Cascades uses the Ada-enhance studying algorithm which selects a small range of vital functions from a large set to present an efficient end result of classifiers then use cascading strategies to stumble on the face in a picture.

[4] Dr. V Suresh, Srinivasa ChakravarthiDumpa, Chiranjeevi Deepak Vankayala, HaneeshaAduri, Jayasree Rapa, (2019) proposed the above title to use OpenCV and Python for face recognition. The primary purpose of this assignment is to clear up the problems encountered within the antique attendance system whilst reproducing a latest revolutionary smart machine which can provide convenience to the group. on this mission, a utility will be evolved that's capable of recognizing the identity of every individual and record report down the facts into a database system. The layout element can be advanced, the earlier than the software component we need to put in some libraries for powerful working of the application. We set up OpenCV and NumPy through Python. The Attendance system using NFC (near area verbal exchange) generation with Embedded camera on cellular tool. The attendance system is progressed with the aid of using NFC generation and cellular utility, each scholar is given an NFC tag that has a completely unique identity at some point of their enrolment into the college. The proposed device is a software system if you want to mark attendance the usage of

facial popularity. in this project we used OpenCV module included with Python so one can allows the institution to make the attendance system smooth and fast.

[5] Amulya. R, Jahnavi. S, Trupthi. B. V, Divya. P, Kalpitha N (2021) offers an online Attendance device that make usage of ML algorithms which is designed for the motive of decreasing the mistakes which could occur all through traditional attendance system. Face recognition is one of the easiest and relaxed method to incorporate in the attendance system. the first precedence is to test the lighting fixtures situation and noise in the history before shooting the photo. the use of that photograph detection of faces are finished the usage of LBPH algorithm. Then the face is as compared or recognized with face of pupil already stored. If located attendance is written or updated. Out of many methods they've selected Viola-Jones detection set of rules considering its high detection charge. Histogram Normalization method has also been stated to be applied to reap the clean image. As PCA does now not don't forget the discriminative data in the information. The primary aim of our device is to extract the face of the pupil and perform assessment with the statistics stored in prior in our system. The machine additionally authenticates the person that prevents the trespasser to operate it.by using this gadget, guide attendance isn't important because the machine captures the photograph via the digicam connected to the computer. by way of similarly techniques, the information is changed or updated. that is a massive undertaking for sophistication attendance system as its miles employed in out-of-control surroundings.

[6] ShireeshaChintalapati, M.V. Raghunadh (2018) submitted the above title with the suggestion as Automatic Attendance system structures based on face recognition algorithm. These structures are based totally on face popularity strategies hence proved to be time saving and secured. This machine can also be used to identify an unknown character follow Viola-Jones algorithm (Face Detection) (PCA/ LDA/ LBPH/ PCA + SVM/ PCA + Bayesian) also have the option to pick. Any individual of this technique is used to stumble on face recognition. The proposed automated attendance control machine is based on face popularity algorithm. Attendance calculated pace in this paper is comparatively quicker than the previous existing structures.one of the problems with the device is that it requires massive dataset of pictures calls for extra calculations.

This gadget can also be used to identify an unknown man or woman. In real time situations LBPH outperforms other algorithms with higher recognition charge and occasional false tremendous rate. SVM and Bayesian additionally prove to be higher classifiers whilst compared to distance classifiers. The future paintings is to improve the recognition price of algorithms while there are accidental changes in someone like tonsuring head, using scarf, beard. The device evolved only recognizes face up to 30 levels perspective versions which must be progressed in addition. Gait popularity can be fused with face recognition structures with a purpose to attain higher performance of the gadget. First one is the history Subtraction wherein history of photograph is subtracted and best face remains in image. second element is face detection and cropping of pics i.e., simplest faces are cropped and stored. 0.33 step is spotting snap shots with the assist of Eigenvalue approach. on this technique Eigen vectors are calculated the use of formulae and to understand pics Euclidean distance is calculated among stored

photographs and testing photograph. Then attendance is marked for matching student. This method calls for easy hardware set up however face recognition is difficult. Eigen vector approach used in this paper offers an accuracy of 60-70%.as a result as opposed to the use of eigen vector, proposed device will use Haar functions for face detection which gives higher end result than eigen vector technique.

