SMART INDIA HACKATHON 2024

PROBLEM STATEMENT ID : SIH1719

TITLE : MONITORING SYSTEM FOR CLASSROOM SESSION IN SKILL TRAINING PROGRAM

THEME : SMART EDUCATION

PS CATEGORY : SOFTWARE

TEAM NAME : HASILA

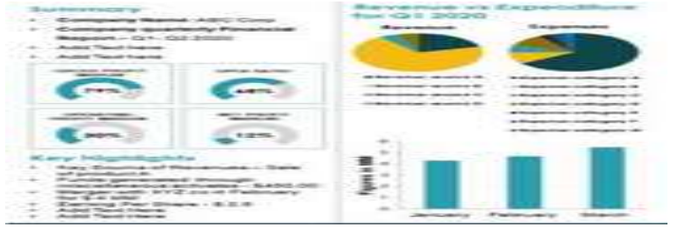
TEAM ID : 28574

SMART INDIA HACKATHON 2024

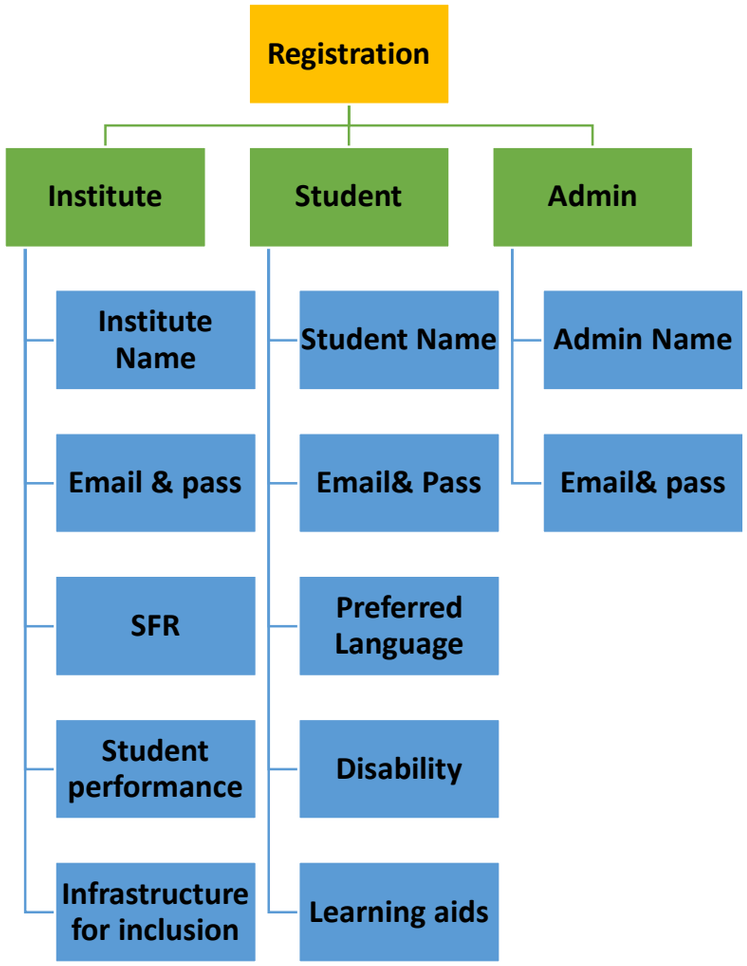
MONITORING SYSTEM FOR CLASSROOM SESSION IN SKILL TRAINING PROGRAM

SCMAS

- Registration & Login Credentials
- Institute Infrastructure
- Student Learning Aids
- Attendance and Monitoring
- Alerting
- Speaker Curriculum Delivery
- Statistical Report



Registration



- **Institute Registration**

The institute registration requires the name of the institute, which helps in identifying the institution. An email and password are necessary for secure login and communication. The Student-Faculty Ratio (SFR) is important as it measures the number of students per faculty member, indicating the level of individual attention students might receive. Additionally, details about the infrastructure for inclusion are needed to understand the facilities and resources available to support students with disabilities.

- **Student Registration**

For student registration, the student's name is required for identification. An email and password are necessary for secure login and communication. The preferred language is important to ensure that communication and learning materials are provided in the student's preferred language. Information about the student's disability and the learning aids they require is crucial to tailor support and resources to their specific needs.

