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Development of Face Recognition for Faculty Attendance Monitoring System

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Abstract **- This study explores the development of a Face Recognition for Faculty Attendance Monitoring System at Tagoloan Community College, aimed at automating attendance tracking, enhancing accuracy, and providing real-time monitoring. The system integrates facial recognition technology with a web-based platform to record faculty attendance as they enter and exit classrooms. It captures real-time facial data, compares it with stored embeddings, and cross-checks faculty schedules to validate attendance. Key features include automated attendance logs, leave management, and comprehensive reporting tools for administrative use. The system's performance is assessed in terms of recognition accuracy, operational efficiency, and user satisfaction, while ensuring the integrity and security of stored data. Although it effectively automates the attendance process, limitations include reliance on pre-enrolled facial data and environmental factors that may affect recognition performance. Overall, the proposed solution provides a reliable, efficient, and scalable alternative to traditional manual attendance systems, supporting improved decision-making and transparency in faculty monitoring.**

Keywords - Face Recognition, Attendance Monitoring, Agile Methodology, Facial Embeddings, Pretrained Model

I. INTRODUCTION

Artificial intelligence has significantly influenced the field of management and education with automation that ensures a higher degree of accuracy and efficiency in processes and tasks. Of the different technologies that have emerged in this field, facial recognition technology based on deep learning has found prominence as a better substitute for the manual process of attendance tracking [1].

For the Tagoloan Community College (TCC) faculty, attendance tracking is done manually by a checker tracking more than 50 faculty members in nine buildings and 44 classroom seats. Such a manual task taking up to 10-20 minutes per building is also susceptible to delays and errors arising from events in the institution and the unavailability of the checker. Inconsistent tracking data, especially when the institution is full and during bad weather conditions, also results in the use of estimates, which are further attached by a pass slip.

There is a practical remedy introduced by facial recognition technology, which can automatically authenticate identities by utilizing biometric traits [5]. The proposed system encompasses real-time camera recognition, automatic attendance recording, and a central database. The necessary components are real-time surveillance, handling teaching load and subjects, user roles, and automatic report processing. Unauthorised guests are labeled 'unknown' to ensure only authorized teaching staff can have their data recorded. An online interface utilises HTML, CSS, JavaScript, and the Laravel technology database, while the facial recognition operations are performed using Python programming and the InsightFace library. Real-time camera control is achieved using aiortc, aiohttp, and aiohttp_cors, whereas MySQL ensures a safe storage mechanism. The proposed system can eliminate manual efforts, downtime, and make TCC's activities compatible with contemporary educational technology [6].

II. PROBLEM STATEMENT

This is one important administrative task within the higher education system, to support workload justification and performance assessment and institutional accountability. In general, at TCC, the faculty attendance is still monitored by a designated checker who has to go around nine buildings and 44 classrooms to monitor more than 50 faculty members. It is time-consuming, inefficient, and often inaccurate, particularly in highly busy times of the year, in bad weather conditions, and when multiple institutional events occur simultaneously. Often, records are incomplete or estimated; other measures are being implemented to further complicate verification, such as pass slips.

These inconsistencies, in turn, impact fundamental administrative functions such as the validation of teaching loads, generation of faculty evaluations, and preparation of various reports for department heads. In addition, the manual system limits timely access to attendance data, increases workload on attendance personnel, and opens up avenues to inaccurate or fraudulent entries.

At present, TCC has no automated attendance system that could check and store faculty data centrally. Because of this need, there is a call for technology integration that will improve efficiency, accuracy, and reliability in tracking faculty attendance and reduce intervention to the minimum possible while providing informed decision-making options for the administration.

III. OBJECTIVES OF THE STUDY

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In this study, the objective is to create the Face Recognition Attendance Monitoring System for Faculty to make attendance monitoring more accurate, efficient, and even remotely manageable using the web-based platform. Face recognition technology, database management, and GUI or graphic interface were merged together to create the attendance monitoring system at Tagoloan Community College.

- To collect and interpret the requirements for designing a facial recognition system for attendance monitoring.
- To develop a user-friendly interface which could cater to the requirements of the Admin, department head, and attendance checking personnel of their organization.
- To develop an automated system for monitoring attendance that uses facial recognition to enable correct identification and tracking of attendance.
- To monitor attendances in real-time and automatically produce attendance records and reports for administrative purposes.
- To maintain the integrity and security of the data stored.
- To test the functionality of the system and overall performance through functionality testing and scenario-based testing and then usability testing by SUS.

IV. REVIEW OF RELATED WORK

The applications of biometric technologies to enhance attendance monitoring in educational institutes have recently been discussed, among which face recognition has become a popular trend due to the contactless nature of the mode, efficiency, and reduced proxy attendance. Smitha et al. [1] proposed a face recognition-based attendance system that automated identity verification and attendance recording, achieving higher accuracy than manual logbooks and proving suitable for academic environments.

