SMART ATTENDANCE SYSTEM WITH YOLO BASED UNIFORM COMPLIANCE DETECTION

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Abstract:

Maintaining discipline in educational institutions requires strict compliance with uniform policies and effective attendance monitoring. Traditional methods often rely on manual checks, which are time-consuming and prone to human error. To address this, our system leverages computer vision and deep learning to automate uniform compliance verification and attendance tracking. A custom YOLOv8 model ensures consistent detection of students wearing improper attire, while facial recognition accurately identifies individuals.A Flask-based web application provides a secure interface for accessing attendance records, which are safely stored in a CSV file. Authentication mechanisms restrict access to authorized personnel, ensuring data security. To further streamline enforcement, the system integrates Twilio to send automated SMS notifications to students who are out of uniform, reducing the need for manual intervention. This approach enhances scalability, reliability, and efficiency, making it ideal for institutions seeking automated, real-time compliance monitoring. By minimizing human involvement, the system ensures fair enforcement while maintaining discipline in a seamless and effective manner. The combination of deep learning, facial recognition, and web-based authentication results in a comprehensive solution that improves uniform compliance while reducing administrative workload.

Keywords: Automated, Authentication, Computer Vision, Deep Learning, Face Recognition, Flask Web App, Uniform Compliance, YOLOv8.

I. INTRODUCTION

Accurate attendance tracking and constant compliance are crucial in educational institutions. Traditional manual monitoring methods are usually time-consuming, inefficient, and prone to human error, which leads to inaccurate data and makes it difficult to enforce uniform laws. The larger the institution, the greater the need for a reliable and automated system. This study accelerates uniform identification and attendance tracking through the use of deep learning and computer vision. A specifically trained Yolov8 model is used to identify students and verify that they are wearing the required attire [3], [5].Additionally, accurate student identification is ensured by face recognition, which lowers fraudulent attendance records and ensures authenticity [7],[6]. Together, these technologies offer a seamless, automated way to monitor student compliance. An HTML and Flask webpage with an intuitive UI makes it simple for authorized workers to examine attendance records [1]. In order to enforce uniform compliance, Twilio is integrated to automatically alert students who are not wearing their uniforms [2],[4].By automating uniform monitoring and attendance tracking, this technology improves accuracy, decreases human labour, and ensures that institutions can maintain discipline more successfully [8],[9].

II. LITERATURE REVIEW

[1] " Student Attendance System using Face Recognition": In this paper system was tested on three different algorithms out of which the KNN algorithm proved to be better with the accuracy of 99.27%. The system was tested on various conditions which includes illumination, head movements, expressions, the distance of students from the camera.

[2] "Automated Smart Attendance System using Face Recognition ": The proposed method consists of different stages to mark the attendance live. A. Face detection B. Database Creation and Training C. Face Recognition and Updating attendance.

[3] " Traffic Sign Detection and Recognition using YOLO Object Detection Algorithm ": The goal of this research is to systematically analyse the YOLO object detection algorithm, applied to traffic sign detection and recognition systems.

[4]" non-uniform imaging object detection method based on NU_YOLO ": LiDAR (Light Laser Detection and Ranging) is a potential technology that can acquire multi-dimensional and multi-wavelength imaging information. A non-uniform sampling strategy is implemented to enhance the imaging speed, but this system's data can't be efficiently processed and detected. In this paper, we introduce a novel method for object detection in non-uniform imaging, aiming to improve scene analysis and enhance the object detection effect. We use the KITTI dataset with a non-uniform sampling strategy to generate a simulation dataset and design and train NU-YOLO (Non-uniform YOLO) to detect the object in non-uniform images

Redmon [2016] highlights YOLO's real-time detection capabilities when introducing it as a unified object detection system. This work set a standard for object detection research and prepared the way for later iterations of YOLO [5].

Chauhan et al. [2019] use an embedded CNN approach to classify and count vehicles in non-laned traffic situations. Their research shows how deep learning models can adjust to unstructured settings, enhancing traffic control and road safety [6].

III. PROPOSED SYSTEM

1.The system is designed to automate student attendance while ensuring uniform compliance using **face recognition and object detection**. It consists of three main modules: **Face Recognition& Uniform Verification**. This module detects students, verifies their uniform compliance, and records attendance. A camera captures real-time video as students enter the classroom. A **YOLOv8** model detects students' faces and classifies them into **"Uniform"** and **"No Uniform"** categories. To correctly associate each face with a uniform status, the system uses the shortest perpendicular downward distance method.

