

Automated Institute Attendance System Using Facial Recognition

Vikrant Gurav, Student, Vidyalankar Institute of Technology, Mumbai, India,
kv7gaming@gmail.com

Mohit Chandorkar, Student, Vidyalankar Institute of Technology, Mumbai, India,
mohitchandorkar841@gmail.com

Amit Nerurkar, Faculty, Vidyalankar Institute of Technology, Mumbai, India,
amit.nerurkar@vit.edu.in

Sachin Deshpande, Faculty, Vidyalankar Institute of Technology, Mumbai, India,
sachin.deshpande@vit.edu.in

Abstract: With the recent impacts due to the pandemic, recording institute attendance through conventional methods like attendance sheets, fingerprint scanners, id cards, etc pose high infection risks. Likewise, validating temperatures of each student entering the institute can be a time-consuming task. In this paper, we propose a system which uses facial recognition to log students entering the institute. Using a sophisticated Convolutional Neural Network, our proposed system would be able to track and recognise students wearing face masks. Furthermore, using a thermal camera which would be installed at the institute entrance, the respective body temperatures of each student entering the institute would be simultaneously logged. Using this system, as institutes slowly start to reopen, faculty members would be able to seamlessly keep track of student attendance and body temperatures.

Keywords —Automated Attendance., Facial recognition, Institute attendance, Body temperature, Computer Vision, Human Computer Interaction.

I. INTRODUCTION

With the necessity of wearing face masks due to the pandemic, facial recognition has become a perplexing task. That being said, with the advancements taking place in Machine Learning and Artificial Intelligence, research on facial recognition has evolved exponentially. An attendance system based on facial recognition has many advantages as compared to the traditional identity card systems, fingerprint systems, iris detection systems, etc. [1] With the rampant increase in the number of covid cases, social distancing is mandatory and using conventional methods for tracking attendance pose a risk of being infected. Likewise, the process of validating body temperature is tedious. A Facial recognition attendance system ensures that people are following the protocols set by the government. We have also introduced the use of a thermal camera, which detects the body temperature of multiple students without the close contact of the security guards. This system is not only confined to be used by institutes. It can also be used in various sectors like government institutions, private offices, housing societies, etc. Our system allows the student/employee to upload their picture with/without a mask (Colleges/Institutions can also use the images of the

employee/student that they already have). [5] After uploading the image, the image is stored in a database. The camera which would be installed at the entrances would scan the faces of the students/employees and run it through the pipeline we've built which compares the live image with the labelled images present in the database. This system ensures that the employee/student entering the campus/organization is wearing a mask and marks student attendance, thus following social distancing protocols.

The development of Convolution Neural Networking architecture has played a vital role in the advancement of facial recognition techniques. Large datasets are available for the development of models for facial recognition. The rise in accuracy of this system has led to widespread commercial use in modern life. Governments and private firms worldwide are using this system to identify people at offices, airports, schools and many other places. Governments across the world have made it compulsory to wear a face mask at public places and maintain social distance. The compulsion of wearing a mask has resulted in a setback for various facial recognition models used for face attendance, face access control, face authentication based mobile payment, face gates at metro/ train stations, face

recognition based social security investigation, community entry and exit points etc. With our proposed system, as institutes slowly start to reopen, we aim to eliminate the issues related to tracking attendance and body temperatures. Faculty members would be able to seamlessly keep track of student attendance and body temperatures without posing any infection risks.

II. EXISTING METHODS AND DRAWBACKS

A. Pen and Paper based

Pen paper-based system uses a student's signature to mark their attendance. There is a high chance of forgery where a student signs on behalf of someone else. Likewise, this method is highly inefficient as it requires each student to receive the attendance sheet.

