

Student Attendance Tracking and Analytics System

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Background

Attendance plays a critical role in higher education, as it is closely related to student engagement and academic performance. However, traditional attendance methods, such as paper-based registers, are often time-consuming, inefficient, and prone to errors. Recent studies highlight that automated attendance systems can improve efficiency and reduce administrative workload, but many existing solutions primarily focus on recording attendance rather than analysing it.

System Design

This project adopts a client–cloud architecture to ensure scalability and simplicity.

Key design features:

- Frontend developed using Next.js
- Backend services provided by Firebase
- No dedicated server or API layer - Real-time database (Firestore)

Core Components:

- Authentication system (Firebase Auth)
- Attendance session management
- Cloud-based data storage - Analytics dashboard

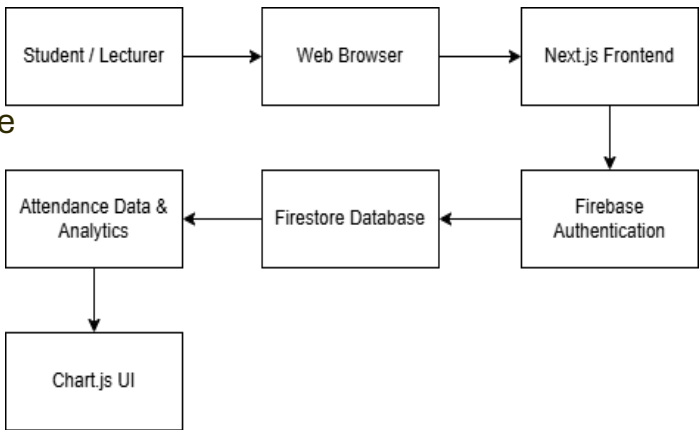


Figure 1 System Architecture of the Attendance Tracking System

Evaluation

To evaluate the system, a questionnaire was conducted with 6 participants (students and lecturers).

Key Results:

- Average system rating: 3.83 / 5
- Majority of responses: Level 4 (Good)
- 67% of users would use the system in a real environment
- 33% responded “Maybe”
- No negative responses

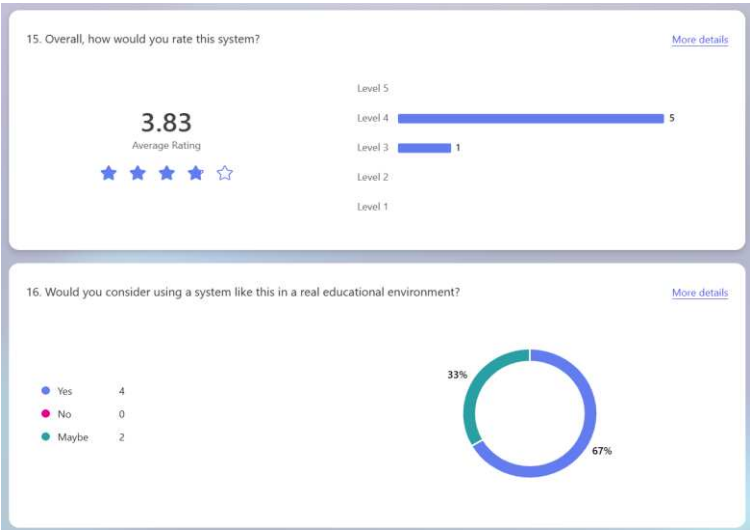


Figure 2 Summary of system rating and willingness to use the system

Conclusion

This project successfully developed a functional web-based attendance tracking system with integrated analytics.

Key achievements:

- Efficient attendance recording
- Real-time data management
- Basic analytics and visualisation
- User-friendly interface

Future Improvements:

- Stronger backend validation
- Advanced analytics features
- Improved security and authentication

Research Gap

Despite the development of various attendance systems, several limitations remain:

- Most systems focus only on attendance recording
- Limited support for data analytics and visualisation
- High cost or complex infrastructure (e.g., biometric systems)
- Limited usability evaluation

Therefore, there is a need for a simple, low-cost, web-based system with integrated analytics.