2.Attendance Marking & CSV Logging

Once a student's face is recognized, their attendance is automatically recorded in a CSV file. If a student is wearing a uniform, attendance is marked along with the Name, Roll Number, Date, Time, and Uniform Status. If a student is not wearing a uniform, their attendance is not marked, but they are added to the "No Uniform" list in the CSV file. The CSV file serves as the primary attendance record for faculty reference.

3. SMS Notification System

Students who are not in uniform receive an automatic SMS notification about their fine. The system scans the attendance CSVfile to identify students marked as "NoUniform. "Using a pre-stored phone number list, an SMS is sent to inform students about the fine and provide a payment link.

4. Web-Based Admin Panel (Flask)

Faculty and admin users can log in to view attendance and manage fine-related actions. The Flask-based web dashboard allows faculty to view attendance records, check uniform compliance. The system does **not support student login**, ensuring only faculty/admin have access.

IV. METHODOLOGY

1.Data Collection and Preprocessing
Preparing the Uniform Dataset: A unique dataset of pictures of students wearing and not wearing uniforms is gathered. Students who are uniform and those who are not are identified by annotations on the images.
Face Dataset for Recognition: To identify students, pictures of them are gathered and encoded. Dlib-based face recognition is used to create face embeddings.

Data Augmentation: To increase the robustness of the model, methods such as brightness modifications, rotation, and scaling are used.

2.Object Detection Using YOLOv8

To identify students and categorize their uniform status, the annotated dataset is used to train the custom YOLOv8 model. The model is used to process live video streams or camera-captured images. The bounding box coordinates and classification outcomes are extracted once each identified student has been examined.

3.Face Recognition for Student Identification

To match identified faces with student records that have been stored, Dlib's deep learning-based facial recognition technology is utilized. The system uses Euclidean distance to compare the facial embeddings it has extracted from the discovered students with the pre-stored embeddings in order to accurately identify them. The ID numbers and attendance records of identified students are matched to them.

4. Attendance Tracking and Data Storage

After a student has been identified, Pandas is used to register their attendance status into a CSV file. Information like the student ID, name, date, time, and uniform compliance status are all included in the CSV file.Through a Flask-based web application with authentication to provide restricted access, the data is safely stored and accessible.

5.Web Application for Data Access

To enable authorized personnel to examine attendance records, a web application built with Flask and HTML is created. Only project participants will be able to access the data thanks to the login mechanism. In addition to showing attendance status, the website give access to download previous or all CSV files

6. Automated SMS Notifications Using Twilio

Using the Twilio API, an automatic SMS notification is delivered to students who are found to be missing their uniform. To guarantee compliance, the notification contains the student's information as well as the infraction. For tracking purposes, sent message logs are kept.

7. System Deployment and Testing

Real-time classroom settings are used for testing the system to make sure that item detection, face recognition, and attendance recording are accurate. Performance reviews are made using the following criteria: Detection accuracy (uniform categorization of Yolov8),Accuracy of facial recognition, Rate of notification success. Test

findings are used to inform optimizations and improvements.

V.   RESULT

Fig1:Detection of Uniform

Fig2:Detection of ID

Fig3:Login Page for Accessing CSV file

All CSV Files

- attendance_2025-03-11.csv
- attendance_2025-03-10.csv
- attendance_2025-03-07.csv
- attendance_2025-03-06.csv
- attendance_2025-03-05.csv
- attendance_2025-03-04.csv

Fig4:List of CSV files

Attendance Dashboard

Logout Download Latest CSV

Fig5:Attendance Dashboard

VI. CONCLUSION

Using machine vision and deep learning, the Attendance Monitoring and Fine System for Non-Uniform Students automates uniform compliance and attendance tracking. Accurate identification is ensured by dlib-based face recognition, while a proprietary YOLOv8 model detects students and validates uniforms. A Flask web application with authentication is used to access attendance records, which are safely saved in a CSV file. By using Twilio integration, manual involvement is reduced by sending automated SMS alerts to students who are not uniform. In educational institutions, this system improves accuracy, efficiency, and the application of discipline.

VII. REFERENCES

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