

# SHOW UP- Student Attendance Dashboard

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## Vision Statement:

Our vision is to revolutionize attendance tracking by harnessing the power of voice recognition technology, providing a secure, efficient, and user-friendly system that ensures the highest level of accuracy and integrity in academic environments. In our solution, both professors and students record the same phrase during class, enabling real-time voice comparison. The system then analyzes and matches the student's recording with the professor's pre-recorded voice template, ensuring that attendance can only be marked when the professor's voice is verified.

This innovative approach eliminates the possibility of fraudulent attendance practices, such as impersonation or manipulation, and adds an extra layer of security by confirming the professor's active participation in the process. By using the Mel-Frequency Cepstrum (MFC) algorithm to analyze voice features, our system provides a reliable and straightforward solution without the need for complex AI models or additional hardware, making it ideal for diverse academic settings.

We are committed to creating a solution that is not only secure and efficient but also respects user privacy, as all voice data is processed locally, avoiding the storage of sensitive information. Furthermore, our system operates seamlessly without the need for internet connectivity, making it adaptable to environments with limited infrastructure.

Ultimately, our vision is to provide academic institutions with an innovative, cost-effective, and easy-to-implement attendance system that simplifies the process, enhances security, and ensures data integrity—empowering professors and students to focus on what truly matters in education.

## Introduction:

The **Student Attendance Dashboard** is an innovative solution designed to revolutionize the way educational institutions manage student attendance. By leveraging voice-based verification technology, the system automates attendance tracking, eliminating the inefficiencies of manual roll calls and reducing the risk of fraudulent attendance. With its secure and interactive approach, students respond to a unique voice prompt provided by the professor, ensuring accurate and tamper-proof attendance

records. The system is accessible via both web and mobile platforms, offering flexibility and ease of use for professors and students alike.

This platform not only improves attendance accuracy but also provides real-time tracking and powerful analytics. Professors can monitor attendance status live and generate detailed reports, while students benefit from an efficient, streamlined process. The **Student Attendance Dashboard** aims to enhance classroom engagement, save valuable instructional time, and provide insights into student participation, making it a crucial tool for modernizing attendance management in educational settings.

## **Problem of Traditional Approach:**

The traditional methods of tracking student attendance, such as manual roll calls or paper-based systems, are time-consuming, inefficient, and prone to errors. These methods often lead to inaccurate attendance records, with the potential for fraudulent activities like proxy attendance, where students mark the attendance of their peers. Additionally, manual tracking can be cumbersome for large classrooms and can divert valuable instructional time away from teaching.

Furthermore, many existing systems lack real-time updates and do not provide actionable insights into student participation. This limits the ability of professors to monitor attendance trends, address issues promptly, and make data-driven decisions. As a result, institutions struggle with maintaining accurate records, ensuring engagement, and enhancing overall academic management. The **Student Attendance Dashboard** addresses these challenges by automating attendance tracking through voice-based verification, providing a more secure, efficient, and scalable solution for modern classrooms.

## **Objectives:**

1. **Automate Attendance Tracking:** To replace traditional manual attendance systems with an automated, voice-based solution that reduces time spent on roll calls and ensures accurate attendance records.
2. **Enhance Security:** To use advanced voice recognition technology for secure and tamper-proof attendance marking, preventing fraudulent practices like proxy attendance.
3. **Provide Real-Time Monitoring:** To allow professors to monitor attendance status in real-time, enabling immediate visibility into who has marked their presence and addressing discrepancies during class.
4. **Generate Actionable Reports:** To provide detailed, data-driven attendance reports and analytics, helping professors identify patterns in student attendance and engagement, and make informed decisions.
5. **Improve User Engagement:** To create an interactive, user-friendly platform that engages both professors and students, fostering greater accountability and participation in the attendance process.
6. **Scalability and Accessibility:** To build a system that can scale across various class sizes and be accessible on multiple devices, ensuring usability across educational institutions.

# **Business Plan**

## **Market Analysis**

### **Target Market:**

- Educational institutions (schools, colleges, universities)

### **Market Need:**

- Time-consuming manual attendance processes
- Inaccurate attendance records
- Desire for efficient and reliable attendance solutions

## **Business Model**

### **1. Revenue Model:**

- One-time license fees for educational institutions
- Subscription-based model for cloud-based services and data analytics

### **2. Cost Structure:**

- Software development and maintenance
- Server and cloud infrastructure costs
- Marketing and sales expenses
- Customer support

## **Marketing and Sales Strategy**

- **Target Market:**
  - Directly approach educational institutions.
  - Partner with educational technology providers.
- **Marketing Channels:**
  - Attend educational conferences and trade shows.
  - Utilize social media and content marketing.
  - Email marketing campaigns.
- **Sales Strategy:**
  - Direct sales approach.
  - Online sales through the website.
  - Partner with educational distributors.

