Face Recognition Attendance System Using Ai

Marimuthu S, Mukesh s, Vasantha kumar A, Vel Murugan S
Department of Computer Science and Engineering
Hindusthan College of Engineering and Technology
Coimbatore, INDIA

Abstract— In colleges, universities, organizations, schools, and offices, taking attendance is one of the most important tasks that must be done on a daily basis. The majority of the time, it is done manually, such as by calling by name or by roll number. The main goal of this project is to create a Face Recognition-based attendance system that will turn this manual process into an automated one. This project meets the requirements for bringing modernization to the way attendance is handled, as well as the criteria for time management. This device is installed in the classroom, where and student's information, such as name, roll number, class, sec, and photographs, is trained. The images are extracted using Open CV. Before the start of the corresponding class, the student can approach the machine, which will begin taking pictures and comparing them to the qualified dataset. Logitech C270 web camera and NVIDIA Jetson Nano Developer kit were used in this project as the camera and processing board. The image is processed as follows: first, faces are identified using a Haarcascade classifier, then faces are recognized using the LBPH (Local Binary Pattern Histogram) Algorithm, histogram data is checked against an established dataset, and the device automatically labels attendance. An Excel sheet is developed, and it is updated every hour with the information from the respective class instructor.

INTRODUCTION

In today's fast-paced world, the need for efficient and accurate attendance management is crucial for educational institutions, workplaces, and various organizations. Traditional methods of attendance tracking, relying on manual processes and paper-based records, are prone to errors, time consuming, and often result in inefficiencies. However, with the advent of smart technologies, a new era of attendance management has emerged – the Smart Attendance System.

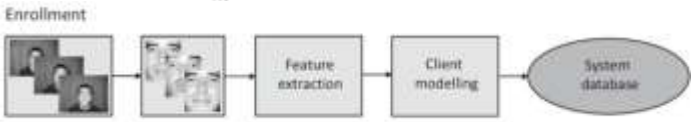
The Smart Attendance System is a revolutionary solution that harnesses the power of advanced technologies such as biometrics, Internet of Things (IoT), and artificial intelligence (AI) to automate and streamline the attendance tracking process. By leveraging these cutting-edge technologies, the system offers a range of benefits, including increased efficiency, enhanced accuracy, and improved overall attendance management.

II. METHODOLOGY

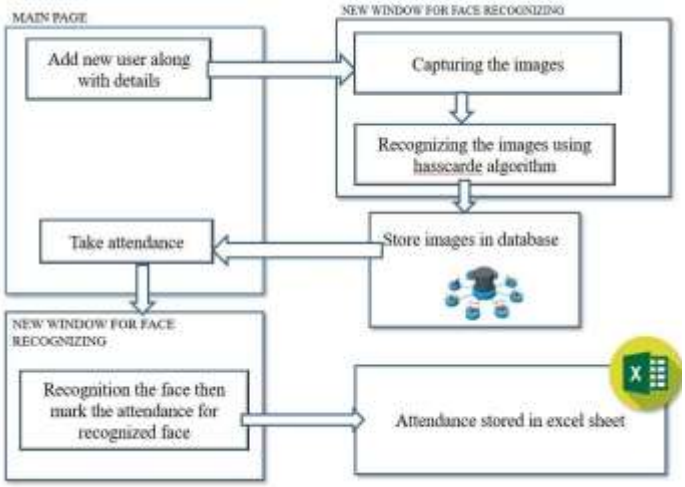
III. Biometric Authentication: Some organizations might have privacy concerns or legal restrictions regarding the use of biometric data. In such cases, alternative methods of identification, such as ID cards or unique codes, can be implemented instead of biometrics.

IV. Remote Accessibility: In certain environments or organizations with strict security policies, remote access to attendance data may not be allowed. The system can be designed to limit access to on-site devices or secure networks only.

V. Real-Time Tracking: Real-time attendance tracking may not be necessary for all organizations. If instant updates are not crucial, the system can be designed to capture attendance data at specific intervals, such as the beginning and end of each session or workday.



VI. ***Architecture***



VII. SYSTEM ANALYSIS AND SPECIFICATION

A. System Analysis

1) Existing System :

In the Existing System, Smart attendance systems often involve the collection and storage of sensitive personal data, such as facial images or biometric information. This raises privacy concerns among individuals, particularly when it comes to data security, consent, and potential misuse. Institutions must address these concerns and comply with applicable data protection regulations

a) Disadvantages :

- Many organizations still rely on manual attendance systems such as paperbased registers or swipe cards, which are time-consuming and prone to
- Some existing systems may not adequately address privacy concerns related to the collection and storage of biometric data.

2) Proposed System : The training process involves selecting the best features that can effectively differentiate between positive and negative examples. This is done using a machine learning technique called AdaBoost, which assigns weights to the features based on their performance in distinguishing between positive and negative examples.

Once the classifier is trained, it can be used to detect objects in new images or video frames. This is achieved by applying the classifier to overlapping subregions of the image and checking whether the features at those positions match the learned patterns. To speed up the detection process, the algorithm uses a cascade of classifiers.

Each classifier in the cascade consists of multiple stages, and an image or region is only passed to the next stage if it passes the previous one. This allows for faster rejection of non-object regions and focuses computation on potential object regions. The Haar cascade algorithm has been widely adopted for real-time object detection due to its accuracy and efficiency. It has been successfully applied to various applications, including face detection, pedestrian detection, and object recognition in computer vision systems.

IV. ALGORITHMS

A. Convolutional neural network

- CNNs are distinguished from classic machine learning algorithms such as **SVMs** and **decision trees** by their ability to autonomously extract features at a large scale, bypassing the need for manual feature engineering and thereby enhancing efficiency
- The convolutional layers grant CNNs their translation-invariant characteristics, empowering them to identify and extract patterns and features from data irrespective of variations in position, orientation, scale, or translation.
- A variety of pre-trained CNN architectures, including VGG-16, ResNet50, Inceptionv3, and EfficientNet, have demonstrated top-tier performance. These models can be adapted to new tasks with relatively little data through a process known as fine-tuning.
- Beyond image classification tasks, CNNs are versatile and can be applied to a range of other domains, such as natural language processing, time series analysis, and speech recognition

Why do we need a K-NN Algorithm?

Suppose there are two categories, i.e., Category A and Category B, and we have a new data point x1, so this data point will lie in which of these categories? To solve this type of problem, we need a K-NN algorithm. With the help of KNN, we can easily identify the category or class of a particular dataset.

B. Key components of CNN?

Convolutional layers

Rectified Linear Unit (ReLU for short)

Pooling layers

Fully connected layers

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