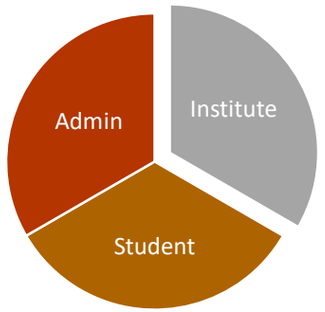
- **Admin Registration**

Admin registration requires the name of the administrator for identification. An email and password are necessary for secure login and communication.

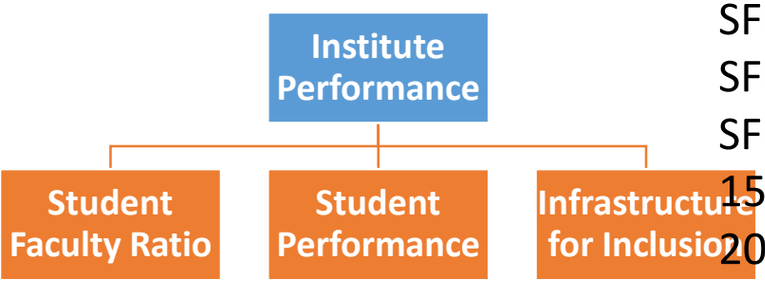
Frontend Design
(JAVA Script ,CSS,HTML)

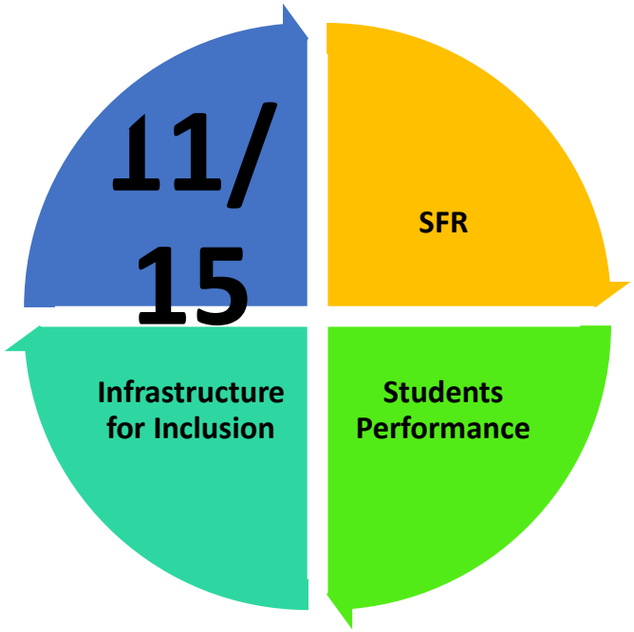
Back End Design
Node.js, Python.

Database: MYSQL



Institute Infrastructure





SFR (Student-Faculty Ratio):

SFR = student_count / faculty_count
SFR Score (5 points):
SFR ≤ 15 → 5.0 points
15 < SFR ≤ 20 → 4.0 points
20 < SFR ≤ 25 → 3.0 points
25 < SFR ≤ 30 → 2.0 pointsSFR > 30 → 1.0 point

Academic Score (5 points):

no_backlog_rate = students_no_backlog / total_students
with_backlog_rate = students_with_backlog / total_students
placement_rate = students_placed / total_students
academic_score = (no_backlog_rate × 3.0) + (with_backlog_rate × 1.5) + (placement_rate × 0.5)

Social Inclusion Score (5 points):
representation_score = min(2.5, (social_category_students / total_students) × 2.5)infrastructure_score = number_of_facilities × 0.625social_inclusion_score = representation_score + infrastructure_score

Overall Score (15 points):
overall_score = sfr_score + academic_score + social_inclusion_score