Implementation

The system provides two main user roles:

Lecturer:

- Create attendance sessions (6-digit code)
- View attendance records
- Access analytics dashboard

Attendance Process:

- Student enters session code
- System validates active session
- Attendance is recorded in Firestore
- Duplicate submissions are prevented (client-side validation)

Student:

- Join sessions using a session code
- Submit attendance
- View personal attendance data

The system is deployed online using Vercel, allowing real-time access.

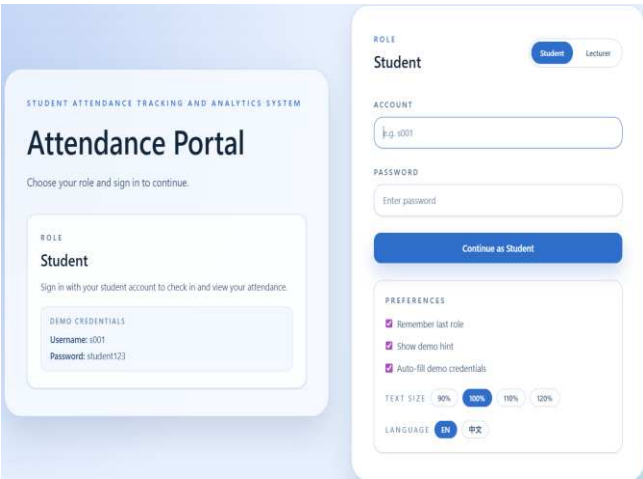


Figure 3 Login Page

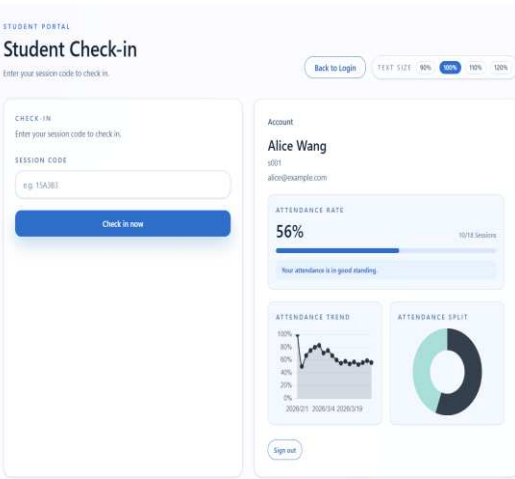


Figure 4 Student Page

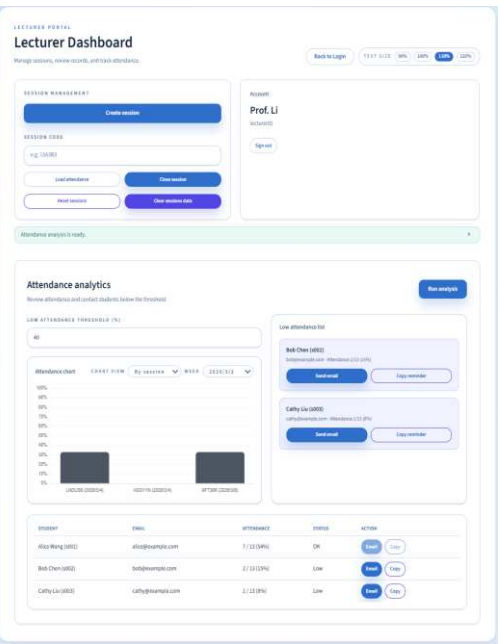


Figure 5 Lecturer Page

Ethical Considerations

- No real student data was used (synthetic/test data only)
- Data privacy is maintained within the system
- Questionnaire responses were collected anonymously
- No personal data was shared or exposed

Transferable Skills

- Time management
- Independent learning
- Problem-solving
- Web development and system design

Project Links

GitHub: <https://github.com/CsMilli000/student-attendance-tracking-analytics-system>

Live System: <https://student-attendance-tracking-analyti.vercel.app/login>

QR CODE:

