AUTOMATIC ATTENDANCE MONITORING SYSTEM USING NEURAL NETWORK

Dr. Khushal Khairnar
Department of Information Technology, PCCOE,Pune
khushal.khairnar@pccoepune.org

Ajinkya Dhainje
Department of Information Technology, PCCOE,Pune
ajinkya.dhainje19@pccoepune.org

Advait Alurkar
Department of Information Technology, PCCOE,Pune
advait.alurkar19@pccoepune.org

Rohan Dhodare
Department of Information Technology, PCCOE,Pune
rohan.dhodare19@pccoepune.org

Rujuta Kulkarni
Department of Information Technology, PCCOE,Pune
rujuta.kulkarni19@pccoepune.org

Abstract - *Daily attendance is an important part of educational institutions and offices, and it is monitored manually either by calling out names or roll numbers or by passing the sheet, which raises concerns about the accuracy and authenticity of the attendance record. Our proposed model uses an open source library namely (Dlib), specifically its implementation of the Convolutional Neural Network (CNN). We don't directly use Dlib, rather we use another library which is built using Dlib, namely face_recognition. This system, which is based on deep learning using CNN, detects the faces of students and marks the attendance by recognizing them with the help of digital image source. After the attendance is updated successfully then data visualization techniques will be acted upon the data to give useful insights about attendance of students and will also be useful for schools/colleges/universities to track the record of attendance of each student.*

Keywords: *Deep Learning, CNN (Convolutional Neural Network), Machine learning, Automatic Attendance monitoring, Dataset.*

I. INTRODUCTION

Since the commencement of the schools and colleges attendance is being monitored manually by professors which consume a lot of time and efforts of students as well as teachers. Sometimes because of the attendance the learning time gets compromised. Also in manual attendance monitoring there can be errors or proxies which can lead to falsification of attendance records. This problem of manual attendance monitoring can be solved with the use of CNN which is a popular deep learning algorithm which uses faces of students for marking the attendance of students.

CNN is a deep learning algorithm that works on an input image, assigns weights and biases to various parameters in the image, and can differentiate between them. Due to its generalizability in offering solutions to computer vision-related issues like face recognition, object detection, image segmentation, etc. CNN has attracted a lot of attention. The CNN architectures have transformed over time to take into account the issues with computer vision. There is much efficient architecture – proposed in this work for automatic attendance monitoring. In order to record attendance in lectures or sections and maintain attendance records, this system aims to provide an automated attendance system that carries out the task of identifying students' faces using an image stream.

In this work, we will first create a repository of images of all the students in the classroom using images captured by the camera. Then, for every lecture, the professor will click a picture of the students sitting in the classroom with his/her camera. After the professor will click the picture, the faces in the picture will be identified and will be mapped to the pre-existing images for verifying the attendance of the particular students and hence the records will be updated automatically every time after the lecture.

II. Literature Survey

In this section, we present some of the related works where similar approaches were used to develop an automated attendance monitoring system:

[1] The OpenCV library is used for image processing in this work of attendance system using machine learning. On all training images, the HAAR Cascade algorithm is used. The HAAR Cascade algorithm is used to select features with the lowest error rate, indicating that these are the features that best classify face and non-face images.The basic similarities of the histograms under comparison are then calculated to perform image classification using LBPH (Linear Binary Pattern Histogram). This system aids in the avoidance of failed proof of attendance systems and serves as a replacement for all existing systems, including Radio Frequency Identification and all other biometric systems.

[2] Attendance monitoring system is necessary in all organizations because tracking student attendance is a difficult task. This system employs face detection and recognition to continuously recognize the faces of students entering the classroom. The facial biometric technique captures the image of the student and compares it to the enrolled image. If the image matches, the attendance is marked. When the students' motion pictures are captured, AI enters the picture. Using artificial intelligence, the system becomes more secure, and the task of monitoring attendance becomes easier.

[3] Face recognition has recently been used in a variety of areas and applications. The system contains a collection of data that represents the students' image. It is a web-based application that provides real-time face recognition of students. This makes the application simple to maintain and deploy. The system's future goal is to create a robust application for real-time smart attendance management.