Student Learning Aids

Hearing Impairment

- Captioned Video Lecture

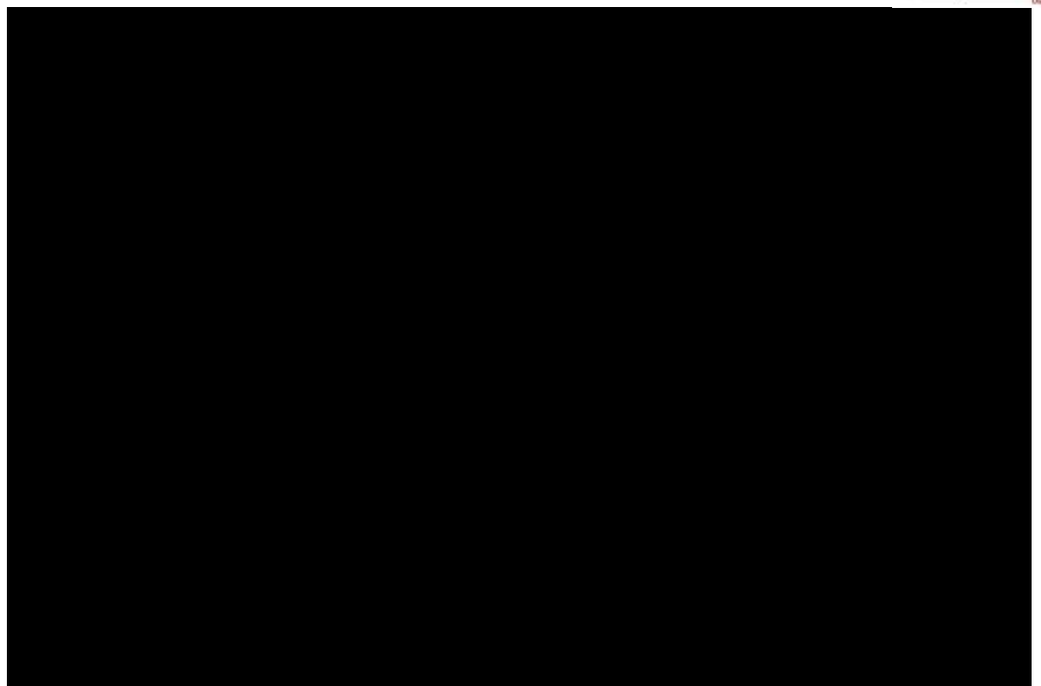
- Sign Language Support

- Screen Recorder

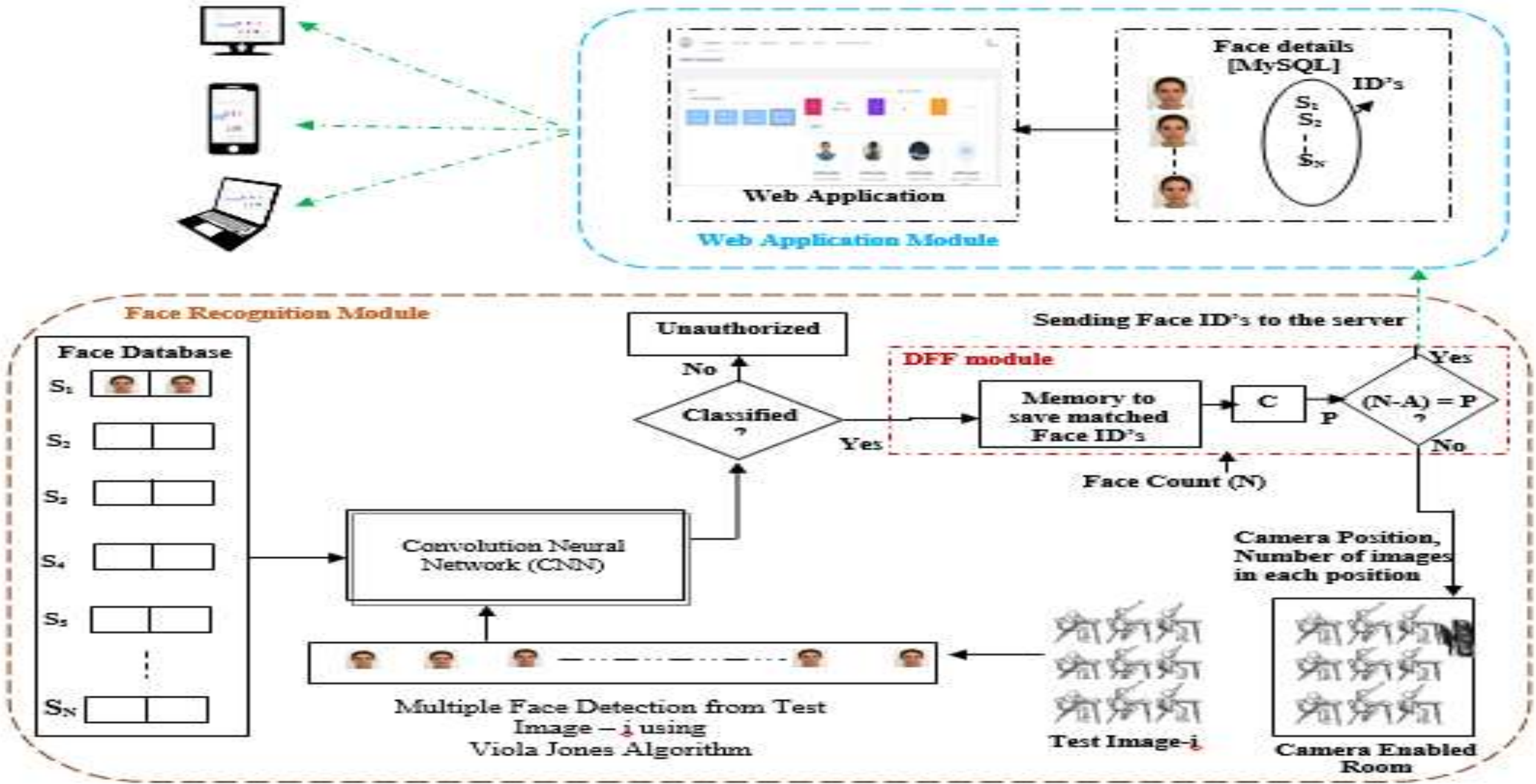
Visual Impairment

