University Management System using Machine Learning

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Abstract—UMS allows easy flow of information across students, faculties, guests etc. within the campus premises. We have developed an application which can be easily installed at various locations across the campus that can be used as a guidance system for the guests across the premises and also as an attendance system for the students. We have also integrated it with chatbot access through which they can ask their queries regarding the campus. There is a need for a system that integrates all the important aspects of the students like attendance, marks, deadlines, schedules etc. We have implemented such a system where the proposed application allows students to view all important details like daily schedule, marks, attendance, tasks to be completed etc. of all the registered subjects all in one place. This application is also useful for the faculties to keep track of their schedules and tasks to be completed.

Keywords—university management system, machine learning, attendance, chatbot, face recognition, mobile application, frontend, backend

I. INTRODUCTION

Universities have a large number of people who access the premises on a daily basis. They could be students, faculty, other staff, parents, people who have come for guest visits, etc. But the access to the premises for all these people is not done in an organized manner. Secondly, we follow the traditional attendance system which can be changed and made more efficient. This will ensure rightful attendance, save the time of both students and teachers, thus resulting in a more productive study environment. Sometimes students may try to access areas they are not allowed to or students or staff may end up in the wrong classrooms since they may not have properly checked in with their schedules. Thus a University Management System becomes necessary in the college premises which will help students, staff, parents, guests etc. and properly guide them within the premises.

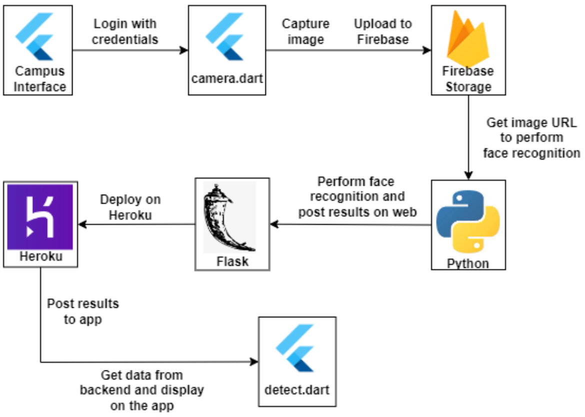


Fig. 1: Block diagram of face recognition

In the present day, we do have biometric scanners or key card entrance control to allow access into the areas. But these systems can just keep track of the accessed time and provide some kind of access control but it's not possible to guide them with these existing systems. The traditional method of manually directing the guests to the required location is still used but this is not a very reliable method to be followed. Also, a lot of times people are so involved with other activities that they are not able to keep track of their schedules and be in the right place at the right time which in turn results in improper utilization of time and resources. The system we will be developing will be able to provide a solution to all these problems in an effective manner.

II. METHOD

A. Aim

To design and develop a University Management System using Machine Learning. The system will also have a face recognition feature that will be used to grant attendance to students and a chatbot feature to guide students, faculty and guests across the college premises.

B. Implementation

The system has 4 major components: Facial recognition,
Chatbot, application development and database design.

- ***Facial recognition***

One of the main features of the proposed application is the face recognition feature. This has been implemented using Python, Heroku, Dart, Firebase and MongoDB. Once the location where the device is, is selected, it opens the camera automatically. Once the image is captured, this image is uploaded to the Firebase and the image URL (Uniform Resource Locator) is returned back to the application. Next, the firebase image URL is sent to the python program. Now the captured firebase image is compared with the stored images from the database.

Once the program finds a matching face, the program returns the name of the image from the database which results as a match to the unknown captured image. If the program was not able to find the match to the images in the database, we can conclude that the unknown captured image is a guest user.

In the application, we get the name of the person whose image is recognized. If the name is obtained, then the details of the respective person is displayed. If a name is not obtained then the unknown person is addressed as a guest user.

- ***Chatbot***

One of the important features of the application is a chatbot that can be used to answer queries of the user. The chatbot is implemented using Python, Heroku, and uses MongoDB as the database. The front end of the chatbot is designed using Flutter and Dart. We used different packages like nltk, pickle, keras, and numpy to create the model.