[4] A method for automatically recording and storing class attendance has been built in this work. During the implementation phase, data from the students, training dataset, automated attendance marking, and facial recognition. Even if a subject is not looking directly at the camera, the CNN model employed in this work can still detect and identify that subject based on their facial traits. The suggested system can automatically mark and save the attendance of the current students, saving the teachers' time and bother, and can identify and recognize the class's pupils with a maximum accuracy of roughly 92%.

[5] The focus of this paper is on automatically marking students' attendance by using video footage from each classroom. To achieve the desired results, algorithms such as Viola-Jones and HOG (Histogram of Oriented Gradients) features are combined with an SVM (Support Vector Machine) classifier. Their method entails several steps, such as the creation of a face database of students, with approximately ten images captured from various angles. This approach also solves the redundancy problem of maintaining manual records.

[6] The algorithm used for attendance monitoring in this system consists of the following steps- Image acquisition, histogram normalization, noise removal, skin classification, face detection, face recognition and attendance. This facial recognition-based attendance management system gives students quick access to precise information about their attendance and uploads that information to a server using Ethernet wire. This technology offers improved security and is user-friendly and convenient. This system provides information on the student, and if there are any absences, information is exchanged with the appropriate proctors and parents.

III. Methodology

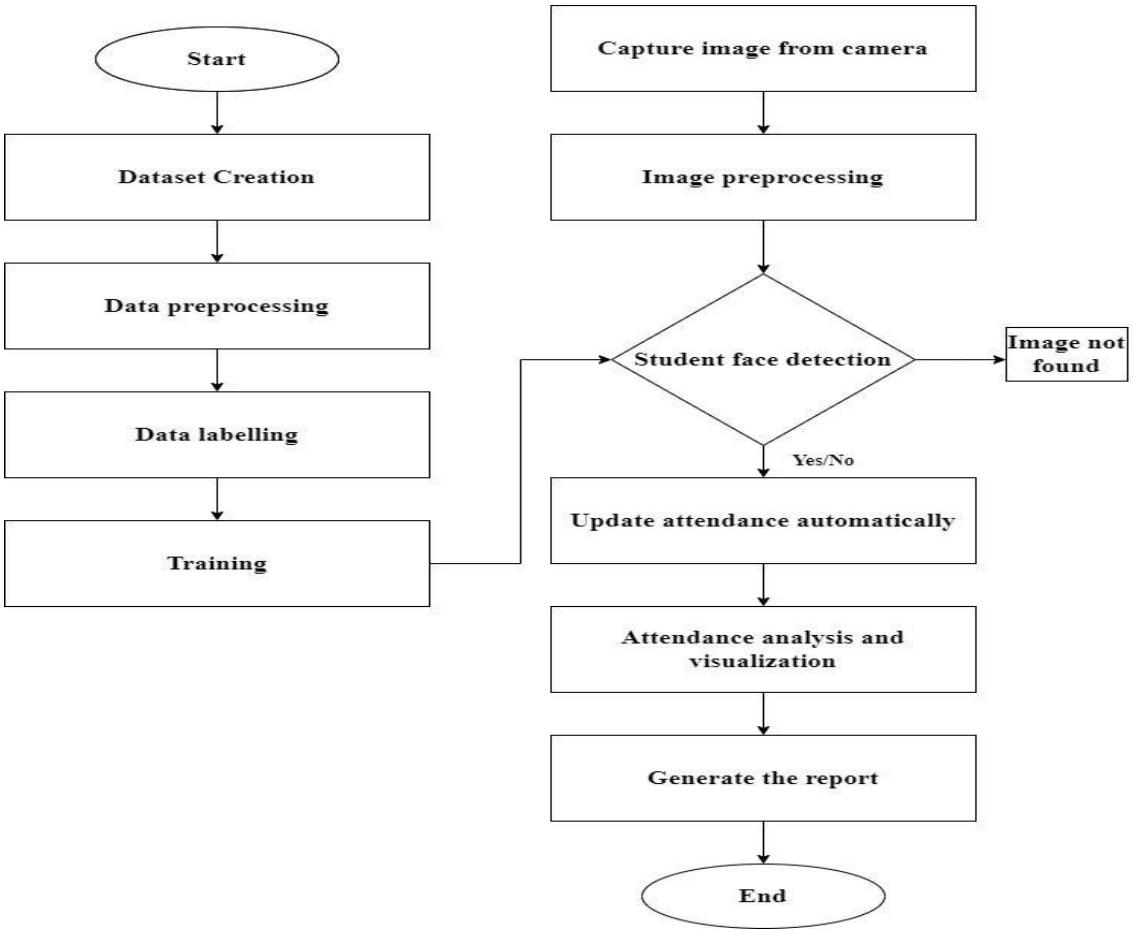

Fig. 1 System Flowchart

A. Dataset Creation and Pre-Processing :

The first step will be to create a Dataset which will contain multiple high quality images of all the individual students in the respective class.

This Dataset consisting of the individual photos of all the students will be used for training the neural network, so that it is able to detect the captured images later on. It is of utmost importance that the images captured are clear and of high quality to ensure the accuracy and reliability of the Attendance Monitoring System.

After building the Dataset, it is pre-processed to remove any redundant data and any images that are not up to the mark. Each individual image is then labeled with their respective names of the students

B. Training using Neural Network :

The most crucial step of the process is to train the Neural Network on the Dataset, to make it remember all the faces along with their respective names. It is crucial to carry out the training with good quality of data and give it enough time for better results. All the individual photos are fed to the neural network and their encoding is stored for comparing later.

