

EXPLORING MACHINE LEARNING-BASED SMART PRESENCE SYSTEMS

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Abstract- In large firms, it may require a significant amount of effort and time to ensure that all employees have met their attendance quotas. Developers are working on a simple, automated approach of demonstrating presence to address this issue. This method, however, requires evidence. Real-time facial recognition and identification technology is frequently used in Smart Presence System applications. In this study, we use two alternative algorithmic approaches. The Convolutional Neural Network (CNN) and Haar Cascade Classifier techniques are both used. This was made possible by the employment of the Haar Cascade Classifier technique. For this comparison, the CNN approach was used. When a user's face is detected on each of the seven days, a new worksheet is generated every week. This real-time face recognition and identification technology is only available to approved employees. The information of non-registrants can be double-checked using a QR code verification mechanism. Some user data may be used by this system. Within the confines of this system, people with and without accounts can coexist harmoniously. We were able to attain a 99 percent success rate using the Haar Cascade Classifier.

Keywords- Haar Cascade Classifier, Convolutional Neural Network, Attendance System, Face Recognition, Machine Learning.

INTRODUCTION

Employee behavior is an important aspect of running a successful organization. This calls for the use of a presence method. Two separate systems are now in operation. Both manual and automated methods are used. There is a fault in the Manual Presence approach. А programmable presence gadget, on the other hand, can notify management whenever an employee is present. Face recognition and tracking technology can be used to check them in. This saves time and effort in putting up a fake front. Employees are under pressure to arrive on time every day because they know their attendance will be logged electronically. Facial recognition is one of the most reliable methods of identifying a person, and it has received a lot of attention in recent years. Biometrics relies heavily on facial recognition technology. Face recognition is an excellent illustration of how image analysis may be put to use. Fingerprint scanning and retinal scanning are just two examples of biometric verification processes that necessitate human interaction. Photo identification based on face traits, on the other hand, is unneeded. Face recognition is better to other biometric technologies because it does not require human intervention. As a result, it is critical for validating people's identities. This mav stimulate the use of larger datasets and novel strategies for overcoming processing constraints and improving precision. The ultimate goal is to accurately identify human characteristics in image databases. Researchers have attempted to identify individuals in big groups using only their facial traits in the field of biometric face recognition.

RELATED WORK

In conjunction with the use of a system such as the Smart Presence System, an efficient and effective technique of tracking employee attendance was devised. On the topic of employee attendance, the research includes interviews, a narrative method, and a literature review.To build an efficient and dependable technique of keeping financial records. Employees were the only ones who got help from them. We did, however, aid individuals who could read QR codes in using our services. Every child that enters the school could be videotaped by security cameras. The individuals were subsequently identified using additional analysis. However, our strategy was superior. Our technology can generate an Excel file using the input data. In Face recognition software was developed by researchers with the goal of incorporating it into a system to monitor school attendance. To classify a student's face traits, the Radial Basis Function (RBF) was used. When this method was used, accuracy increased by 82%. We were able to obtain more precise results using this procedure than we had previously. This paper discusses real-time facial recognition for one or more people in a short amount of time with high accuracy and efficient detection rates, as well as the construction of such a system. Those who lacked titles had to work harder, but it took longer. Using a single QR code saves time over the alternative. To solve the drawbacks of prior attendance tracking technologies, created a face recognition and RFID-based system at the same time. It comes with a high price tag. Face recognition and real-time tracking were used to find and identify individuals. QR codes can be used to locate unregistered guests and staff members.

METHODOLOGY



Fig. 1. Human picture unrecognized by smart presence system.





Even if you don't have an account, you can still get QR codes by entering some basic personal information. We shall use a testing approach in this case.

Figure 2 depicts the evolution of a subscriber.

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Employees must turn their faces toward the camera as they approach the gate so that they can be identified. If a human face is detected, the door will automatically open. Anyone who hasn't already signed up should go to the QR code section.

Haar Cascade Classifier

The Haar Cascade Classifier is a computer vision algorithm used for object detection. The idea was created by Paul Viola and Michael Jones. It is made up of four subcomponents, as shown in Figure 3. Under these settings, integral picture generation, Adaboost implementation, comprehending Haar features, and cascade approach application might all be difficult.



Fig. 3. An examination of the Haar Cascade Classifier's steps

A detection window is used to scan nearby rectangular areas in order to discover a Haar characteristic. We mix and subtract the pixel intensities of each region in this procedure. These Haar features can be readily determined using integral pictures, and very little further mathematics is required. As a result, Adaboost selects and expands on the most useful components. The method combines weak classifiers to create a "strong classifier" capable of identifying the object. Each stage of the cascade classifier has its own set of problems.