### **5.1. Conclusion from the literature review**

In the above-mentioned literature survey done over the various research papers of face recognition, the following are realized. The process is a double step method of face detection and face recognition. This research paper is more focused on how to make the face detection easier. Various above mentioned research papers have given several ways to do so. Some of them needs the user to physically complete the detection in front of the installed hardware-based detector. A few relies on the high graphics camera to capture and identify images of faces to detect attendance. One other proposed the idea of recognizing faces during online session. This project has figured out a similar method of using the web cam of the device to capture the facial features of the employee.

The next topic of focus is the face recognition. Facial recognition includes various methods and algorithms mentioned in the survey. There is multiple algorithm which has grown from requiring high resolution images to dim light, low resolution images. There is another algorithm of Viola-Jones algorithm which requires a high number of images to train, which is a demerit of the algorithm. Hence, The One sort algorithm is selected as it requires only one training image per head. The haar cascade feature recognizer is used as it is capable of feature extraction in low resolution images.

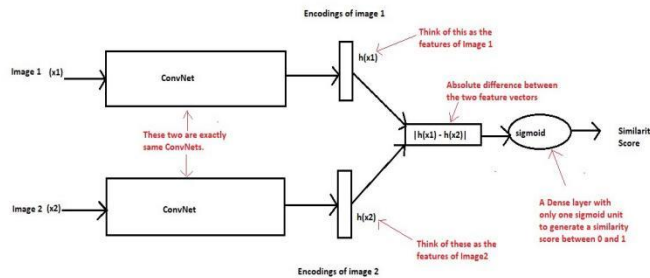
## **VI. Algorithm And Methods**

### **One shot learning algorithm**

Man-made consciousness and AI have gone through incredible lengths throughout the long term. With the blasting of neural organizations individuals have looked to profound learning as the cutting edge of computer-based intelligence that will take us to the period of self-driving vehicles and maybe perhaps even broad insight? Anyway, one issue that emerges with our present innovation is that it chiefly depends on tremendous measures of information. Normally in the billions if not significant degrees more. This all appears needless excess for an undertaking, for example, picture acknowledgment where we people can do impeccably with extremely least information tests. Consider it, you don't have to show a child a hundred photos of a feline for it to have the option to separate it between different creatures. You just need to show a couple of changes and they can as of now recognize selective elements. This is the thing that a single shot learning is attempting to accomplish. Obviously, the image above is only a ridiculous distortion yet the general idea is to become familiar with an idea in only a single shot. It attempts to impersonate human knowledge in that we can naturally gauge the likenesses from only one example of a given article and use it to separate new examples. It is a generally new field in directed learning and there are as yet numerous revelations to be made yet many are now saying it is quite

possibly the most thrilling new field and can possibly draw us significantly nearer to human-level canny frameworks.

## 6.1 Block diagram from one-shot learning algorithm



## 6.2. Vital libraries

**Open CV:** Open-Source computer Vision. It is one of the most broadly involved instruments for computer vision and picture handling assignments. It is utilized in different applications, for example, face identification, video catching, following moving items, object exposure, these days in Coronavirus applications, for example, facial covering location, social removing, and some more.

**NumPy:** NumPy is one of the center libraries in Python programming and offers help for clusters. A picture is basically a standard NumPy cluster containing pixels of main items. Consequently, by utilizing essential NumPy tasks, like slicing, masking, and fancy indexing, one can alter the **pixel upsides of an image**. The picture can be stacked utilizing skimage and shown utilizing Matplotlib.

**Face Recognition dependency:** Perceive and control faces from Python or from the order line with the world's least complex face acknowledgment library. Built utilizing dlib's cutting edge face acknowledgment worked with profound learning. The model has a high accuracy on the Marked Appearances in the Wild benchmark. This additionally gives a straightforward face recognition order line instrument that lets you do confront recognition on an organizer of pictures from the order line.

**Pandas:** Python package Pandas contains various data structures that can be used for many different data manipulation tasks. It also contains several methods for data analysis, which become very useful when analyzing large data sets.

### 6.2.1 Pseudo Code

1. Capture the Employee Image
2. Applying one-shot learning algorithm (Face Detection)
3. Extract the ROI in Rectangular Bounding Box
4. Convert to Gray scale, apply histogram equalization and resize to 100x100

5. if Updating Database then  
    Store in Database  
    Else
6. Apply recapture image  
    end if
7. Attendance start marking.

