

**Title: Smart Automated Classroom Attendance System Using Face Recognition**

**<Submitted by>**

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**Project Description**

**Abstract**:

The project aims to develop an automated attendance system for classrooms using camera equipped with facial recognition technology. Traditional attendance tracking methods often suffer from inefficiencies, such as manual recording errors and time-consuming processes. By leveraging cameras and advanced facial recognition algorithms, this system offers a more accurate, efficient, and convenient way to monitor student attendance in educational settings. The system logs attendance in real-time, provides notifications of anomalies.

**Introduction**:

Attendance tracking is a critical aspect of classroom management in educational institutions. Manual methods, such as taking roll call, are prone to errors and consume valuable instructional time. In response to these challenges, the project proposes an automated attendance system that utilizes cameras for seamless and accurate attendance monitoring.

**Objectives:**

* Develop a system that integrates in classrooms.
* To automate attendance marking processes using machine learning for accurate face recognition.
* To ensure high accuracy in face recognition, capable of working in various lighting and environmental conditions.
* To create a scalable and secure system that can handle the addition of new users (i.e., faces) and safeguard personal data.
* Automatically log attendance data in real-time and store it securely.
* Provide administrators with access to attendance records, real-time monitoring, and analytics.
* Ensure compliance with data privacy regulations and security standards.

**Technical Specifications:**

* **Model Choice**:

Consider using convolutional neural networks (CNNs) for face recognition. Pre-trained models such as VGGFace,FaceNet, or DeepFace can be fine-tuned on a specific dataset to improve accuracy.

* **Programming Language:**

Python, due to its comprehensive support for data science and machine learning libraries.

* **Database Management:**

A relational database like MySQL or PostgreSQL for storing attendance records; MongoDB can be an alternative for more flexible data storage.

* **Deployment Platform:**

Web application (using frameworks like Flask or Django).

**Development Steps:**

* **Dataset Collection and Preparation:**

Collect a dataset of face images for all individuals. This dataset must be large and varied enough to train a robust model. Preprocess the images (resize, normalize, etc.) to make them suitable for training.

* **Model Training:**

Select a suitable machine learning model for face recognition. You could start with a pre-trained model and fine-tune it on your specific dataset to improve its accuracy. This process involves training the model to recognize the distinct features of each individual’s face.

* **System Integration:**

Integrate the trained model into an application that captures images from a video feed, uses the model to recognize faces, and marks attendance by logging the date, time, and person's identity into a database.

* **User Interface Development:**

Develop a user-friendly interface for both administrators and users. For administrators, provide functionalities to add or remove individuals from the system and manage the database. For users, ensure the interface is simple and requires minimal interaction.

* **Testing and Evaluation:**

Rigorously test the system to evaluate its accuracy and performance in real-world conditions. This may involve testing with different lighting conditions, angles, and facial expressions to ensure the model's robustness.

**Challenges:**

* **Accuracy in Varied Conditions:**

Ensuring the model accurately recognizes faces under different lighting conditions, angles, and facial expressions.

* **Scalability**:

Designing the system to easily accommodate new users and handle large databases efficiently**.**

* **Privacy and Security**:

Implementing strong data protection measures to safeguard personal information.

**Functional Requirements:**

* **Camera Integration:**

The system shall integrate with cameras installed in the classroom to capture real-time footage.

* **Face Recognition:**

The system shall employ facial recognition algorithms to accurately identify students present in the classroom.

* **Attendance Logging:**

The system shall automatically log the attendance of each student based on their presence in the classroom captured by cameras.

* **Real-time Monitoring:**

The system shall provide real-time monitoring capabilities to track attendance as students enter or leave the classroom.

* **Multiple Camera Support:**

The system shall support multiple cameras if the classroom is equipped with more than one camera for comprehensive coverage.

* **User Interface:**

The system shall have a user-friendly interface for teachers/administrators to view attendance records, monitor real-time attendance, and manage the system.

* **Notification System:**

The system shall integrate a notification system to alert teachers/administrators of any anomalies or discrepancies in attendance records.

* **Scalability:**

The system shall be designed to be scalable, allowing for easy expansion to accommodate additional classrooms or camera installations if needed.

* **Integration with Existing Systems**:

The system shall provide the ability to integrate with existing student information systems or databases for seamless attendance management.

**Non-Functional Requirements:**

* **Accuracy**:

The facial recognition algorithm shall achieve a minimum accuracy rate of 80%-85% in identifying students present in the classroom.

* **Security**:

The system shall implement user authentication for administrator access to prevent unauthorized access.

* **Scalability**:

The system architecture shall have capability to extend classrooms.

* **Response Time**:

The system shall respond to notifications of attendance anomalies or discrepancies within 1 minute of detection.

The user interface shall respond to user interactions (e.g., selecting a classroom, viewing attendance records) within 2 seconds.