Convolutional Neural Network Algorithm:

Convolutional neural networks, a type of deep learning neural network, are used to analyze structured data sets like photos. CNN excels at identifying visual compositional elements like as lines, gradients, circles, eyeballs, and other features. Convolutional neural networks are appropriate for use in computer vision because of this characteristic. CNN can be used directly on an underexposed image without the need for any preparation. A specified number of hidden layers must be added in a specific order to form a convolutional neural network. It's a feed-

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forward neural network with multiple layers. CNN may detect hierarchical characteristics due to its sequential nature.

Several tasks relating to research have been done. They are all linked in some way. This process contains no gaps in its steps. Figure 1 is a flowchart of the method, and Figure 4 is an illustration of the procedure.



Fig. 4. The pipeline flowchart for the Smart Presence System

The initial stage in any research project is to gather relevant information. You can't call your effort groundbreaking research until you collect and analyze data. To achieve its goals, the Intelligent Presence System employs a bevy of libraries and AI approaches. Today, it is a cutting-edge, useful tool for computer vision. The Haar Cascade Classifier is used in this solution to provide immediate facial recognition. This application employs machine learning to search through both static and dynamic photos. The Python Imaging Library (PIL) was used to train the majority of the datasets. It makes image processing easier for Python users. As soon as the practice photos load, convert them to grayscale. Using this 397

method, the photos may be successfully turned into a NumPy collection with the IDs deleted. The next step is to upload the face retrieved from the training image to the ID database. The facial recognition system will save a new training dataset after each cycle. Every day, a new paper will be published.

Use a QR code technique to communicate with people outside of our company. The approach necessitates human interaction at various points. QR codes are classified into two types. The former is aimed at end users, whereas the latter is aimed at executives. Because One Type Password (OTP) was used, each password was guaranteed to be unique.

RESULT AND DISCUSSION

In order for our study project to be completed. When building a system, it is critical to find the best answer. To achieve our purpose, we used two separate types. The haar cascade predictor method has a success rate of 99 percent, making it the best option here. Table I compares the accuracy of each technique.

TABLE I. HOW TRUSTWORTHY ARE DIVERSE COMPUTATIONAL WAYS TO EVALUATING PERFORMANCE?

Algorithms	Results
Haar Cascade Classifier Algorithm	99 %
Convolutional Neural Network Algorithm	97%

850 pictures are currently cached. There were 850 test shots and 340 instructional photos in total.





Train Images
Test Images

Fig. 5. Make a slice graph.

Figure 5 depicts the changes between the train and test images. There are 850 instructive photographs and 340 assessment photographs.



Fig.6. The Matrix of Problem Solving

Statistical analysis is essential to gain a better understanding of a given topic. We notice two distinct methods. Figure 7 depicts machine learning approaches such as the convolutional neural network (CNN) approach and the Haar The Cascade Classifier. most crucial considerations are the calculation's complexity and the time necessary to finish it. The CNN algorithm takes significantly longer to process than the Haar Cascade Classifier. The computational cost of the Haar Cascade Classifier is significantly lower than that of CNN.



Fig.7. graphic representation of performance The study's primary focus is on observing and documenting people's actions. When someone approaches this project camera, it automatically takes a picture. We'll enter it into the system right away. Data will be processed when it has been gathered. Data collection, training, and testing were already finished. Make certain that the obtained data has been correctly trained. The program was then launched. Following the start of work, the algorithm will be followed, and the face will be retrieved using machine learning by comparing it to the individual's previous data. and the outcomes that followed. We use a twofold strategy in this case. There's also the Haar Cascade.



Fig. 8. Heat Map of Reliability

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The Classifier Algorithm obtains 99% accuracy, whereas the Convolutional Neural Network Algorithm achieves 97% accuracy, as seen in Figures 7 and 8. Figures 6 and 8 exhibit a confusion matrix and an association heatmap, respectively. This undertaking has the potential to help a wide range of sectors. In many businesses, attendance is still tracked manually, using paper forms. But we live in an age of advanced technology, and we should take advantage of it. these project's work increased the quality of systems like these.

CONCLUSION

The use of machine learning techniques can improve the functionality and efficiency of an intelligent presence system. A system that uses machine learning can quickly and effectively detect people in a specific location and take appropriate action based on that knowledge since it can learn and adapt to new patterns and behaviors. The application of machine learning to face recognition and identification studies has the potential to provide various valuable outcomes. Our goal is to create a new paradigm that simultaneously increases the operational security of enterprises and minimizes the time it takes to implement changes. The goal was to improve the system's performance and overall output. However, there is a significant flaw in this study. Because of its complexity, face recognition necessitates manual labeling. Our system will work as designed, but considerable changes can be made if necessary. There are some moral problems that must be addressed in any investigation. Our discoveries could have far-reaching consequences for the advancement and growth of this field of inquiry. It can be used simply to offer adequate safety. The elimination of various possible security risks benefits the company. Simply put, there isn't enough time to conduct all of the necessary research. Any future updates must be introduced in stages. Depending on the findings, this research could become an even more valuable resource in the near future. In terms of features, usefulness, and safety, newer releases will outperform earlier ones.

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