B. Biometric Attendance

Biometric attendance systems use iris recognition or fingerprint recognition to mark the attendance of students. Some Biometric systems may have trouble scanning due to various reasons. Mainly due to – sweaty fingertips, eyelashes, lens, eyelids, and corneal reflections, verification can be time consuming and tedious. Furthermore, biometric scanning poses an infection risk due to forced contact between optical scanners.[7]

C. ID Card System

Id card system uses an RFID tag or students' college id card to mark his attendance. While this method makes a compelling case at first glance, it is not without its own drawbacks. For example, a student may forget their id card or misplace it. In such cases, the student would be marked absent for the day. Id card systems also pose a high risk of direct body contact which can be a risk due to the pandemic.

III. PROPOSED SOLUTION

A. Scope

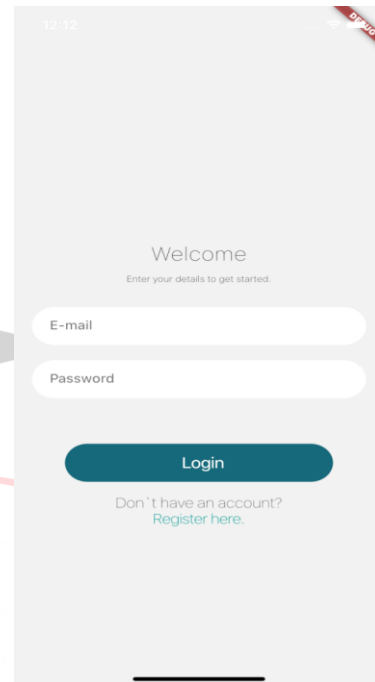
Our proposed system aims to reduce the risks involved in tracking attendance due to pandemic related risks. In this system, the institute can use existing student images obtained during admission which need not have a face mask on. Inversely, if the institute does not have these photos, the students can register and upload their respective images using our proposed app. In this case, the students can upload two images - One image without a face mask and one image with a face mask. Obtaining 2 images would increase the accuracy of the facial recognition pipeline. These images would then be added to the institute database. With thermal cameras installed at the institute entrance, the system would not only be able to track multiple students entering at a time but also track body temperatures of each student and log the student in with their respective body temperatures. Any unrecognised/unauthorized entry into the institute would also be detected. [1]

B. Uploading Images through Mobile Application

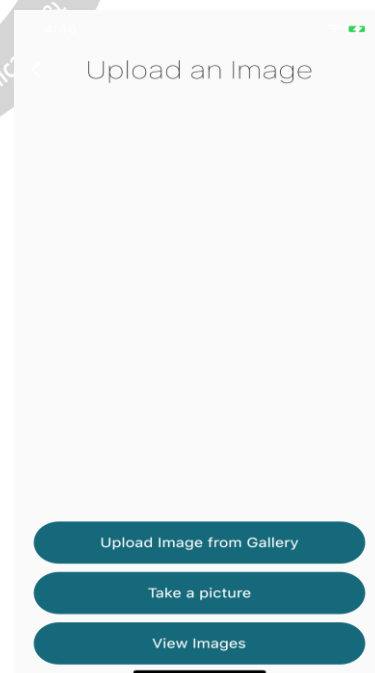
Using the mobile application that we have developed, the user would seamlessly be able to upload images of themselves. After logging in, the user can upload two images of themselves - One without the face mask and one with the face mask. After uploading these images, the submitted images would go through a review process. The user can also update their pictures in the future if required.