In the training phase the weights and biases are adjusted in the convolution and ReLu layers of the Convolutional Neural Network. This makes the network “remember” the image. Once the training of the Neural Network is complete, we can begin marking the attendance of the students automatically.

C. Capturing the image from Camera tomark attendance :

After the Neural Network is trained we can begin monitoring the attendance of the students by capturing their images. The image is captured during class with all the students present in it. The captured image is then pre-processed and is given as an input to the trained neural network.

Once the photo with all students is fed to the neural network, it separates all the photos it finds in the group photo to individual photos and compares each of them with the stored encodings of the known photos. Upon finding a match it gives it the appropriate label according to the dataset.

The list of present and absent students is displayed to the teacher and upon approval the attendance is updated in the database for that specific lecture.

D. Analyzing and Visualizing the attendancereports :

The database is updated after every lecture and stores all the historical data of attendance of all students for all their lectures. The students can access this database to cross-verify their attendance for full transparency in the attendance process. The historical data can be then used to generateinsights into the attendance trends of students and we can analyze and visualize them to better understand them.

The fully implemented system would look something like this, consisting of two separate GUI’s for students and teachers. The Teacher is able to select the lecture for which the attendance isto be marked and upload the group photo of the class for that specific lecture. Upon submitting the photo, the model automatically recognizes all the photos and makes a list of present and absent students. The teacher can view this list and approve the attendance for that lecture. Once approved, the attendance will be updated in the database.

The students can access the database and check their attendance for any lecture through their separate GUI. This way they can also keep
track of their attendance.

IV. Result

PySyft: It is a Since finding individual and group photos of people in varying permutations is a difficult task with a lot of privacy concerns involved, we can check the results of our model by taking publicly available photos of famous people such as cricketers and stock photos. This will enable us to efficiently train our model without worrying about the privacy concerns of the photos we are using. We can fine tune the working of our system to our liking using these publicly available photos before using the real photos of people. We have already used such photos to see the working of the algorithm, the screenshots of some such datasets are attached below:

Test Case :

The input is a group photo which includes the images of our team members and people that our model does not recognize and see whether it is ableto classify it as “Match not found”.

