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FACE RECOGNITION IN EXAM HALL USING MACHINE LEARNING

Dr.K.BALASUBRAMANIAN AKSHAYA.S, GOKILA.R, JANAPRIYA.K, KANMANI.M

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
E.G.S.PILLAY ENGINEERING COLLEGE NAGAPATTINAM,611002.

Abstract – Maintaining integrity during examinations is important in educational institutions. Traditional methods such as manual in vigilance are labor-intensive and are often ineffective against immunization and misconduct. This paper presents an automated face recognition system using machine learning to verify the student identity in the examination hall. The system appoints the Convolutional Neural Network (CNN) for facial detection and recognition to ensure safe, real -time monitoring. This solution reduces human dependence, improves accuracy, and strengthens examination safety.

Keywords: face identity, CNN, real -time monitoring, student authentication, examination safety, deep education.

I.INTRODUCTION

It is a growing concern to ensure the authenticity of student identity during the examination. Traditional methods such as ID verification and manual supervision are often insufficient, time -taking and prone to error. With progress in artificial intelligence and deep learning, the automatic face recognition system has become a viable solution. The project introduces machine learning-based systems that verify the students' face on entry and monitor them during the examination to prevent copying.

II. LITERATURE REVIEW

Facial identification has made significant progress with deep learning and development of computer vision techniques. Traditional image processing methods for facial detection have gradually given way to the powerful firm nervous network (CNN)-based model, which now create a spine of modern facial recognition systems. These models have shown remarkable accuracy in the controlled environment, enabling applications from biometric security to automatic appearance.

However, laboratory conditions introduce the examination hall challenges such as infections in the actual environment.

Different lighting conditions, changes in facial orientation, occlusions (such as masks or accessories), and background distraction recognition can significantly affect accuracy. Studies have shown that trained models on standard datasets often fail to maintain performance under such dynamic conditions. Scientists have tackled these issues by using data expansion techniques like rotating, resizing, and tweaking brightness to make the model stronger. How a face is positioned also plays a big role in how well the system can predict. Faces that are tilted or not straight can make it hard to pick out a feature, which leads to mistakes in sorting them out. To deal with this, the alignment algorithm and pose-inverter models have been introduced. Background noise and non-human lighting in live environment can also cause false positivity. Using models such as U-Net help solutions such as face segmentation and background subtraction help to distinguish facial features.

To increase generalization in the environment, domain optimization and transfer teaching techniques have been widely discovered. Pre-ecosed models are fine using an institute-specific dataset to improve real-time recognition. In recent development

III. PROPOSED DESIGN

The proposed face recognition system for the examination hall aims to increase identification verification and monitoring through the use of advanced machine learning techniques. A high-resolution camera module is deployed at the entrance of the exam hall to capture facial images of students as they enter. These images are then processed through a convolutional neural network (CNN) -Based model trained on a dataset of pre-ingified design faces. To improve strength and accuracy, input images undergo preprosars such as noise, histogram equal and facial alignment before being fed in recognition models.

The real-world issues employ different lighting conditions, changes in facial angles, and to handle occlusions (eg, masks or accessories), data growth techniques such as image rotation, scaling, brightness and contrast growth during system training. This ensures better generalization and resilience of the model in uncontrolled environments. Additionally, the methods of division are used to focus on relevant facial characteristics, reduce interference from the background and improve the accuracy of detection.

The trained face recognition model can run based on the deployment requirements either on the local edge computing device (such as Jet son Nano or Raspberry Pie) for quick on-site verification or on the cloud server. The system is integrated into a user -friendly web or mobile application that allows the infigilater to see the entry log, match the results and receive alert in real time. In cases of mismatch or failed verification, the system triggers an alert for manual intervention.

In addition, the application can maintain

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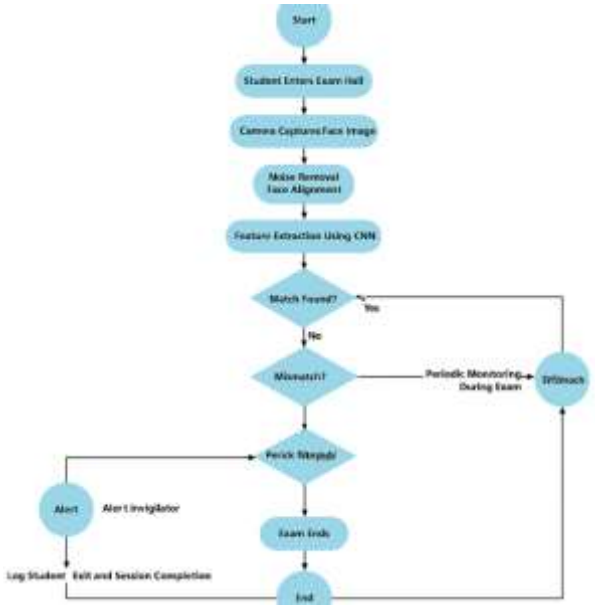
historical data of student entries and verification enable audit trails and support post -examination investigation.

