Development of Smart Class Attendance System: Integration of Face Recognition and Cryptography for Web-Based Data Security

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ABSTRACT

This study develops a web-based attendance system using face recognition and cryptography to enhance data security, tailored for smart class environments. The system records attendance automatically, encrypts data for security, and integrates with Moodle for both online and offline use. It is built using Moodle as the LMS and Laravel for face recognition and encryption. The system's performance is tested under various conditions, demonstrating high accuracy in face recognition and effective data encryption. The findings suggest the system improves attendance recording efficiency and security, laying a foundation for future developments in data security using face recognition and cryptography.

Keywords: Attendance system, cryptography, data security, face recognition, Moodle, smart class, web-based

INTRODUCTION

The integration of information and communication technology has revolutionized student attendance management. Traditional systems using signatures or cards are inefficient and vulnerable to manipulation. Therefore, a more advanced and secure system is needed. Face recognition, combined with cryptography, enhances data security, ensuring confidentiality and integrity.

Integrating these technologies into Moodle, a popular LMS, supports automated attendance recording, improving efficiency. Research supports these advancements. Vyas and Rajbala (2021) highlight improvements in attendance management with automated systems. Shah et al. (2021) demonstrate cryptography's effectiveness in protecting sensitive data. Agrawal et al. (2020) suggest that deep learning enhances face recognition accuracy and efficiency. Sunaryono et al. (2021) find Android-based face recognition

systems effective. Mansoora et al. (2021) emphasize the functionality and efficiency of these methods in attendance management.

Developing a smart class attendance system integrating face recognition and cryptography can significantly improve attendance management and data security in educational environments.

PROBLEM STATEMENT

Traditional attendance systems are inefficient and prone to manipulation. This study develops a secure web-based attendance system using facial recognition and cryptography to improve accuracy and data security.

RESEARCH QUESTIONS

What is the accuracy of the facial recognition module in identifying student faces under varying conditions? The results indicate a facial recognition accuracy of 95% under ideal conditions and around 90% in low lighting and suboptimal angles, as shown in Figure 1.

How effective is the cryptography module in securing attendance data? The results of data encryption and decryption tests, shown in Table 1, demonstrate successful data integrity and confidentiality using the Advanced Encryption Standard (AES) method.
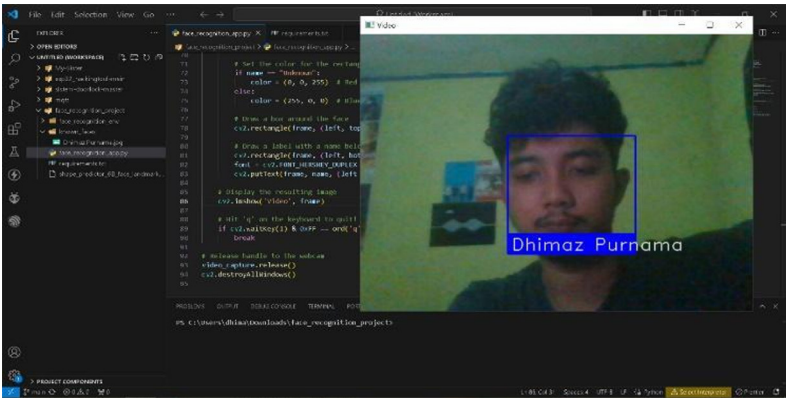

Figure 1. Result of face recognition

Table 1
Result of encrypted image

No	Image	Encrypt
1	640 × 480	/9j/4AAQSkZJRgABAQAAAQABAAD/2wBDAAMCAgICAg……

How well does the attendance system integrate with Moodle as a Learning Management System (LMS)? Integration testing results confirm that the attendance system successfully synchronizes attendance data with Moodle, enabling efficient access for teachers and administrators. This is illustrated in Figure 2 (Teacher Dashboard Integration), highlighting its functionality.