TechStack for the mobile application

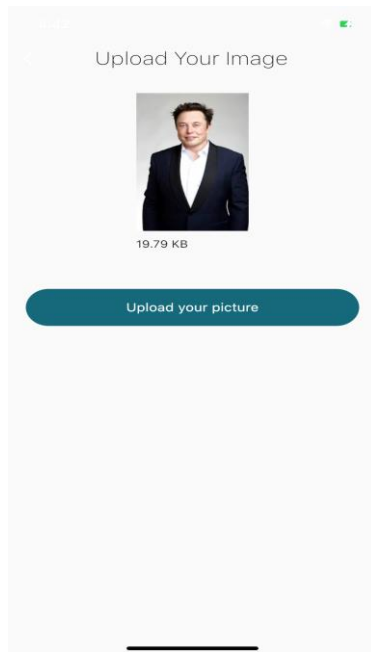
- Flutter
- Google Firebase



Fig[A1] Login Page



Fig[A2] Menu



Fig[A3] Upload Image Page

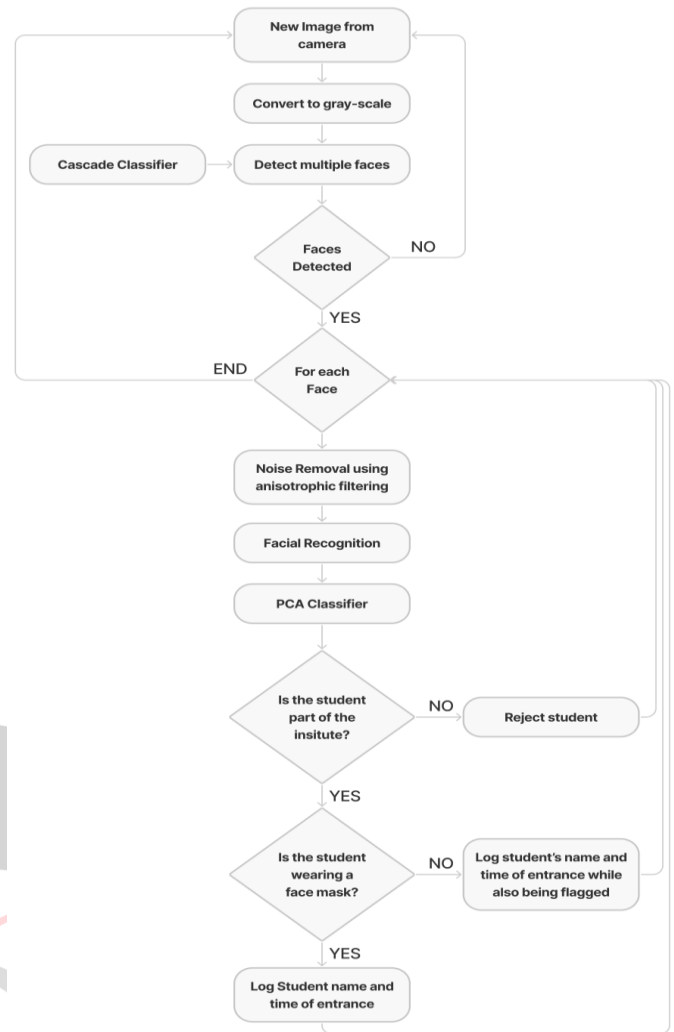
Fig[A1], Fig[A2] and Fig[A3] shows the screens of the mobile application. After logging in, the user can seamlessly upload an image of themselves.

C. Uploading Images through Mobile Application

Using a Convolutional Neural Network and a provided training set, the system would be able to track and verify multiple students entering the institute. Students entering the institute with a face mask would be logged into the system with the respective time. Students who enter the institute without a face mask would be logged into the system while also being flagged. If an unrecognised/unauthorised person is detected entering the institute, the system will instantly alert the faculty. [6]

Face Recognition Algorithm:

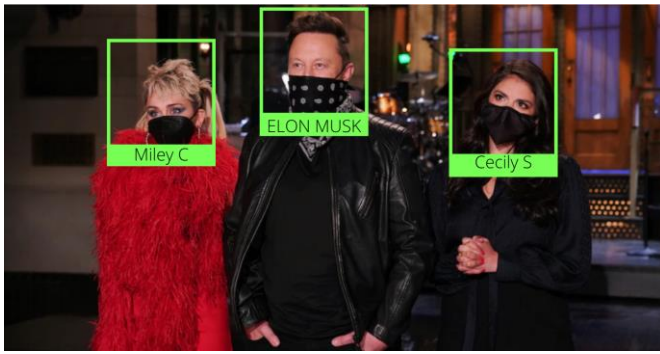
- The cameras provide a new image every 33 milliseconds.
- This image is then used to detect multiple faces.
- The face recognition algorithm is then run on each of the faces in the frame.
- The recognised faces are logged into the system.