Some comparative studies have reviewed face recognition among other biometric approaches. Omari and Jardat [4] compared fingerprint, RFID, and face recognition systems and concluded that although face recognition requires higher computation, it is more convenient and scalable than other methods. Similarly, Jha et al. [5] found improved reliability and reduced administrative workload in a smart attendance system using face recognition.

Advances in deep learning have further enhanced facial recognition performance. Deng et al. [7] proposed RetinaFace, a deep learning-based face detection framework capable of accurately detecting faces under challenging conditions. Building on such models, Gowda et al. [8] and Sunaryono et al. [9] demonstrated improved recognition accuracy and processing speed for real-time classroom attendance systems.
Several studies have emphasized the integration of face recognition systems with centralized databases and administrative platforms. Oluyemi et al. [6] highlighted that centralized data management combined with real-time monitoring enhances transparency and supports decision-making. Web-based systems developed by Amora et al. [10] and Domingo and Ladia [11] enabled efficient attendance management through dashboards and automated reporting tools.

While there has been significant progress in this field, most existing systems primarily target student attendance, operate in controlled environments, and lack faculty-centric features. Ismail et al. [12] emphasized the need for attendance systems aligned with institutional administrative workflows. These gaps indicate the necessity for a scalable, faculty-focused, real-time attendance monitoring solution, which the present study aims to address.

V. METHODOLOGY

This study presents the methodology undertaken to develop Face Recognition Faculty Attendance Monitoring System at Tagoloan Community College. An Agile development approach shall be adopted with seven phases: Plan, Design, Develop, Test, Deploy, Review, and Launch. Agile will be employed for this thesis because it is characterized by iteration and flexibility, which allows continuous improvement, early issue detection, and rapidly acting upon any technical challenges and user feedback.

Fig. 1 Agile lifecycle, adapted from Pratama & Kristiana (2023)

In designing and building this system, it applied a structured planning and design and development methodology. In this planning aspect of system design and development, there was input gathered from key stakeholders, which included the Vice President for Academic Affairs (VPAA), attendance checkers, and department heads. An interview and structured questionnaire were used in gathering data, which was analyzed to identify system requirements. In addition, identified data privacy and security concerns were also taken into consideration. These were in compliance with the Data Privacy Act of 2012.

During the design phase, both low and high-fidelity prototypes were developed through Figma. Feedback from stakeholders was integrated from the initial stages of the process to cater to system alignment. The system functionality and interaction were designed by sequence diagrams, use case diagrams, and entity-relationship diagrams, and the system architecture included modularity to enable scalability and further improvement.

During the development phase, the implementation of the system components was done iteratively. While working on the backend, the programming was done using the Laravel

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framework with an MVC structure to make the system easily maintainable and modularizable [13]. On the other hand, the user interface was developed using HTML, CSS, and JavaScript to make it responsive and interactive. In the recognition system, tasks were done in Python using OpenCV and InsightFace for real-time recognition and matching purposes. APIs made the communication between the recognition system, the developed website, and the MySQL database seamless.

VI. RESULTS AND DISCUSSION

This study reports the findings of the Face Recognition-Based Faculty Attendance Monitoring System implementation and evaluation. This includes assessing system performance with regards to accuracy of face recognition, usability, and system tasks. Findings are analyzed in light of actual system functioning, face recognition tests done in different environments, and system feedback from school administrators and attendance office personnel.

A. Implementation Outcomes

The Face Recognition Enhanced Monitoring System was implemented with the core features defined during the design and development phases, including a high accuracy and efficient recognition library, user-friendly interface, leave and pass management, and administration tools. The deployed system was functionally evaluated through scenario-based testing conducted with student participants and guidance counselors to verify end-to-end workflow completion.

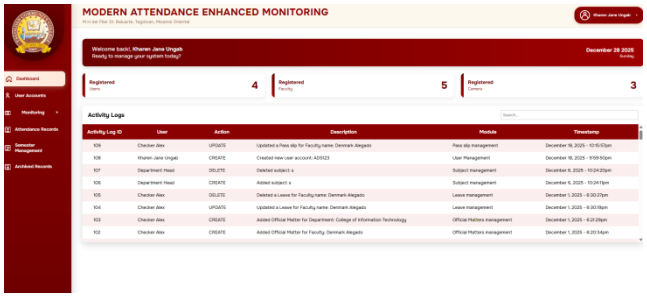

Fig. 2 High Fidelity Web Interface for the Face Recognition Attendance Monitoring System

Figure 2 shows the implemented admin dashboard interface, used during scenario-based testing, supports administrative tasks including user account creation, activity log monitoring, and access to the system's main functions. Observations indicate stable task completion with minimal operational issues, while user feedback identified areas for improvement in navigation clarity and the specificity of guidance provided.