## VII. Procedure

The proposed system participation framework depends on face acknowledgment. Utilizing the device camera, it will snap a photo of the person followed by identifying face in the picture, perceiving the person and afterward refreshing their participation in information base. An effective face recognition calculation upgrades the exhibition of face acknowledgment frameworks. A portion of the calculations proposed for face identification are Face math-based strategies and AI based techniques. Face district is removed and pre-handled for additional handling. This pre-handling step includes with histogram evening out of the removed face picture and is resized. Histogram Leveling is the most well-known Histogram Standardization procedure. This works on the differentiation of the picture by making it clearer as it extends the scope of the forces in a picture. As the system picked face acknowledgment-based framework enrolment of each individual is required, for example we need to take the pictures of people in various points, different articulations and make a preparation dataset which is utilized by classifier to perceive people.

**Detection and extraction:** face recognition is significant as the picture taken through the camera given to the framework, face discovery calculation applies to distinguish the human features in that picture, the quantity of picture handling calculations is acquainted with recognize faces in a picture and furthermore the area of that identified appearances. We have utilized hog strategy to distinguish human features in given picture.

**Face positioning:** There are 68 explicit focuses in a human face. As such we can say 68 face indicator spots. The fundamental capacity of this progression is to distinguish indicator spots of appearances and to identify the picture. A python script is utilized to naturally identify the face milestones and to locate the face however much as could reasonably be expected without misshaping the picture.

**Face encoding:** When the features are distinguished in the given picture, the following stage is to remove the exceptional recognizing facial component for each picture. Fundamentally at whatever point we get limitation of face; the facial point is separated for each picture given information which are profoundly exact and these are stored in database for face acknowledgment.

**Face matching:** This is last advance of face recognition process. We have utilized one of the most mind-blowing learning methods that is deep learning which is exceptionally precise and equipped for yielding genuine worth feature vector. The framework sanctions the features, developing the **haar-cascade** features for each. Inside the algorithm, the feature extraction function work is utilized to figure face in picture and all features in the dataset. Assuming that the current picture is



**Steps for working:**

**Authentication:** The username and password credentials are provided by the company. By using the given credential, the user/ employee can log-in in the attendance application.

**Home page:** After the first successful login in the application, the user is automatically redirected to the dashboard page. The dashboard page consists of three options of Attendance, Face Emotion, Fitness AI. The Attendance option gives the user to mark attendance by accessing the device web-camera. Face emotion can tell the type of emotion by identifying the various features of the faces. Fitness AI have three options of BMI calculator, push-up monitoring and squats monitoring.

**Attendance Marking Page:** After the successful authentication, in the dashboard the user can find the option of attendance. In Attendance page the user must to upload an image by clicking on “**Take Image**” button to extract facial features for the image. Because of the advantage One-Shot algorithm over other algorithms, only one JPG file is enough to train and extract features even in low resolution and mild lightning.

**Check-in process:** In the check-in module the user has to click on the Check-In button on the attendance page to register respective attendance. Only after clicking on check-in and giving attendance, the attendance will start for the respective day, otherwise the user will be marked absent. The duration of the user is monitored and shown in the table format visible at the bottom of the page.

**Check-out process:** The checkout module consists of a check-out button in the same page of attendance which the user needs to click while completing the respective day’s shift. If in-case the user forgets to check out after checking in the person will be marked absent for the day. The checkout time and the check in time together depicts the working duration of the user in the table at the bottom of the page.

**FitnessAI process:** Wearable devices such as a wristwatch or physical activity tracker provide AI-based assistants with data about users' fitness and lifestyle goals, current exercise levels, eating habits, and wearable data that has been collected from wearable devices. The Fitness AI feature given in the application has similar function. The User can either upload a video or do activity of him/her self in front of web-cam. The AI can count the squats and pushups and stops counting once the desired target is acquired.

The Fitness AI also consists of BMI calculator. The user is supposed to put their respective height and weight, which results in the output as BMI. He user can use the exercises in fitness AI to calculate the burnt calories while exercising.

