

Automated Student Attendance Management Using Real-Time Face Recognition

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Abstract

This paper presents a facial recognition-based student attendance management system aimed at automating and improving accuracy for students attending extra classes. Traditional manual attendance methods are time-consuming and inefficient for large student populations. The proposed solution utilizes Python programming, OpenCV for real-time computer vision, and Tkinter for the graphical interface. The system captures students' facial images via webcam, stores them in a structured dataset, and trains a recognition model using the Local Binary Pattern Histogram (LBPH) algorithm. During each class session, the system matches live webcam input with the training dataset, records identified student attendance in real-time, and exports the data in CSV format for easy tracking and reporting. The core functionality streamlines the attendance process and increases reliability. Extensive testing was conducted with over 190 students across multiple sessions under varying lighting conditions, including morning, day, and night. The system demonstrated a recognition accuracy exceeding 90%, with an average accuracy of 94%, supported by comparative tables of different conditions. Additionally, the system effectively minimized false positives, with only rare instances of misidentifying outsiders as students. Clear figure labeling and tabulated accuracy comparisons validate the robust performance of the system. These outcomes underline its potential as a scalable and reliable solution for educational institutions. Additionally, the system provides a foundation for future enhancements, such as integration with SMS-based parent notifications and adaptation for general attendance management.

Keywords: Face Recognition, Attendance Automation, Machine Learning, Python, OpenCV