- Font size

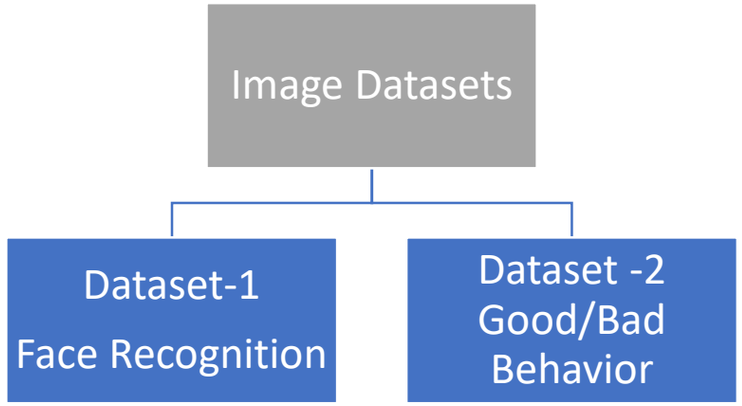
- Contrast
- Audio Materials

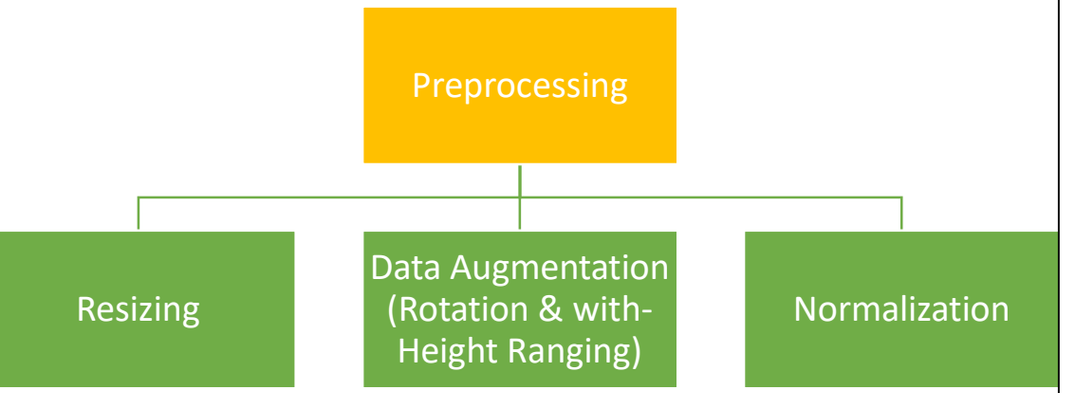


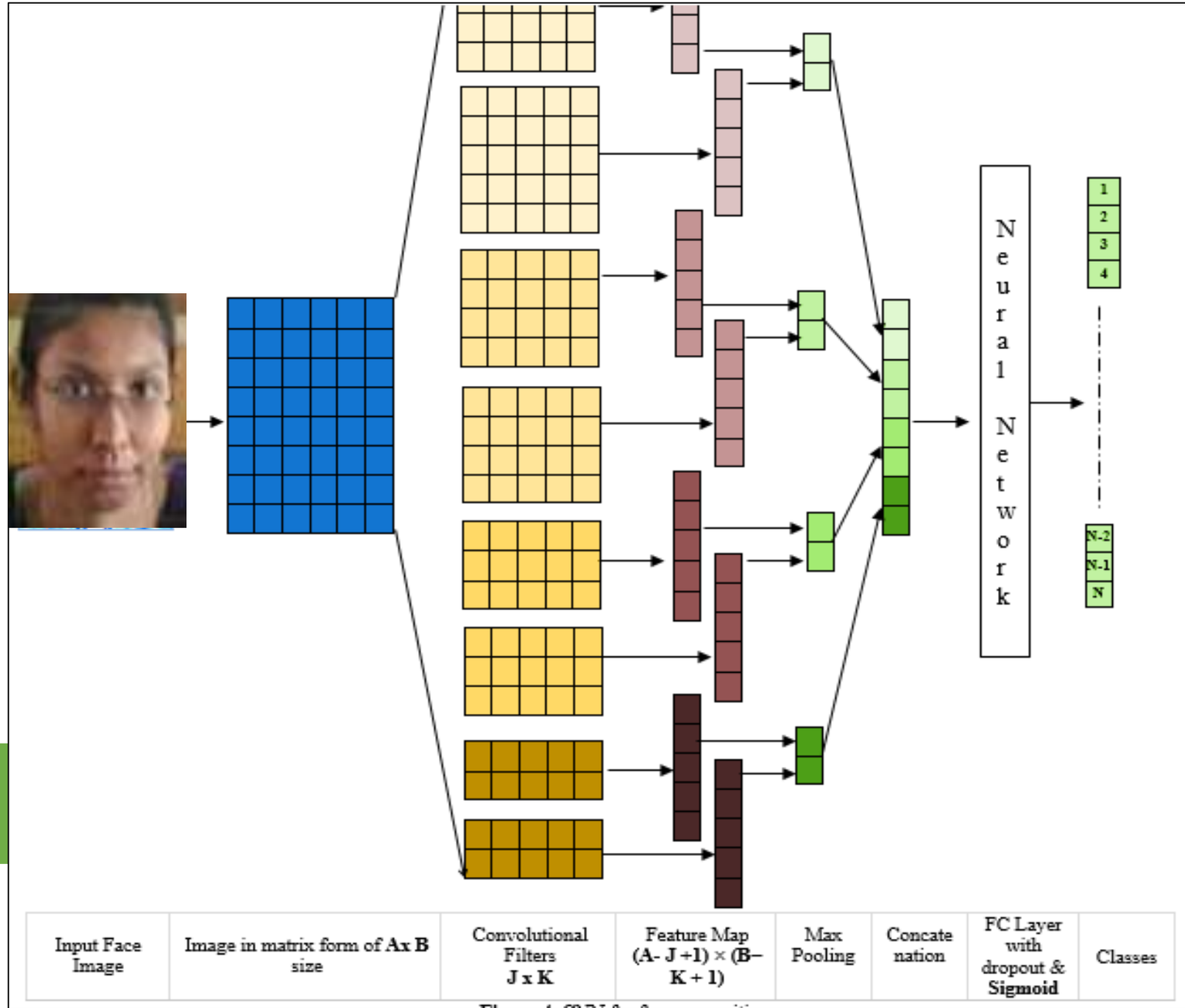
Class Monitoring



Attendance & Monitoring(Cont…)







Attendance & Monitoring (Cont…)

CNN Models Performance Analysis

Parameter	CNN-9	CNN-11
% Accuracy	92.3	96.4
Sensitivity	0.495	0.5
Specificity	0.4166	0.5
Precision	0.9520	0.9980
F1-score	0.5209	0.664