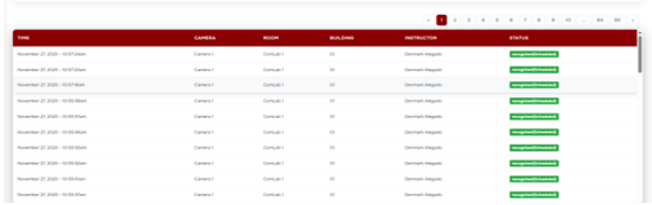

Fig. 3 Results of the Recognition

Figure 3 shows the recognition results captured by the camera are affected by distance, angle, and lighting conditions. Testing indicates that the camera can recognize faces up to 13 ft away. Registration of multiple angles improves model accuracy, and better lighting conditions further enhance recognition performance. As shown in the figure, a distance of 1–7 ft from the camera yields 100% face recognition accuracy.

B. Usability and Task Performance

The usability evaluation of the Face Recognition Faculty Attendance Monitoring System was conducted to assess its effectiveness, efficiency, and overall user satisfaction in a real-world academic setting. This evaluation focused on key aspects such as task performance, system accuracy, response time, and ease of use. By analyzing both quantitative metrics and qualitative feedback, the study aimed to determine how well the system supports faculty attendance monitoring and to identify areas for potential improvement. The results provide valuable insights into the system's practicality, reliability, and readiness for deployment within Tagoloan Community College.

TABLE 1 Final SUS Score Computation

Participant	Sum of the Adjusted SUS Score	SUS Score (Sum x 2.5)
P1	31	77.5
P2	38	95
P3	28	70
P4	23	57.5
P5	21	52.5
Average SUS Score	-	70.5

Table 1 presents the computed SUS scores of the participants. Based on the results, Participant 2 obtained the highest score, which falls within the excellent range. This can be attributed to the participant's prior experience with similar systems, indicating that familiarity and experience can positively influence SUS scores. Participants 1, 3, 4, and 5 received marginal SUS scores, which correspond to a "good" usability rating, with Participant 5 obtaining the lowest score. The lower score of Participant 5 may be influenced by their age group, which falls between 45–54 years old, as well as their lack of experience with similar systems. Their technical proficiency, which ranged from intermediate to beginner, may have also contributed to this outcome. These findings suggest that age and prior experience can significantly affect SUS performance.

After computing the overall SUS score of all participants, the system achieved a score of 70.5, indicating good usability but also highlighting areas that require improvement. In particular, the system needs enhancements to

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reduce complexity and shorten the learning curve for users. Improvements should focus on better accommodating first-time users and individuals in higher age groups to ensure a more accessible and user-friendly experience.

C. *Discussion*

- The Face Recognition Faculty Attendance Monitoring System significantly reduced attendance recording time while maintaining high accuracy, demonstrating efficiency and reliability for academic settings.
- SUS results indicate excellent usability (average score 70.5), confirming that the system is intuitive and user-friendly; minor limitations under low lighting or extreme angles are left for future improvement.
- Integration with a web-based platform allows centralized monitoring and reporting, providing a scalable solution for faculty attendance management.

VII. CONCLUSION AND FUTURE WORK

The Face Recognition–Based Faculty Attendance Monitoring System successfully automated faculty attendance at Tagoloan Community College, improving accuracy, reducing manual workload, and supporting administrative efficiency. Developed using Agile methodology, the system leveraged Laravel for backend development, MySQL for data management, and Python with InsightFace for facial recognition, ensuring iterative improvements and alignment with stakeholder requirements.

A. *Conclusions*

The system met its objectives by providing a user-centered interface, real-time attendance tracking, automated log generation, and secure role-based data access. Facial recognition minimized human error, while centralized storage ensured data reliability. Feedback highlighted areas for improvement, guiding future development toward enhanced usability, scalability, and system integration.

Recommendations and Future Work

1. **Advanced Facial Recognition** – Integrate more robust algorithms to improve recognition under diverse environmental conditions, including lighting variations and face coverings.

2. **Scalability Enhancements** – Optimize backend architecture to handle larger datasets, more faculty members, and complex scheduling requirements.

3. **Institutional Integration** – Connect with Faculty Portal, HR, and Payroll Systems for automated synchronization of attendance, work assignments, and compensation processes.

4. **Enhanced Reporting and Analytics** – Implement comprehensive dashboards to analyze attendance trends, punctuality, and faculty engagement for data-driven decision-making.

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