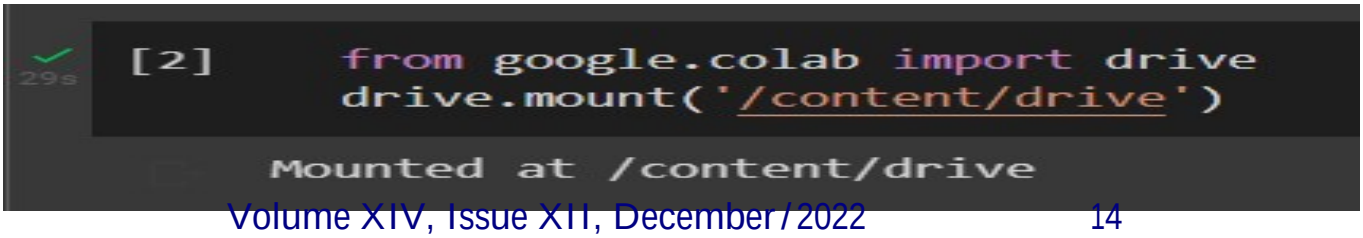

Fig. 2 Mounting Drive to Google Colab

```
known_encodings = []
for i in Roll_no:
  known_encodings.append(face_recognition.face_encodings(
```

Fig. 3 Storing encoding of known images from dataset

```
for i in range(len(known_encodings)):
  if face_recognition.compare_faces([known_encodings[i]], new_image_encoding
    match = 1
    Present_Students.append(Roll_no[i])
    Present_Roll_no.append(i)

if match == 0:
  print ("No match found")
```

Fig. 4 Comparing segmented image with dataset

```
I found 2 face(s) in this photograph.
There are 2 students absent in the photo
The list of present students are =  Rohan.jpeg Rujuta.jpeg
[2, 1]
```

Fig. 5 Output after comparison

Fig.6 Photograph of team

Our model is trained on only 3 people in the picture(Rujuta, Advait, Rohan). The 4th person in the picture is unknown.

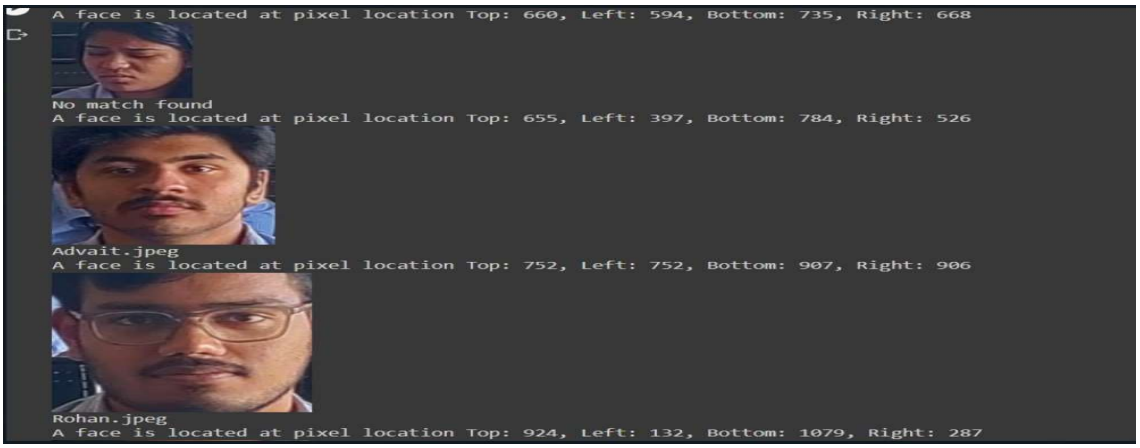

Fig.7 Result-1 for 2nd Photo of our Team

As we can see, the model did not recognize the face(as it was not trained on it) and has labeled it as “Match not Found”. Moreover, the model has correctly identified the rest of the three faces and labeled them correctly.