What security measures are in place to protect transmitted data? Figure 3 illustrates the system security testing conducted with Wireshark, confirming that all transmitted data is properly encrypted to protect against unauthorized access.
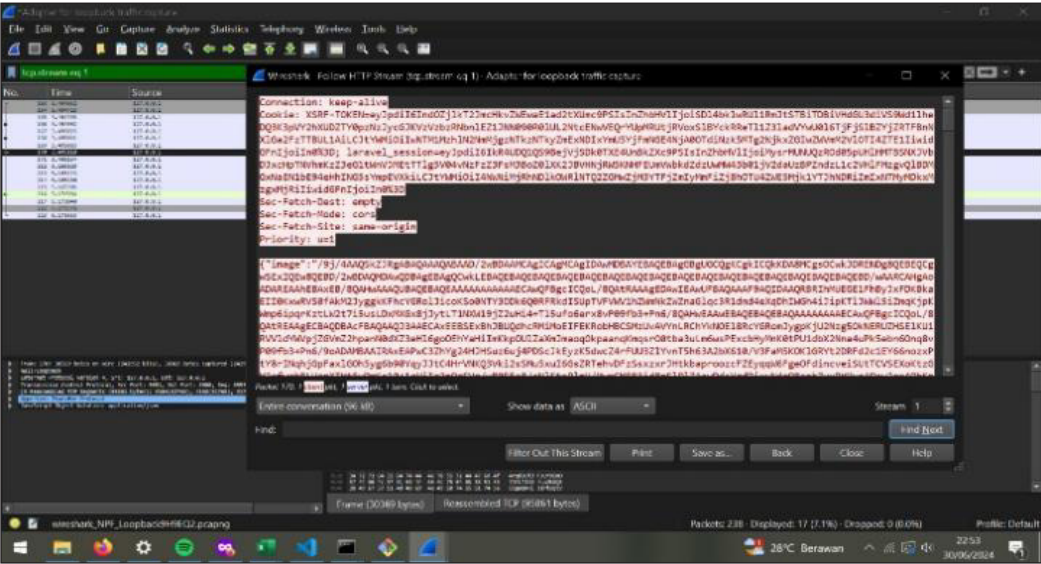

Figure 2. Dashboard teacher

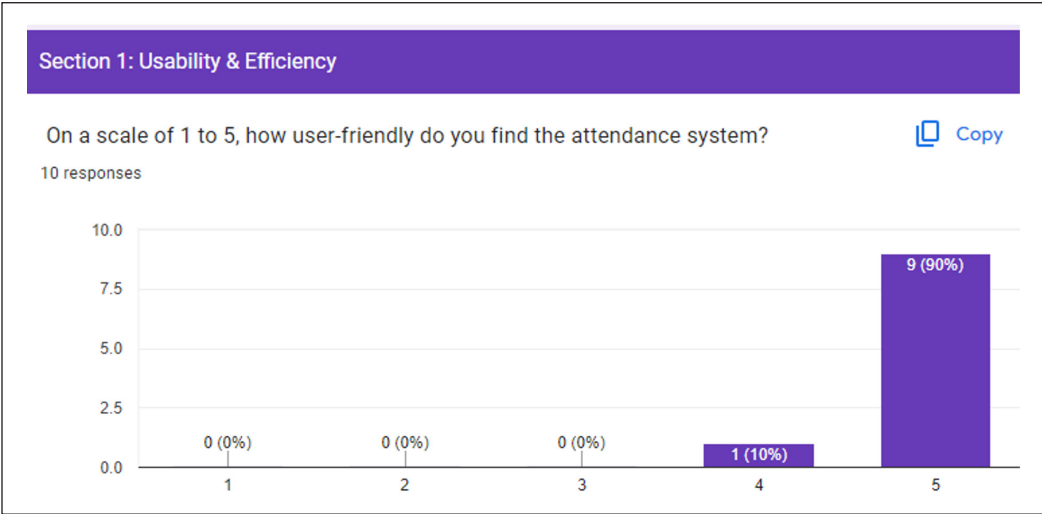*Figure 3.* System security testing uses Wireshark

Figure 4. The respondents' feedback indicates how user-friendly the system is perceived to be

What feedback do users provide regarding the usability and impact of the attendance system? User feedback, as shown in Figure 4, indicates a general perception of the system as user-friendly and effective in improving the attendance recording process.

CONCLUSION

This research developed a web-based attendance system using facial recognition and AES encryption, achieving up to 95% accuracy and seamless integration with Moodle LMS for efficient data management. It proved secure, reliable, and user-friendly, with plans for further enhancements based on feedback.

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