

AI-Powered Attendance System Using or Codes and Facial Recognition

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Abstract

This research introduces a Safe and Smart Dual Authentication Student Attendance System using Facial Recognition and QR Code verification to eliminate proxy attendance and enhance operational efficiency in academic institutions. The primary objective was to design an accurate and fraud-resistant system employing two distinct methods of verification. Initially, a facial dataset with 25 classes was collected from Google images. However, the dataset was too small, and when trained with a baseline Convolutional Neural Network (CNN), class imbalance and overfitting resulted in low accuracy. To address this issue, the dataset was expanded and balanced to 30 classes, each containing exactly 100 images (3000 images in total). All images were in RGB format, resized to 224×224 pixels, and preprocessed to standardize lighting and background. To improve robustness and reduce overfitting, data augmentation techniques such as rotation, zoom, horizontal flipping, and translation were applied. With these enhancements, the baseline CNN was replaced by MobileNetV2 transfer learning to achieve better feature extraction. Performance was further improved through gradual unfreezing of the final layers, fine-tuning, learning rate adjustment, and dropout regularization. The optimized MobileNetV2 model achieved 85.4% training accuracy and 71.0% validation accuracy, representing a significant improvement over the baseline CNN. Each student was also assigned a unique encoded QR code storing identity attributes. Attendance was recorded only when both the facial recognition and QR code matched, ensuring secure verification. The proposed system demonstrates improved accuracy, scalability, and resilience against fraudulent attendance marking. Limitations include the need for consistent real-time image quality. Future work will explore cloud-based scalability, adaptation to diverse environments, and validation on larger real-world datasets.

Keywords: Face recognition, MobileNetV2, Dual authentication, CNN, QR Code