**X. Result**

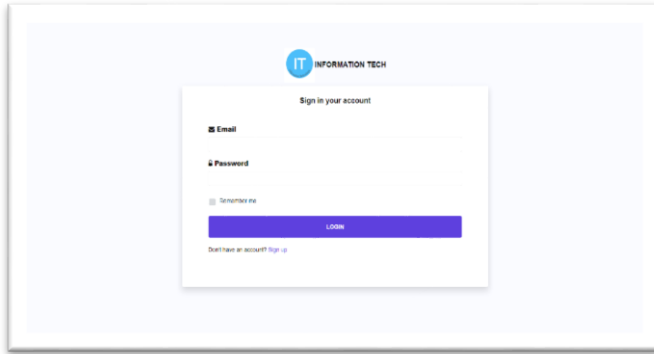


Fig 10.1 - Authentication page

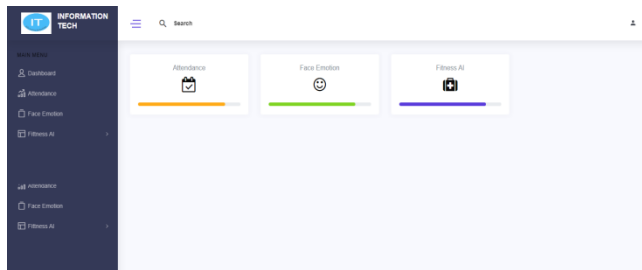


Fig 10.2 - Home Page

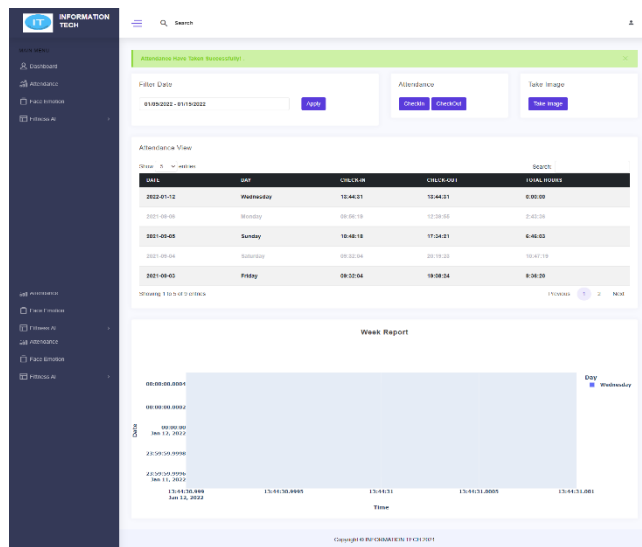


Fig 10.2 - Attendance marking page



Fig 10.4 - Check-in and check-out

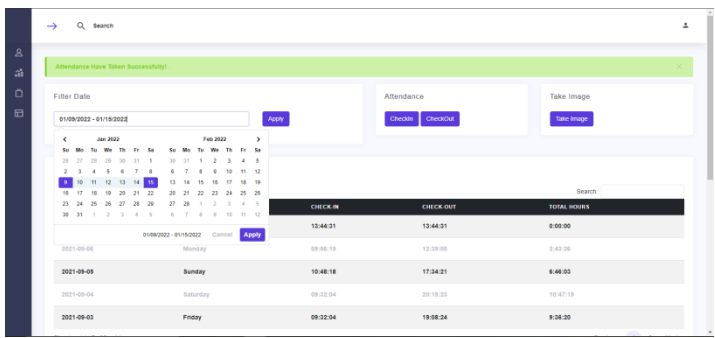


Fig 10.5 - Filter date

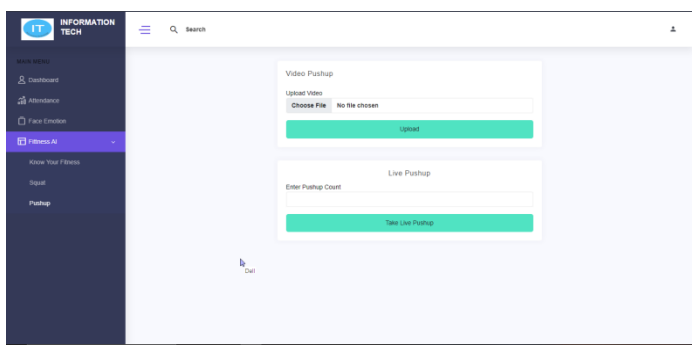


Fig 10.6 - FitnessAI page

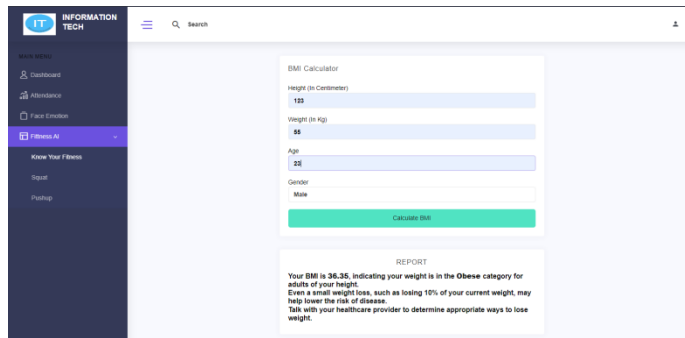
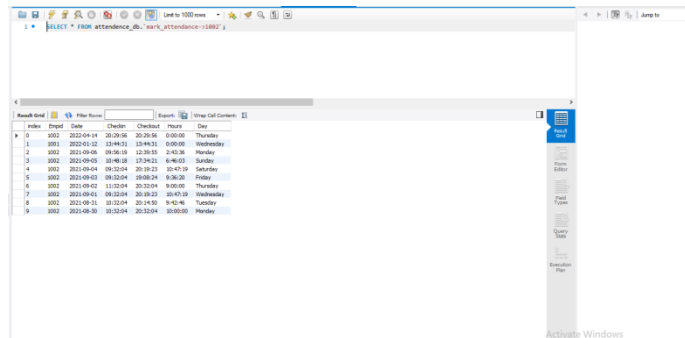


Fig 10.7 - BMI calculator



| Index | Empid | Date       | Checkin  | Checkout | Hours    | Day       |
|-------|-------|------------|----------|----------|----------|-----------|
| 1     | 1001  | 2022-01-14 | 20:20:56 | 20:20:56 | 0:00:00  | Thursday  |
| 1     | 1001  | 2022-01-12 | 13:46:51 | 13:46:51 | 0:00:00  | Wednesday |
| 2     | 1002  | 2022-01-08 | 09:56:18 | 12:36:55 | 2:40:36  | Monday    |
| 3     | 1002  | 2022-01-05 | 09:58:18 | 12:24:21 | 2:26:03  | Sunday    |
| 4     | 1002  | 2022-01-04 | 09:52:04 | 20:39:23 | 10:47:19 | Saturday  |
| 5     | 1002  | 2022-01-03 | 09:52:04 | 09:58:24 | 0:06:20  | Friday    |
| 6     | 1002  | 2022-01-02 | 11:52:04 | 20:52:04 | 8:00:00  | Thursday  |
| 7     | 1002  | 2022-01-01 | 09:52:04 | 20:48:22 | 10:56:18 | Wednesday |
| 8     | 1002  | 2022-01-31 | 10:52:04 | 20:14:30 | 9:42:26  | Tuesday   |
| 9     | 1002  | 2022-01-30 | 10:52:04 | 20:52:04 | 10:00:00 | Monday    |

Fig 10.8 - Employee attendance database

## XI. Conclusion

A face recognition application for employee attendance system using the One-Shot algorithm is made. The application is capable of analyzing and extracting facial features from every live image. These extracted features are then compared with the already trained images present in the database. These features are then compared and based on the similarity of the two images the attendance is posted. The application also provides option to the user to update the training image, but the permission to update the image must be given by the administrator in control.

By applying the method described in the paper, accurate algorithm and quality-based face recognition results can be obtained. With the help of one-shot algorithm only one training image is required for the authentication. Due to this one can achieve high performance level in recognizing human faces and analyzing facial features which is supported by the Haar cascade. It extracts several features from the training image that can be easily used to compare and authenticate the user even in the scenes containing complex backgrounds and low resolutions, this technique is sufficiently secure, dependable, precise and productive. There is no requirement for specific equipment for introducing the framework in the system. It tends to be built utilizing a device camera.

## XII. Future Work

In future aimed to build a separate admin authentication and home page to monitor the fellow employee's attendance, and to focus on the Fitness AI to assist mental and physical fitness.

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