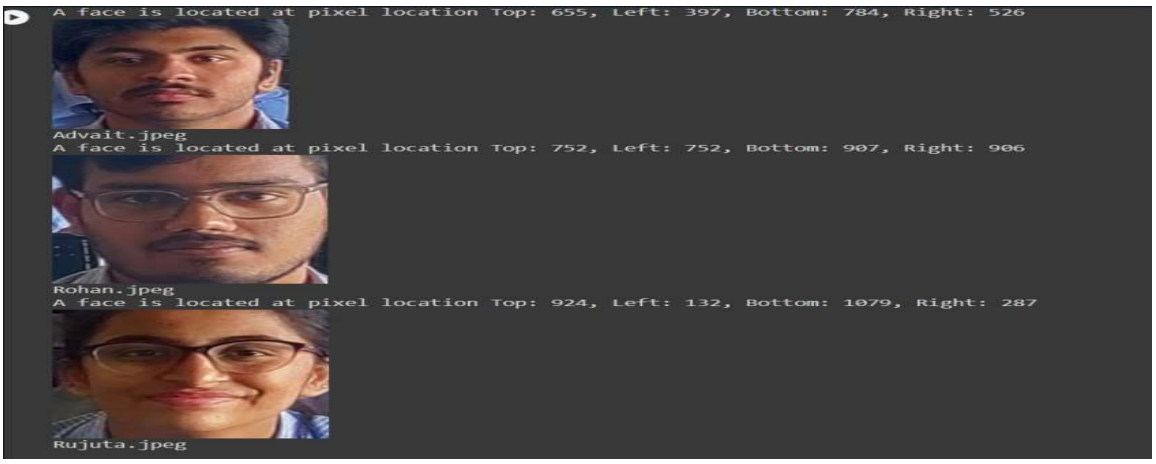

Fig.8 Result-2 for 2nd Photo of our Team

As we can see from above results, that model recognizes students' faces and later the attendanceis automatically updated in Google sheets as ‘P’ for Present and ‘A’ for Absent under respective names of student and day of the lecture.

Days/Name	Ajinkya	Rujuta	Rohan	Advait	Total Present	Total Absent
Monday - 31/10/2022	P	P	A	P	3	1
Tuesday - 01/11/2022	A	P	P	A	2	2
Wednesday - 02/11/2022	A	P	P	A	2	2
Thursday - 03/11/2022	P	A	P	P	3	1
Friday - 04/11/2022	P	P	A	A	2	2
Saturday - 05/11/2022	A	P	A	P	2	2