ACTIVITY DIAGRAM



IV.REQUIREMENTS

Hardware Requirements

Examination hall requires a reliable and efficient hardware to ensure real -time and accurate identity verification to the facial identification system. A high-resolution camera is required to capture the images of the students at the entry points and during the examination. To effectively train deep learning models, a GPU-competent system such as Nvidia RTX 3060 or higher is recommended. For purinyogen and real -time processing, a powerful CPU ensures smoothly operating and rapid estimate speed, the Intel i7 or AMD Rven 7 (or above). Minimum 16GB RAM is required to handle the calculation of deep learning without large facial dataset and lag. Additionally, the system must have at least 500GB SSD storage to adjust training data, registered student images, models and log files. Field saints can be used to capture and verify images without relying on the cloud infrastructure with an edge computing devices such as an enclosed camera or NVDia Jetson Nano in field significance scenarios. These hardware components collectively support the efficient functioning and scalability of the system in a live examination environment.

Software Requirements

The Face Recognition System in Exam Halls is developed primarily using Python, due to its rich ecosystem and strong support for machine learning libraries. Deep learning model development is carried out using frameworks like TensorFlow or PyTorch, which provide robust tools for building and training convolutional neural networks. Image preprocessing tasks such as face detection, alignment, and enhancement are handled using Open CV, while data handling and manipulation are managed through libraries like NumPy and Pandas. For user interaction and system integration, web-based frameworks such as Flask or Django are used to build intuitive interfaces for invigilators or administrators. The system's backend requires a reliable database solution such as MySQL, PostgreSQL, or Firebase to manage student records, attendance logs, and session data. For development and testing, environments like Google Colab, Jupyter Notebook, VS Code, or PyCharm offer flexibility, visualization tools, and debugging features to streamline the workflow and accelerate the development process..

Performance metrics

In the examination hall, the facial identification system is mainly developed using the python, due to its rich ecosystem and strong support for machine learning library. Deep learning model development is performed using a framework such as tensorflow or pitorch, providing strong equipment for construction and training. OpenCV handles the image preprosying functions such as facial detection, alignment and development. NUMPY and Pandas take care of data handling and manipulation. To create a user-friendly interface for the affected or administrators, the system uses a web-based framework such as flask or Django. These help the framework system to integrate and make it easier to use.The backnd of the system requires a reliable database solution such as the backnd of the system to manage student records, attendance logs and sessions data. For development and testing, environment like Google Colab, Jupiter Notebook, vs. Code, or Pycharm provides facilities to streamline workflows and speed up workflow to flexibility, visualization tools and debugging facilities.

V.METHODOLOGY

The face recognition system identifies and tracks a person walking into the examination hall in a sequential manner. The process begins with the student's face being photographed by a digital camera placed at the entrance of the examination hall. The camera takes images of every student's face and stores it in the system. This includes cutting down on fuzzy bits, lining up facial features, and making the images more standard. Clean and aligned facial images are then passed in a deep learning model based on a deeper neural network (CNN), which removes unique facial characteristics including patterns, controversies and landmarks.

The model is trained on a label dataset, with registered students facial images, which are able to accurately identify individuals during real -time operation.On being trained, the model compares the features extracted with the stored database to identify the face and confirms whether the involved person is an authorized student or not. Results would be presented in a web or mobile interface where an infigilator would be able to monitor the status of verification. The system logs each recognition event and stores it in the backnd database for later analysis or auditing.

To increase strength, the model is adapted to data growth techniques such as rotation, brightness adjustments and scaling. This helps the system to handle real -world variations such as light, camera angle, or change in student posture. The system also supports periodic verification during the examination to prevent immunization, ensuring that the same person is present throughout the session. It ensures a safe, efficient and scalable approach for student authentication in comprehensive functioning examination settings.

VI.CONCLUSION

The face recognition system for the examination hall provides a sharp, automatic and safe solution for student

identity verification and monitoring during the examination, which reduces dependence on manual supervision. Traditional methods of identity verification are weakened for time-consuming, error-prone, and copying, while the use of deep teaching techniques ensures more accuracy, stability and scalability. With the advanced features of Conveyable Neural Networks (CNNS), the system oppresses identity verification on entry and through the entire examination period for appearance monitoring aiding in student impersonation prevention.

This system's flexibility to real-world challenges such as different illumination, changes in head poses, and alterations in location is a remarkable strength. The system is well adapted to operate with high performance in the live examination environment through robust model training with state of the art image prepressing methods and data augmentation. It is designed to act even in challenging scenarios, ensuring smooth operation without compromising accuracy.

The user -friendly web or mobile interface allows invigilator and administrators to see real -time results, receive alerts for mismatch and maintain digital logs of entry and monitoring sessions. With the help of a structured database, the system can track historical data, which can lead to better auditing and safety reviews. Integration of AI and facial recognition in examination settings is an important step towards smart and more secure educational environment.

Finally, this machine learning-based face recognition system increases operating efficiency, strengthens examination safety, and reduces manual workloads. Model with precision and ongoing reforms in data's.

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