By leveraging advanced voice recognition technology and a user-friendly interface, our voice-activated attendance system offers a cost-effective and efficient solution for educational institutions.

## **Architectural Description:**

### **System Requirements**

### **Hardware Requirements:**

- Devices with microphones (e.g., laptops, smartphones, tablets).
- Server for hosting the application.

### **Software Requirements:**

For our project, we leveraged Streamlit as the primary technology for both our frontend and backend. This unified approach streamlined development and deployment, allowing us to rapidly build and share our application.

Streamlit's intuitive Python-based framework enabled us to create interactive user interfaces, handle data processing, and implement machine learning models within a single environment.

### **Network Requirements:**

- Stable internet connection (minimum 5 Mbps).
- SSL-enabled communication for secure data transfer.

### **Architecture**

The system uses **3-tier architecture**:

- 1. Presentation Layer:**
  - User-facing dashboards for professors and students.
  - Accessible via web browsers.
- 2. Application Layer:**
  - Core logic for processing voice inputs and matching attendance.
  - Handles requests for reports and analytics.
- 3. Database Layer:**
  - Stores user details, attendance logs, and course information

### **Database Design**

#### **Key Tables:**

- 1. Users:**
  - user\_id, name, email, role (professor/student), voice\_sample.
- 2. Courses:**
  - course\_id, name, professor\_id.
- 3. Attendance:**
  - session\_id, course\_id, student\_id, status, timestamp.

#### **Relationships:**

- Professors manage courses.
- Students are linked to multiple courses.
- Attendance logs connect students, courses, and sessions.

# User Manual

## Workflow

### Professor Workflow:

1. Log in to the System: Access the attendance system using credentials.
2. Initiate Attendance Session: Trigger the session by speaking a designated phrase.
3. Record Voice Prompt: The system should record the spoken phrase.
4. Retrieve Attendance Data: After the session concludes, access a report detailing student attendance.

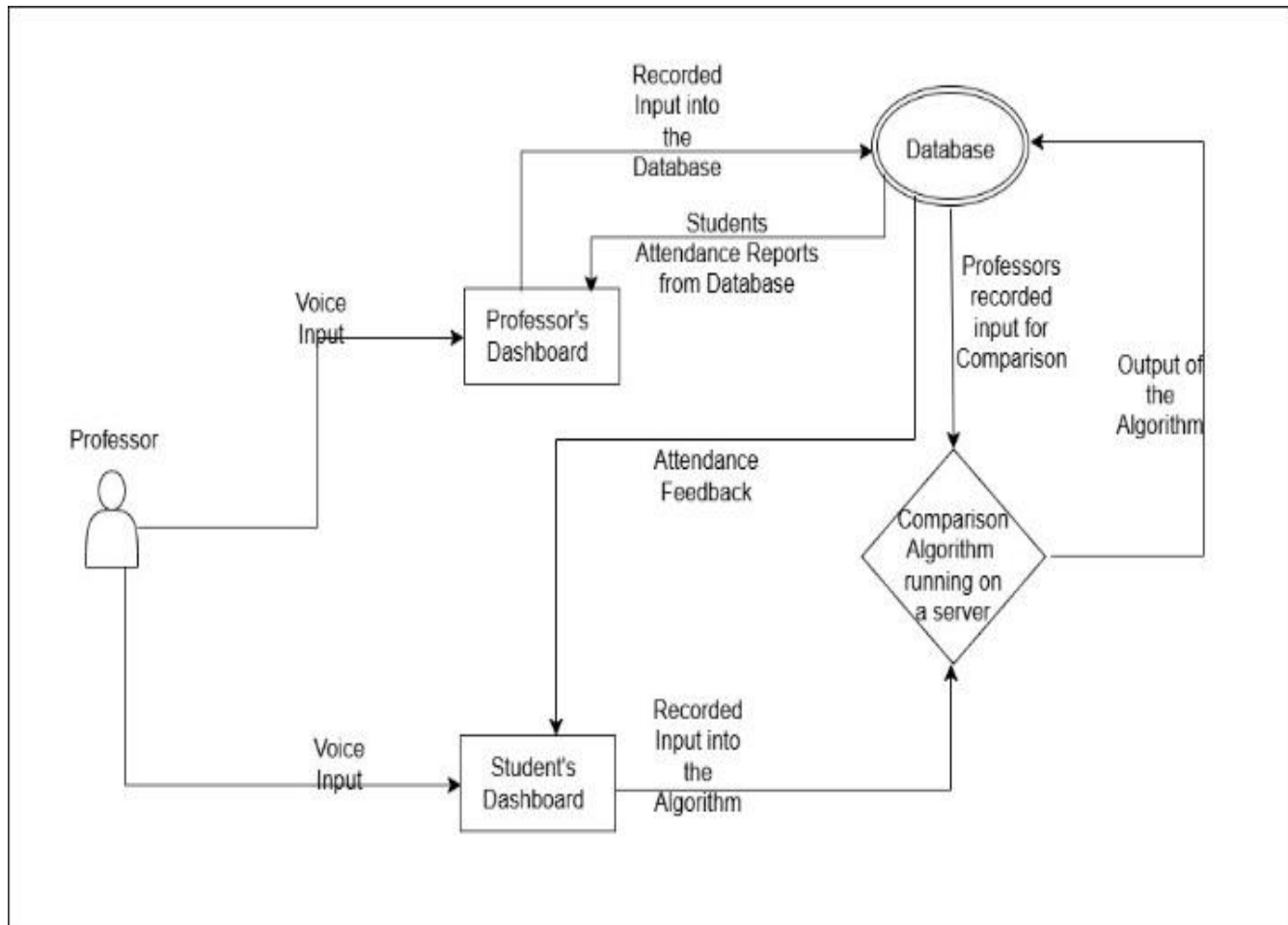
### Student Workflow:

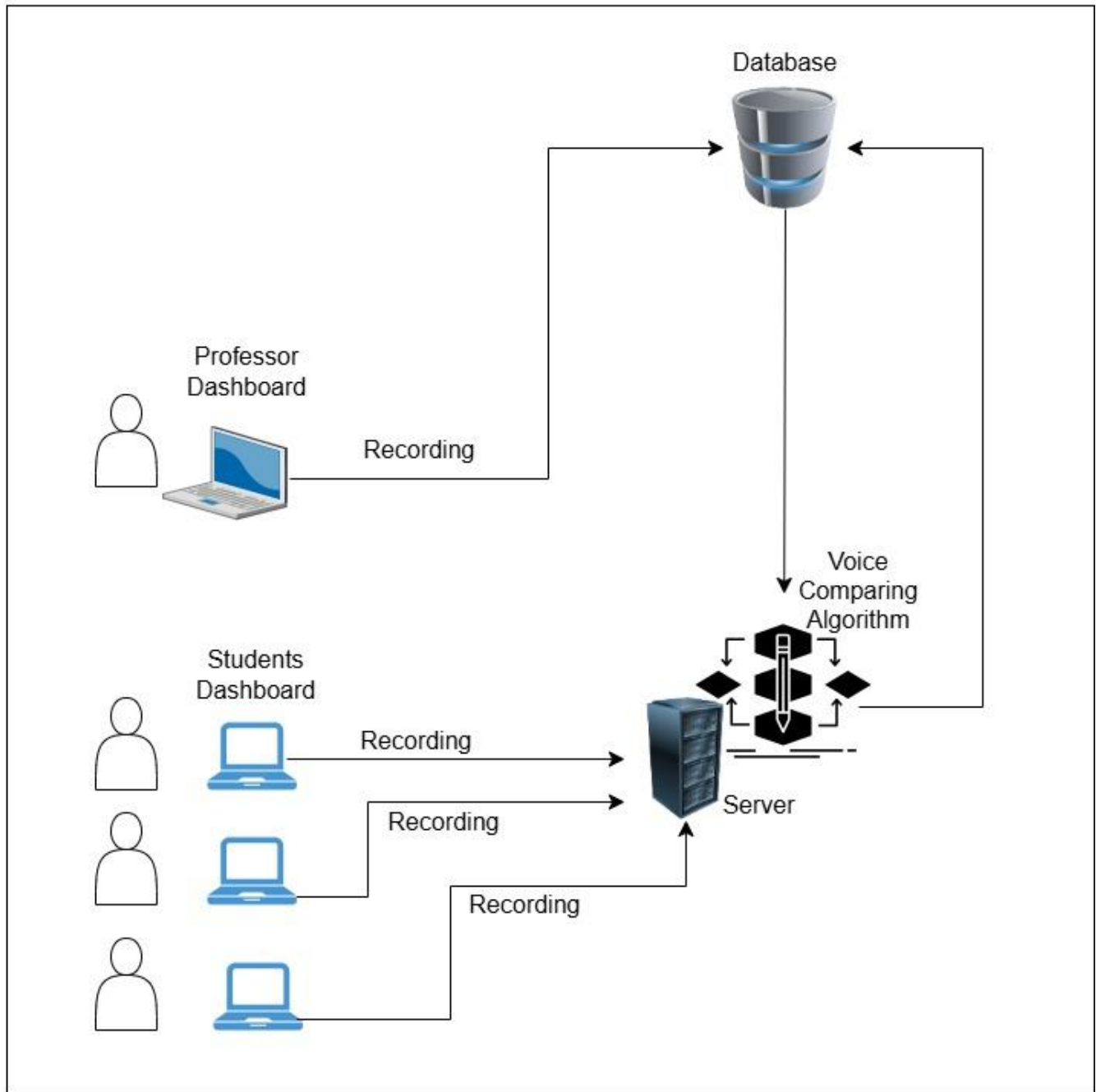
1. Log in During Live Session: Access the attendance system while the session is active.
2. Record Voice Prompt: Speak the provided phrase and submit the recording.
3. Confirm Attendance: Receive immediate confirmation that their attendance has been recorded.

