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MACHINE LEARNING FOR LOCATION-AWARE FACE RECOGNITION-BASED ATTENDANCE SYSTEM

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Abstract: Traditional methods of recording attendance, according to this article, are inefficient and time-consuming for educators. Taking attendance the old-fashioned method, by going around the room calling out names or writing them down on paper, can be time-consuming and leave possibility for error or manipulation. According to the report, a computer-based attendance management system based on Computer Vision technology could be a solution to these problems. Human images, for example, are just one type of visual data that may be sorted and analyzed using cameras, sensors, and algorithms in what is known as "computer vision." Using computer vision in the classroom could make photography easier. This would pave the way for automatic recognition and recording of attendance in the field of managing attendance utilizing face recognition technologies. There are numerous advantages to employing this technique over more traditional methods of tracking attendance. At first look, automated attendance management systems may appear to be a good concept because they would save time and effort by eliminating the need for human attendance monitors. This type of technology also assists educators in keeping track of pupils who arrive late or depart early by giving real-time attendance data. This system may generate detailed attendance statistics at the end of each day, which administrators can utilize to identify and address issues with participation and turning up to class. The major purpose of this study was to demonstrate the possible benefits of employing a computer-based attendance management system that uses Computer Vision technology. It demonstrates the system's ability to improve students' academic results by streamlining attendance tracking.

Keywords: Python; OpenCV and Google API; Student attendance; Face recognition

1. INTRODUCTION

There are numerous face-to-face attendance options available, however the vast majority either do not store data remotely or require a private cloud service subscription. It is still possible to create a low-cost attendance system by combining Python modules for facial recognition and attendance tracking (such as OpenCV) with free cloud storage services (such as Google Sheets). Using these simple but efficient Python tools, we can considerably improve our ability to identify people and keep track of attendance records. Because of the Google API, we can integrate Google Sheets with our time and attendance system. As a result, we can track attendance in the cloud, which is both handy and free. Businesses of all sizes may benefit from better efficacy and lower costs of managing attendance if the suggested technique is implemented. Using Python-based tools and low-cost cloud storage, we can streamline and reduce the cost of attendance tracking.

2. LITERATURE SURVEY

Because of the availability of digital distractions in today's classrooms, schools are emphasizing the importance of constant student attendance more and more. Reading names aloud and gathering signatures were originally the traditional methods for tracking attendance, but they are now obsolete. The letter was

written by Naveen Raj. Writing a Mon paper involves a significant amount of time and effort. To improve this technique, the "Python-based Student Attendance System with Facial Recognition" was developed.A snapshot of the student is taken by the computer's camera, and an algorithm evaluates the image to identify them based on their facial features. When facial recognition is working well, the data is transmitted to an Excel table and attendance is taken instantly. The system's graphical user interface (GUI), which allows users to interact with it, was created using Python Tkinter. The new approach of recording attendance is more effective and less prone to human error. This radical departure from the norm could significantly boost the value of formal education. The International Journal of Research Publications and Reviews published "Facial Recognition Attendance System Using Python" by Shivangi Awasthi and 2Shubhangi Awasthi in 2022.

Many aspects of our ever-changing society have been altered by automatic face recognition (AFR) technology. This technique has practical applications, such as tracking student attendance. A face recognition-based attendance system may recognize students based on their biometric traits and high-definition monitor footage. I want to use deep learning to create an automated facial recognition system that can discover and identify persons in surveillance footage and still photographs. Face recognition has improved thanks to the application of various algorithms and methodologies. In order to automatically update attendance records, I plan to employ deep learning to turn video frames into easily examined images. This technology has the potential to dramatically increase the convenience, precision, and efficiency with which schools take attendance.(Divya Pandey will speak about the Face Recognition Attendance System she developed in Python at JETIR in October 2020.

Facial recognition software can be used to create a biometric identification based on a person's distinctive and noteworthy appearance. Every company needs to track staff attendance, but traditional methods may be tedious and time-consuming. The OpenCV solution we propose for face recognition consists of a camera, an algorithm to extract features from images, face encoding and recognition, spreadsheet attendance monitoring, and PDF output.The method is taught with the help of photographs of qualified students, and a training database is created. Images of the students' faces are saved in a database once they have been cropped and identified. To find information in an image, the Local Binary Pattern Histogram (LBPH) approach is utilized. The software has been trained to rapidly identify qualified students. Using the camera's acquired image, the student's face is compared to a database of recognized faces. If a student can be identified, their presence is noted on the attendance record. If the student's face cannot be recognised, their absence will be recorded. By exporting the guest list to PDF, it is simple to distribute and store. The proposed methodology can assist any group because it is faster and more accurate than the ones now in use.

Schools, colleges, and universities rely heavily on attendance monitoring systems to keep order and ensure that all students receive a good education. Traditional methods of taking attendance include calling "roll" or obtaining paper signatures, both of which can be time-consuming and ineffectual. However, thanks to modern technologies, you may put up an autonomous system that is not only effective but also simple to operate. This project builds an automatic attendance system using a Raspberry Pi 3B+, OpenCV/Python libraries, and a recognizer algorithm to let teachers take attendance without being distracted or losing time. Face recognition technology saves time, provides proper identification of participants, and eliminates the possibility of proxy involvement. This suggested technique could be used anywhere precise attendance data is required. It is critical to the project's objectives and design ideas. This engineering project's success can be ascribed to its ability to assist universities and colleges in better monitoring and controlling student attendance. The suggested procedure also ensures precision, removes all room for error, and saves significant time. Ghalib Al-Muhaidhri and Javeed Hussain are named as the authors. Presentation at IJERT 2019: "Smart Attendance System Using Face Recognition"IoT is transforming how higher

education institutions track attendance due to the effectiveness and affordability of its solutions. Using the Internet of Things, a cloud-based Smart Attendance System prototype that can automatically generate attendance records, report on them, monitor them, and notify administrators was established. It is possible to collect attendance fast simply passing the portable device from student to student. The technology has undergone extensive testing, and preliminary results show that it will help instructors and employees save time. The application of this technology opens up new avenues for research and development in this field. It also demonstrates how difficulties with current attendance systems can be solved by leveraging the Internet of Things to increase efficacy and efficiency everywhere. Yadav, V., and Bhole, G. P. wrote it.

3. METHODOLOGY

Cmake

A native build system can be set up to generate libraries, compile source code, construct wrappers, compile executable binaries, and store data that users can modify before the native build files are generated. This option gives customers more flexibility during creation and makes it easier to modify and customise their built settings.

Dlib

68 facial coordinates (x, y) that correspond to distinct facial landmarks may be identified using the popular machine learning framework Dlib. Because of its simple Python bindings, this library is widely used in the construction of high-quality machine learning and data analysis tools. When I need to identify a person's features for identifying purposes, it's the first thing I reach for. I realized that the sites and persons it identified were accurate.

Face Recognition

Dlib is a facial recognition tool that is both strong and easy to use. The utilization of cutting-edge facial recognition technology allows for remarkable precision. Labeled Faces in the Wild has a success rate of 99.38%, making it one of the most dependable face recognition libraries accessible.Dlib is not only incredibly precise, but it also includes a command-line utility for identifying persons in a collection of images. This tool allows people with various technical abilities to easily incorporate facial recognition into their work.Dlib is commonly used in facial recognition applications due to its dependability and simplicity.

OpenCV

OpenCV is a free and comprehensive computer vision and machine learning software library. This service provides users with access to over 2500 powerful algorithms that may be used for a range of tasks, such as locating linked images inside a bigger image.OpenCV has been downloaded over 18 million times since its initial release. As a result, many developers that are interested in artificial intelligence use it in their projects. It has become the de facto standard for applications in computer vision and machine learning across several fields due to its versatility and plethora of features.

Google API

Google established a collection of application programming interfaces known as the Google APIs to ease communication between Google services and those of third parties. Google's search engine, email service, language translation service, and mapping service are all examples. These application programming interfaces (APIs) enable programmers to have access to user information, analytics, machine learning, and other services for their projects, such as Google Maps. One of the most appealing aspects of the Google APIs is the RESTful interface for reading and writing data to Google Sheets. Programmers can use languages such as JavaScript, PHP, and Python to connect to Google Sheets in real time to see and update data.

Google API - Authentication and authorization

Any API, even Google's, requires login and permission to use. Because it provides a safe and convenient method of user authentication and permission, OAuth 2.0 is frequently utilized for this purpose. To use a Google API, programmers must first obtain keys from the Google Developers Console. Once the client app has gathered all of the necessary information, it may request an access token from the Google Authorization Server. The access token of the client app is validated and authorization to utilize a Google API service is granted. Because the OAuth 2.0 protocol is so simple to set up, developers can easily integrate

it into their programs.

Google Sheets API

The Google Sheets API employs a RESTful approach to access and edit spreadsheet data. You may see cell counts, change current information, and create new sheets.

- Values input and exited from spreadsheet cells are calculated.
- Change the worksheet's layout. Control spreadsheets that are linked together

Work flow

Fig.1 The proposed technique is to gather information about coworkers for use in a facial recognition project. To finish the work as specified in the instructions, some software installation is required. OpenCV activates the camera and stores real-time facial images to collect input for the final product. When you enter an image into the Face Recognition Python module, it will look for faces in it. This information is then saved in a Python array. The encoded face is then compared to a database of recognized pupils using the Python package. A local CSV file is created if a recognized face is discovered. The system plans to save attendance records to a free cloud service. This is made possible thanks to the Google API. To connect to the Google API, the Python program requires a Key file. The next step is to connect Google Sheets to the Google Sheets API. A Google Sheet has been created with the names and arrival times of everyone that attended. Data purges are carried out on a daily basis. Every day, a copy of the attendance log is saved locally in case it is required later. When a face is found, it is added to a new CSV file labeled after the day it was found. Because both local and remote storage are free, this strategy is both practical and cost-effective.

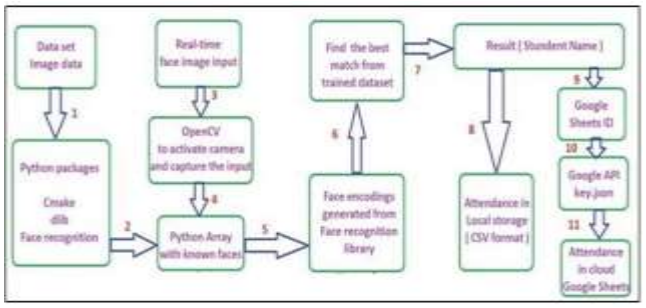

Figure 1 Python, OpenCV, and the Google API can be used to create a face tracking system.

Implementation

Figure 2 depicts the procedures involved in locating an image and storing it in a database where it may be watched.

Figure 2 Students must include a photograph of themselves in their separate folders.

As seen in Figure 3, OpenCV activates the camera and captures a real-time image of a face for use as input.

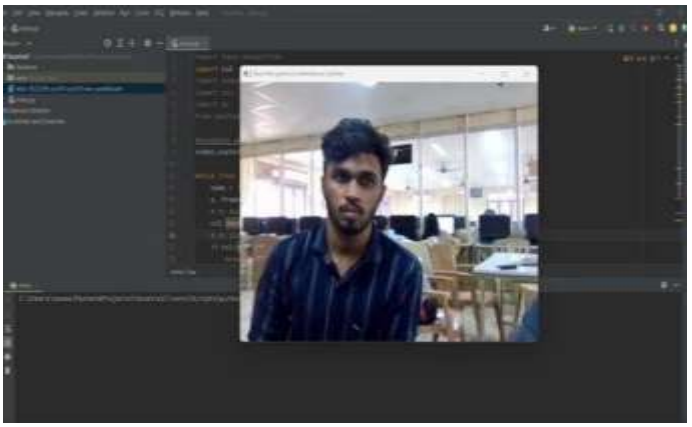

Figure 3 Begin the Recording Device

Face encodings generated by the Face recognition module (Figure 4) can be used to get the closest match from a Python array holding a list of known pupils.

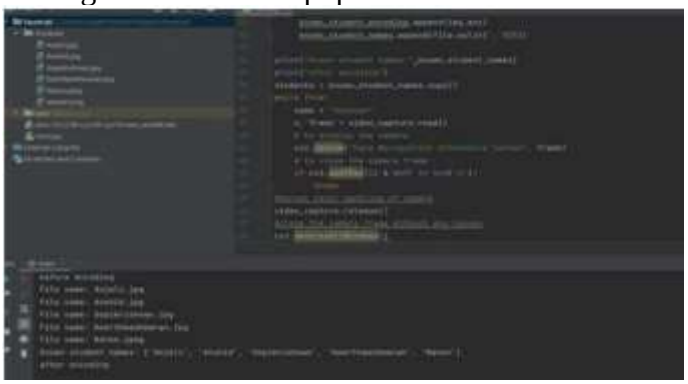

Figure 4 How to Identify a Face

After the back end imaging process is completed (see Fig. 5), real-time face monitoring and picture verification are

undertaken.

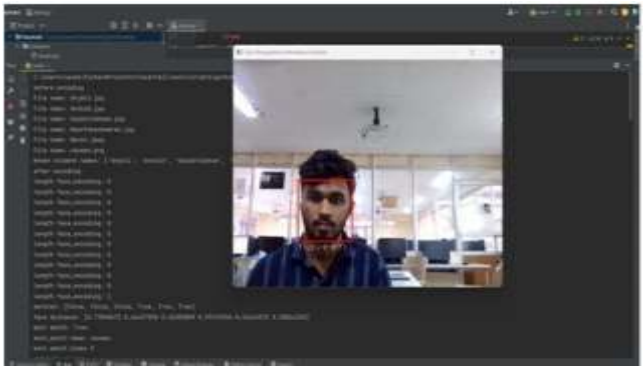

Figure 5 Keeping a local CSV file with the person's presence information up to date

4. CONCLUSION

The Google API, the initiative's unique selling feature, is intended to improve on the usual face attendance system. As a result, the system runs more smoothly and precisely. This was built using pre-existing Python packages. These applications are popular owing of their simplicity and high productivity.

Python-based systems, among other advantages, can ease the development process. Workers are relieved of the tedium of attending to implementation details at such a detailed level, allowing them to focus more on the project's primary aspects. The work can be accomplished faster and with less resources.

The cost-effectiveness of the project is critical. Google Sheets can be used to retain attendance records at a lower cost than cloud storage. Google Sheets is a cloud-based spreadsheet tool that allows for real-time collaboration and information sharing. This eliminates the need for less expensive cloud storage solutions and opens up the system to smaller businesses and organizations.

The Google API and Python-based tools were used to create successful and low-cost face attendance software. This solution provides precise, real-time attendance data and easily integrates with existing workflows.

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