

IOT Attendance Recognition System Using LBPHFaceRecognizer

Abstract

In the pursuit of streamlining attendance management in educational and corporate settings, this paper introduces an advanced Attendance Recognition System (ARS) employing the Local Binary Patterns Histogram (LBPH) Face Recognizer algorithm, executed on a Raspberry Pi microcontroller. The ARS is designed with a focus on data sovereignty, ensuring that attendance records are securely uploaded to local storage, countering the common trend of cloud reliance. This paper delves into the technical intricacies, operational efficiency, and security advantages of the proposed system, highlighting its potential to revolutionize traditional attendance tracking methods.

The ARS operates through a camera module interfaced with the Raspberry Pi, capturing facial images in real-time for processing via the LBPHFaceRecognizer. This process involves the extraction of distinctive facial features, which are then used to identify individuals against a pre-stored database of registered faces. The LBPH algorithm, known for its robustness and high accuracy in varying lighting conditions, performs feature extraction by analyzing pixel intensity patterns and generating histograms that represent local features of the face. Upon successful identification, the system automatically updates the attendance log within the local storage system, thereby ensuring immediate and accurate attendance recording.

One of the standout features of the ARS is its integration of Internet of Things (IoT) principles, which facilitates the interconnectivity of devices within the local network. This interconnectivity allows for real-time updates and synchronization of attendance data across all connected devices within the network. By avoiding reliance on external cloud storage, the system enhances data security and ensures that the administering authority retains full control over the data. This local storage approach addresses privacy concerns and mitigates risks associated with data breaches and unauthorized access that are prevalent in cloud-based solutions.

The cost-effective nature of the ARS makes it a viable solution for a wide range of applications, from small educational institutions to large corporate environments. The use of a Raspberry Pi microcontroller, known for its affordability and versatility, significantly reduces the overall system cost while maintaining high performance. Additionally, the system's scalability allows for easy expansion to accommodate an increasing number of users without compromising on efficiency or accuracy.

Operational efficiency is further enhanced by the system's non-intrusive and automated method of attendance tracking. Traditional methods, which often involve manual input and are prone to human error, are replaced by a seamless and reliable process. This not only reduces administrative workload but also ensures that attendance data is consistently accurate and up-to-date. The ARS's user-friendly interface and automated functionality mean that minimal training is required for administrators, further reducing the implementation and operational overheads.

Moreover, the ARS prioritizes data privacy, aligning with stringent data protection regulations and best practices. By maintaining attendance records on local storage, the system ensures that sensitive information is not exposed to external threats. This local data control is particularly crucial for institutions that handle large volumes of personal data and are subject to rigorous compliance requirements.

In conclusion, the Attendance Recognition System using the LBPH Face Recognizer on a Raspberry Pi microcontroller offers a robust, secure, and efficient solution for attendance management. Its emphasis on local data storage, coupled with the scalability and cost-effectiveness of the system, makes it an attractive alternative to traditional and cloud-based attendance tracking methods. The ARS not only enhances operational efficiency and reduces

human error but also upholds a strong commitment to data privacy and control, setting a new standard for attendance management in educational and corporate settings.