Fig[B] Facial Recognition Algorithm

The image is firstly put through a cascade classifier. Cascading classifiers are trained with several hundred "positive" sample views of a particular object and arbitrary "negative" images of the same size. [2] After the classifier is trained it can be applied to a region of an image and detect the object in question. To search for the object in the entire frame, the search window can be moved across the image and check every location for the classifier. In this case, the object to be searched in the frame would be a face.

After a single face or multiple faces are detected, the image would go through anisotropic filtering to reduce noise. It is a technique that eliminates aliasing effects at extreme viewing angles, by reducing blur and preserving detail at extreme viewing angles. After the noise removal is executed, each face goes through the facial recognition process. If the face is recognised, the name of the student with the respective time and body temperature is logged.[4]



Fig[C] Face Detection

Fig[C] shows the working of the system detecting multiple faces. A live feed of this view is also available to the institute admin. [8]

D. Body Temperature Detection

Using thermal cameras installed at the institute gate which are synced with the face recognition cameras, every time a student's face is detected and logged in, the respective body temperatures would also be validated.



Fig[D] Thermal Temperature Detection

Fig[D] shows the working of thermal temperature detection. A live feed of this view is also available to the institute admin.

IV. CONCLUSION

In conclusion, conventional methods of tracking student attendance can be tedious and can involve unwanted risks considering the pandemic. Our system ensures that all protocols are followed and avoids unnecessary contact between individuals in the process of tracking attendance and validating body temperature. The solution accurately detects the faces of students entering the campus, logs their attendance along with the time they've entered. Simultaneously, a thermal temperature detector validates their body temperature and logs it as well. Additionally, students can also seamlessly upload their images (if required by the institute) using the mobile application. The Automated Institute Attendance System helps in increasing the accuracy and speed ultimately achieve high-precision real-time attendance to meet the need for automatic classroom evaluation.

Furthermore, this system can also be used in many sectors such as faculty attendance, private offices, housing societies, etc. Automating the process of tracking the people entering institutes, offices, housing societies, etc can save a lot of time wasted in physically validating attendance and body temperatures and also adds an element of security as our system instantly detects an unauthorised entry. Moreover, as these sectors slowly start to reopen, this system reduces the infection risks involved considering the pandemic.

REFERENCES

- [1] Wei Bao, Hong Li, Nan Li and Wei Jiang, "A liveness detection method for face recognition based on optical flow field," 2009 International Conference on Image Analysis and Signal Processing, 2009, pp. 233-236, doi: 10.1109/IASP.2009.5054589.
- [2] S. Dev and T. Patnaik, "Student Attendance System using Face Recognition," 2020 International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp. 90-96, doi: 10.1109/ICOSEC49089.2020.9215441.
- [3] Neha Kumari Dubey , Pooja M. R. , K Vishal , Dhanush Gowda H. L, Keertiraj B. R, 2020, Face Recognition based Attendance System, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 09, Issue 06 (June 2020).
- [4] E. Varadharajan, R. Dharani, S. Jeevitha, B. Kavinmathi and S. Hemalatha, "Automatic attendance management system using face detection," 2016 Online International Conference on Green Engineering and Technologies (IC-GET), 2016, pp. 1-3, doi: 10.1109/GET.2016.7916753
- [5] R. Samet and M. Tanriverdi, "Face Recognition-Based Mobile Automatic Classroom Attendance Management System," 2017 International Conference on Cyberworlds (CW), 2017, pp. 253-256, doi: 10.1109/CW.2017.34.
- [6] Smitha, & Hegde, Pavithra & Afshin,. (2020). Face Recognition based Attendance Management System. International Journal of Engineering Research and. V9. 10.17577/IJERTV9IS050861.
- [7] Surekha B., Nazare K.J., Viswanadha Raju S., Dey N. (2017) Attendance Recording System Using Partial Face Recognition Algorithm. In: Dey N., Santhi V. (eds) Intelligent Techniques in Signal Processing for Multimedia Security. Studies in Computational Intelligence, vol 660. Springer, Cham. https://doi.org/10.1007/978-3-319-44790-2_14.