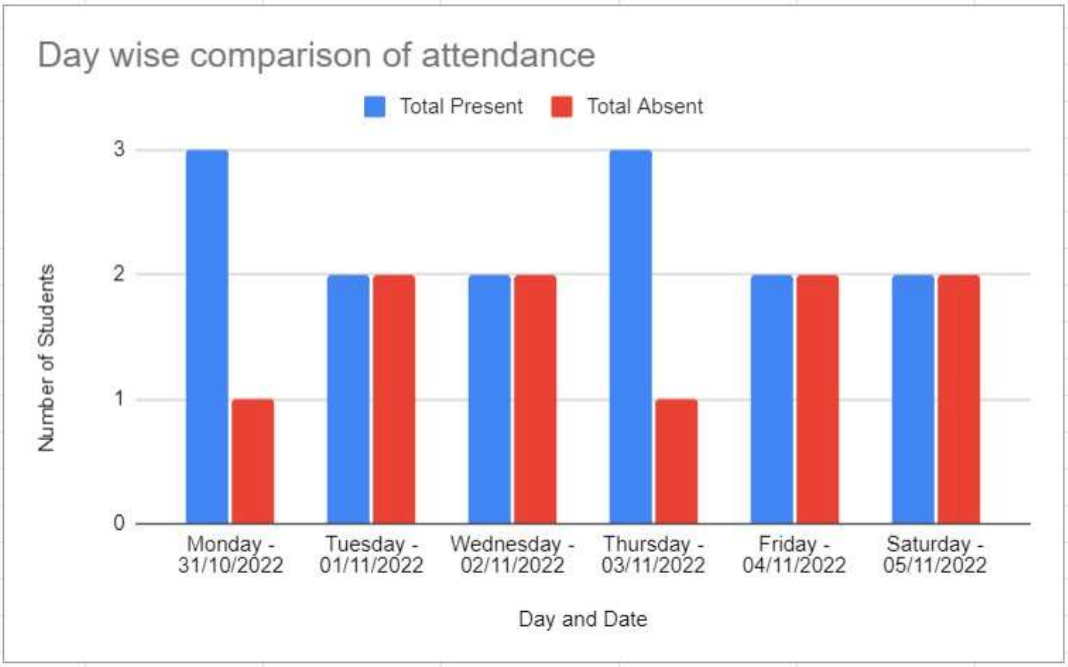

Fig.8 Automatic Google Sheet updation and generation of Report

V. Conclusion and Future Scope

We have successfully implemented a system for automated attendance monitoring with the use of Neural Network. We can upload class photos of students through the GUI and the attendance gets marked in the google sheets automatically and this data is later used for analysis and presenting the visualization of attendance report. Also we achieved an accuracy of 99.38% for this model. Wecan use this system in schools, colleges to reduce the effort of the teacher by manually monitoring and recording attendance. Even the cost to implement this system is very low as compared to other systems which use iris scanner or fingerprint scanner.

Also, the data analysis and reports generated bythe system will be helpful for the educational institutions for the assessment of the students. Evenstudents will be able to keep track of their attendance from time to time of each and every lecture. This will increase the transparency in the whole process for all the parties involved.

VI. References

[1] Ruzda Ansari, Uzma Bagwan, Ghazala Khan,"Attendance System using Machine Learning",International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), 2022, doi: 10.48175/IJARSCT-3236.

[2] K P, Naveen Reddy & Alekhya, T & Manjula T, Sushma & Krishnappa, Rashmi "AI-Based Attendance Monitoring System", International Journal of Innovative Technology and Exploring Engineering, 2020, doi: 10.35940/ijitee.B1057.1292S19

[3] S. Kakarla, P. Gangula, M. S. Rahul, C. S. C. Singh and T. H. Sarma, "Smart Attendance ManagementSystem Based on Face Recognition Using CNN," 2020 IEEE-HYDCON, 2020, doi:10.1109/HYDCON48903.2020.9242847.

[4] S. Chowdhury, S. Nath, A. Dey and A. Das, "Development of an Automatic Class Attendance System using CNN-based Face Recognition," 2020 Emerging Technology in Computing, Communication and Electronics (ETCCE), 2020, doi:10.1109/ETCCE51779.2020.9350904.

[5] H. Rathod, Y. Ware, S. Sane, S. Raulo, V. Pakhare and I. A. Rizvi, "Automated attendance system using machine learning approach," 2017 International Conference on Nascent Technologies in Engineering (ICNTE), 2017,doi: 10.1109/ICNTE.2017.7947889.

[6] Mangesh Owandkar, Akash Kolte, Devendra Peshave, Mrs Savita Jadhav, "Attendance Monitoring System using Face Recognition", International Research Journal of Engineering and Technology (IRJET), 2017, doi:10.1109/ICICTA.2017.985675

[7] M. Coşkun, A. Uçar, Ö. Yildirim and Y. Demir, "Face recognition based on convolutional neural network," 2017 International Conference on Modern Electrical and Energy Systems (MEES), 2017, doi: 10.1109/MEES.2017.8248937.

[8] R. Fu, D. Wang, D. Li and Z. Luo, "University Classroom Attendance Based on Deep Learning," 2017 10th International Conference on Intelligent Computation Technology and Automation (ICICTA), 2017, doi: 10.1109/ICICTA.2017.35.

[9] L. Yuan, Z. Qu, Y. Zhao, H. Zhang and Q. Nian, "A convolutional neural network based on TensorFlow for face recognition," 2017 IEEE 2nd Advanced Information Technology, Electronic and Automation Control Conference (IAEAC),2017, doi: 10.1109/IAEAC.2017.8054070.

[10] S. Guo, S. Chen and Y. Li, "Face recognition based on convolutional neural network and support vector machine," 2016 IEEE International Conference on Information and Automation (ICIA), 2016, doi: 10.1109/ICInfA.2016.7832107.