## Product Description

Our innovative voice-activated attendance system streamlines the traditional attendance-taking process, making it efficient and accurate. By leveraging advanced voice recognition technology, our system eliminates the need for manual attendance sheets and time-consuming roll calls.

## Methodology:





## 1. Voice Prompt Generation and Recording:

Professor:

Initiates an attendance session.

Speaks a unique voice prompt.

The system records the professor's voice as a reference.

## 2. Student Recording and Submission:

Students:

Record the voice prompt provided by the professor.

Submit their recordings to the system.

### **3. Voice Matching and Verification:**

MFCC Feature Extraction:

The system extracts Mel-Frequency Cepstral Coefficients (MFCC) from both the professor's and student's recordings. MFCCs are a representation of the spectral and temporal characteristics of the speech signal.

Similarity Comparison:

The system compares the MFCC features of each student's recording with the professor's reference recording.

A similarity metric (e.g., Dynamic Time Warping or Cosine Similarity) is used to measure the closeness between the two recordings.

Threshold-Based Decision:

If the similarity score exceeds a predefined threshold, the student's attendance is marked as present. Otherwise, the attendance is marked as absent or flagged for manual review.

### **4. Attendance Record and Notification:**

The system records the attendance status of each student.

Notifications are sent to both the professor and students about the attendance status.

## **Testing Methodology:**

To evaluate the system's efficacy, a series of controlled tests were conducted within Smith Hall. A single participant assumed the role of the professor, while another participant moved to various locations within the classroom to simulate different seating arrangements. The system successfully detected the student's presence in each test, demonstrating accurate attendance tracking under varying conditions.

To further assess the system's ability to detect fraudulent attendance attempts, a live recording was captured via a mobile device. The participant, positioned outside the classroom, attempted to submit their attendance using the recorded audio. The system correctly identified the discrepancy and marked the participant as absent, validating its robustness in preventing fraudulent attendance.

## **Security Considerations and Mitigation Strategies:**

A potential security concern identified during testing was the possibility of students recording the professor's voice prompt and sharing it with peers to fraudulently mark attendance. To address this risk, the following mitigation strategies were implemented:

### **1. Unique Voice Prompts:**

Manual Phrase Selection: The professor manually selects a new, unique phrase for each attendance session, reducing the likelihood of pre-recorded audio being used.



Unpredictable Prompts: The varied and unpredictable nature of the prompts makes it difficult for students to anticipate and prepare fraudulent recordings.

## 2. Timestamp Analysis:

Time-Sensitive Verification: The system compares the timestamp of the student's recorded response to the session's active timeframe.

Early or Late Submissions: Any submissions outside the designated attendance window are flagged for review.

## 3. Mel-Frequency Cepstral Coefficients (MFCC) Analysis:

Audio Feature Extraction: MFCC is a technique used to extract relevant features from audio signals, such as pitch, timbre, and rhythm.