The access of the chatbot is given to the user in multiple pages of the application for answering

We have a data.json file that has expected queries, their intents and expected responses. To create the training data of the chatbot, we tokenize each word of the input and determine its intention using natural language processing. We then train the model to recognize different patterns like greetings, asking for directions, asking for marks, attendance, etc. When a query is sent by the user from the application, it is tested using the created model and the intent of the query is determined and the appropriate output of the model is returned and displayed on the application.

If a student requests for marks or attendance, another request is sent to the back end of the application to obtain the requested details of the student as stored in the database and this is displayed to the user.

Fig.2 shows the block diagram and the flow of the chatbot component.

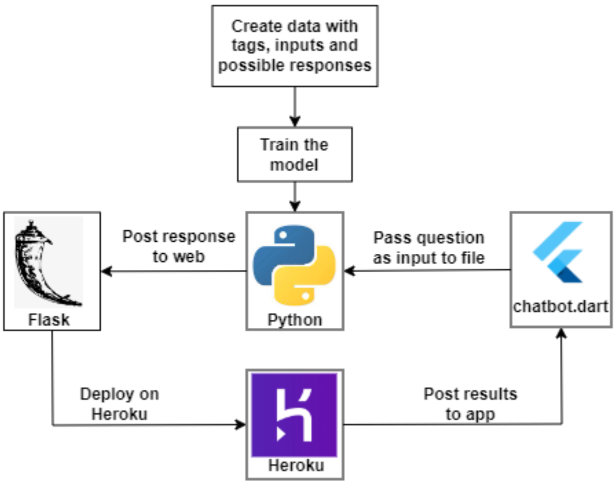


Fig. 1: Block diagram of face recognition

- ***Application development***

All the main features like face recognition, chatbot and other details like schedules, marks, attendance, and set of items to be completed have been integrated in the proposed application. This has been implemented using Flutter and Dart using Visual Studio Code.

The app starts with the user having to choose between Campus Interface and Student/Staff Interface. For the devices placed across the campus, Campus Interface must be chosen and logged in using the campus login credentials. Students and staff can view the other details by logging into their personal devices by choosing the Student/Staff Interface. They have to enter their registered phone numbers after which they will be receiving the OTP (One Time Password). Once the OTP is verified, they will be logged into their account.

In Campus Interface, after logging in using campus login credentials, the user must choose the location of the device from the locations provided. Now the Camera will remain open until the user logs out of the device. When any person that is a student, staff or guest clicks on the Take Photo button, the image will be captured and Face Recognition will be performed on the captured image. If the person is not recognized then the person will be considered as a guest. They can either click on the Refresh button or access the chatbot and ask their queries.

If the person is recognized then the details of the person as per the database will be displayed to them. They can also see their current schedule and where they are expected to be at that particular time. If the person is recognized as a student and the location and timings of the face recognition is same as the location and timing as per the schedule in the database, a button will appear clicking on which they can mark the attendance for that class.

In Student/Staff Interface, once the user logs in using their registered phone numbers, based on their role, i.e. student or staff they will be taken to the respective Homepages. If the user is a student then they can view their schedules, attendance, marks, To-do-List and other details that are stored in the database. If the user is a staff then they can view their schedules, To-do-List and other details that are stored in the database. The users can update and change the status of the to-do-Lists and also access the chatbot and ask queries.

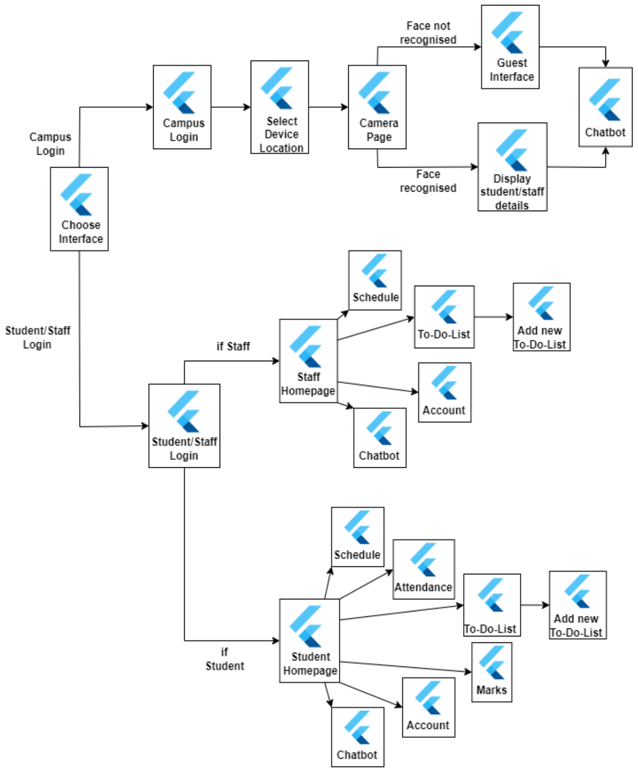


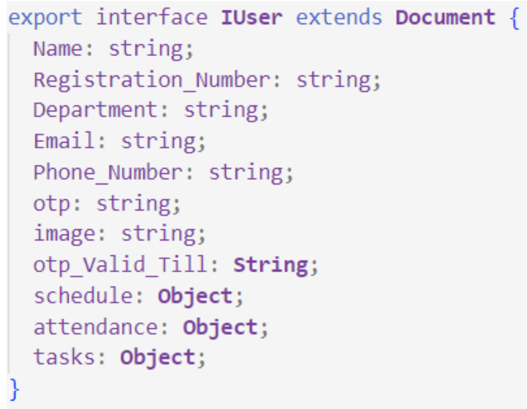
Fig. 2: Block diagram of the mobile application

- ***Database design***

The database contains the details of students, faculty locations of various rooms across the campus and other details.

For the student the database contains the name, registration number, the schedule and marks in various subjects, their attendance in various subjects and a set of tasks that need to be completed.

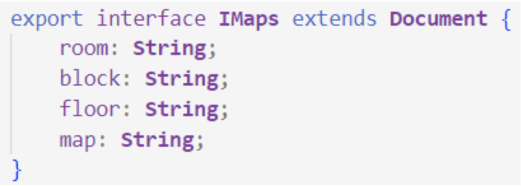
For a faculty member, the database contains the name registration number, their schedule, and a set of tasks that need to be completed.



```
export interface IUser extends Document {
  Name: string;
  Registration_Number: string;
  Department: string;
  Email: string;
  Phone_Number: string;
  otp: string;
  image: string;
  otp_Valid_Till: String;
  schedule: Object;
  attendance: Object;
  tasks: Object;
}
```

Fig. 3: Schema of the user (both student and faculty)

The database will also contain the location of various rooms across campus that will be displayed when asked to the chatbot.



```
export interface IMaps extends Document {
    room: String;
    block: String;
    floor: String;
    map: String;
}
```

Fig. 4: Schema of different locations on campus

III. RESULTS AND DISCUSSIONS

Regarding the functionality of the application, the features can be divided into the features for the campus, common features of the gas and features for the student or faculty.

For the campus functionalities the administrators can login on devices across the campus and these devices can be used for facial recognition which will work as the attendance system across campus.

For the guest functionalities the guests will be able to interact with the chatbot and ask for directions across campus for availability of faculty members or for other guidance.

For the student and faculty functionality the logged in students of faculty members can access the application on that personal devices and can view the schedules and the task list. The students can also view their marks and attendance in various subjects. Students and faculty can also interact with the chatbot and obtain guidance in various matters.

All the functionalities are successfully implemented in an efficient manner. The application is evaluated for multiple test cases constructing all guest, campus login, student and faculty login functionalities. The application has passed and works effectively for all the possible test cases.

IV. CONCLUSIONS AND FUTURE WORK

UMS is important to various organizations like educational institutions. It can be used to manage and control people across the organization with great efficiency which has been implemented successfully in the proposed application.

We have successfully developed the application and implemented as per the requirements. The developed application can recognize if the person is a student or a faculty member and display their details respectively. The application is also so effective in assisting and guiding guests across the campus.

We have successfully implemented all the required requirements in one application which can be installed and used on multiple places across campus. This helps in having a more effective version of attendance. Students and faculty members can also login and use the application on their personal devices and view their details like schedule, to do list etc. making this multi-purpose application cost effective.

The developed system can be improved by adding speech-to-text and text-to-speech features for the chatbot. We also need to improve the efficiency of the facial recognition model and add other functionalities like notifying students and faculties regarding upcoming schedules, providing an interface for faculty to update students' attendance and marks etc.

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