Pattern Matching: The system compares the MFCC features of each student's response to a reference model, identifying any significant deviations that may indicate fraudulent attempts.

By combining these security measures, including the robust MFCC-based analysis, the system aims to minimize the risk of fraudulent attendance and ensure the integrity of the attendance records.

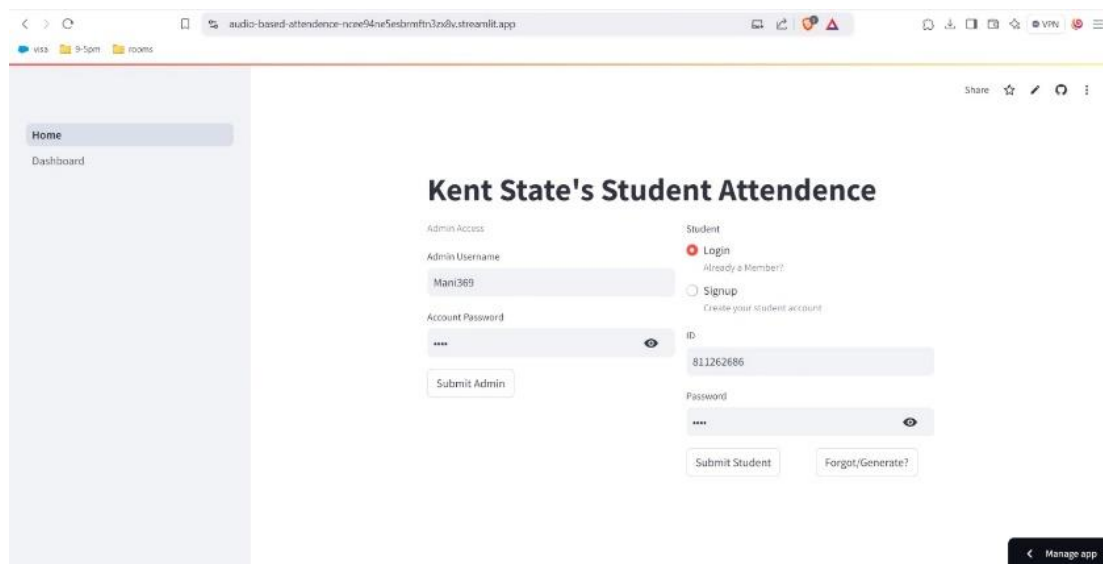
## 4. Device Whitelisting:

Authorized Devices Only: The system restricts access to specific, authorized devices.

Professor Approval: Students must request permission from the professor to add their devices to the whitelist.

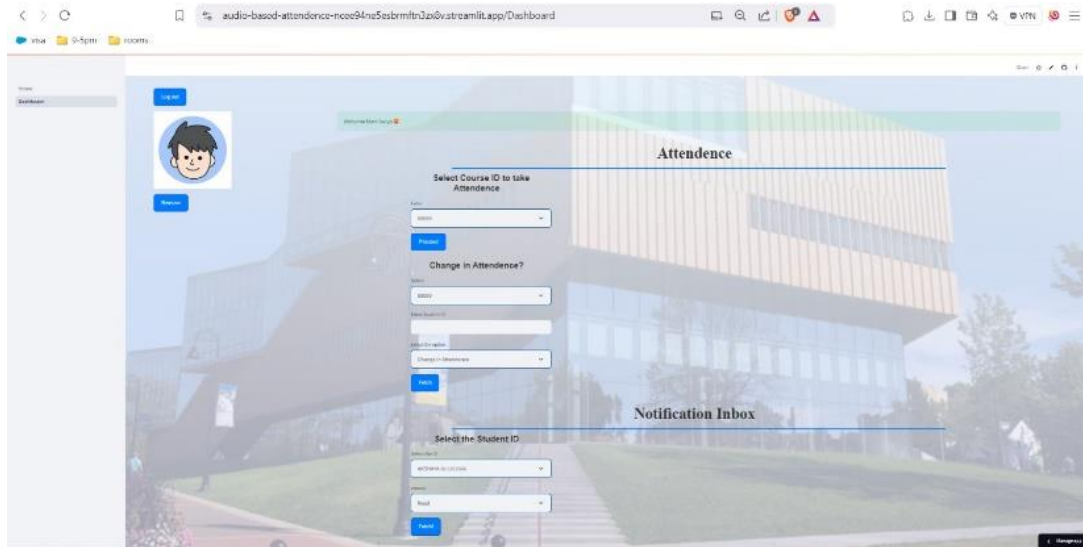
# Features

Below are the interface mockups for the system:



## Professor Dashboard

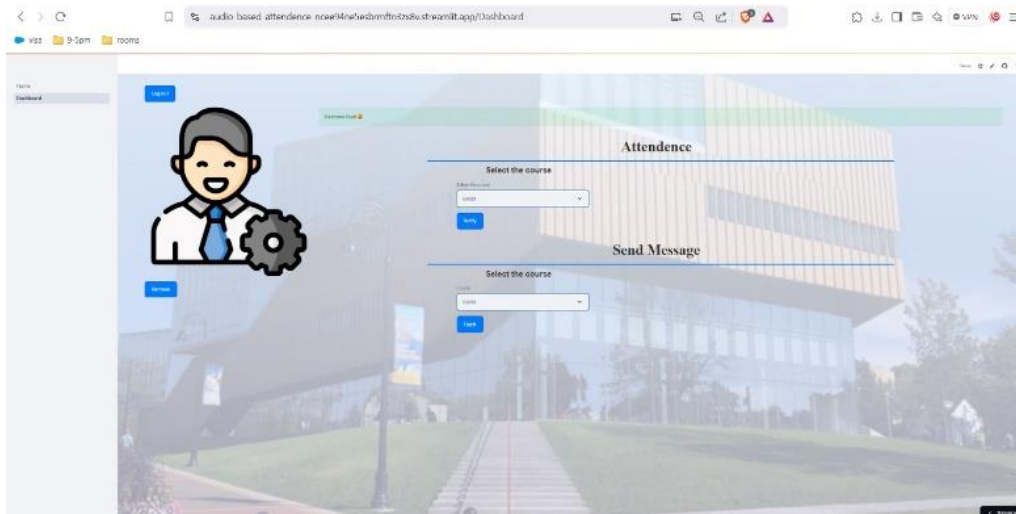
Shows the session initiation screen and real-time updates for attendance.



- Session Management:
  - Initiate and terminate attendance sessions.
  - Set session duration and voice prompt.
- Attendance Reporting:
  - Generate detailed attendance reports, including student-wise and session-wise data.
  - Export reports in various formats (PDF, CSV, etc.).
- Real-time Analytics:
  - Monitor real-time attendance status.
  - Visualize attendance trends and patterns.
- Manual Overrides:
  - Manually mark students as present or absent in case of technical issues or exceptional circumstances.

## Student Dashboard

Displays attendance history and the interface for submitting voice responses.



- Attendance Recording:
  - Record voice prompts during active sessions.
  - View real-time confirmation of attendance.
- Attendance History:
  - Access past attendance records.
  - View session details and feedback, if provided.
- Notifications:
  - Receive timely notifications about upcoming sessions.
  - Get alerts for missed sessions or attendance issues.

## How to Access the System:

1. Web Application: Hosted at <https://audio-based-attendance-nce94ne5esbrmftn3zx8v.streamlit.app/>
2. Authentication: Users (professors and students) must log in using institutional credentials.
3. Supported Platforms: Modern browsers like Chrome, Firefox, Edge.

## FAQ

### 1. What if my voice is not recognized?

If your voice is not recorded properly, your attendance will be marked as "discrepant." This means that the system was unable to verify your attendance based on the voice recording.

To resolve this issue, you should contact your professor to discuss the situation and potentially provide additional evidence of your attendance, such as a timestamped photo or video of yourself in the class. Your professor may then manually override your attendance status.

### 2. Can I mark attendance after class?

No, The attendance system is typically designed to have a specific time window during which students can record their attendance. This time window is usually set by the professor and aligns with the duration of the class or lecture.

If you attempt to record your attendance outside of this designated time window, the system may not recognize your submission or mark it as invalid.

### **3. How does the system prevent fraudulent attendance?**

The system prevents fraudulent attendance by employing a combination of security measures. It uses randomized voice prompts to deter pre-recorded submissions, timestamp-based authentication to verify the timeliness of recordings, and liveness detection to differentiate between real-time and pre-recorded audio. Additionally, it requires secure authentication to prevent unauthorized access. These measures collectively ensure the integrity of the attendance process.

### **4. Is the system accessible for hearing-impaired students?**

No, the current system relies heavily on audio input, it may not be fully accessible to hearing-impaired students.