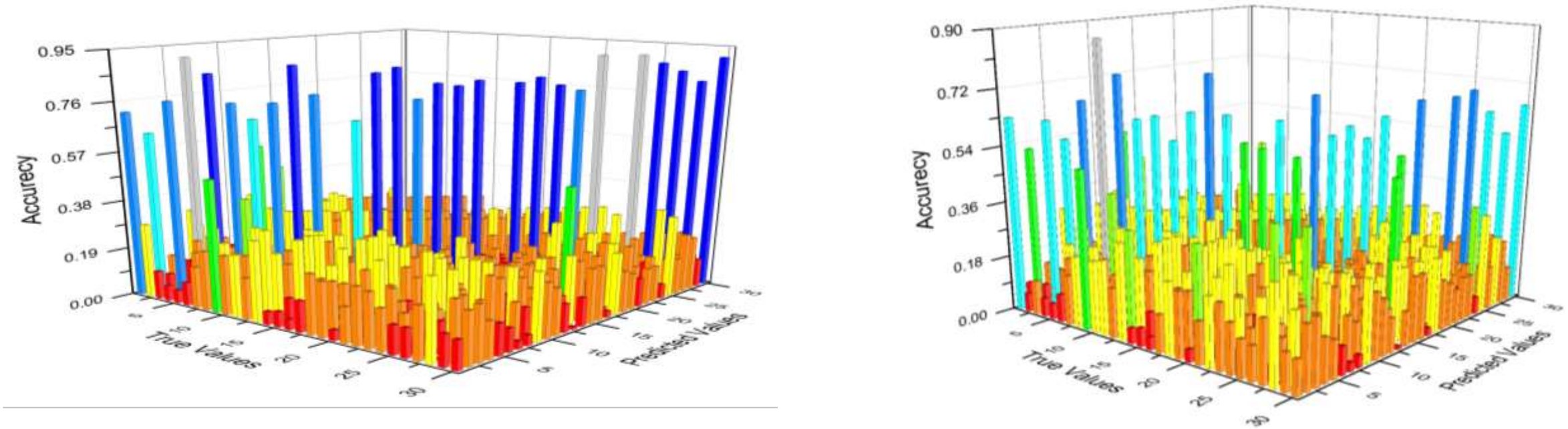


Figure 5. Confusion matrix for accuracy, (a) CNN with 9-layers, (b) CNN with 11-layers.

Attendance & Monitoring (Cont…)

Steps in Viola-Jones Face Detection:

Convert Image to Grayscale: The algorithm works on grayscale images, so color images are converted to grayscale for processing.

Compute Integral Image: Generate an integral image from the grayscale image to enable fast computation of Haar-like features.

Sliding Window Approach: Use a sliding window technique to scan the image at different scales and positions. Each window is treated as a candidate region for face detection.

Apply Haar-Like Features: Extract Haar-like features from each window and compute their values using the integral image.

Classification Using AdaBoost:Apply the AdaBoost classifier to determine if a given window contains a face. The classifier combines weak classifiers into a strong classifier.

Cascade of Classifiers: Each candidate window is passed through a cascade of classifiers:If a window fails in an early stage, it is discarded. If it passes all stages, it is classified as a face.

Return Detected Faces: After processing all windows, the algorithm outputs the locations and sizes of detected faces in the image.

Student Alerting

Good Behavior





Bad Behavior





Input: Real-Time Video Feed

Processing Step 1: Bad Behavior Detection

Pass Frame Through CNN Model 2 (Behavior Recognition)

Processing Step 2: Person Identification Extract Region of Interest (Face)

Pass ROI Through CNN Model 1 (Face Recognition)

Prepare Email

- Attach the frame with bad behavior as photo proof.

Send Email Using SMTP

- Email sent to designated recipient (e.g., teacher, principal, parent).

Speaker Curriculum Delivery

Speaker Curriculum Delivery

- **Keywords from Given Curriculum**
- **Speech Processing**
- **Integration and Output Report**

Speaker

Speech to Text

Keywords From Text

Gemini's **TextSimilarity API** to match synonyms

Comparator

Keywords From Curriculum

Effectiveness

$$\left(\frac{\text{Number of Matched Keywords}}{\text{Total Number of Predefined Keyword}}\right.$$

Speaker Curriculum Delivery(Cont…)

Speech to Text

Use a **microphone** or pre-recorded audio file as the input.

Tools: PyAudio or sounddevice in Python for live audio recording.

Preprocess the Audio: Clean the audio for better recognition accuracy.

Noise reduction: Remove background noise using filters. **Segmentation**: Split long recordings into smaller chunks for processing.

Use Gemini's **NoiseFilter** API to preprocess audio.

Send Audio to Gemini's Speech-to-Text API: Convert the audio file into a suitable format.

How to compare Two Keywords

Step 1: API Preparation: Gemini's NLP capabilities (like **Text Similarity API**) can compare two keywords semantically. The API evaluates similarity by computing a score between 0 and 1.

Step 2: Send Keywords to Gemini API. Prepare an HTTP request to Gemini's **Text Similarity API**. Provide two keywords as input.

Step 3: Parse the Response: The API returns a similarity score. Use this score to decide:

- If the keywords are sufficiently similar (e.g., above 0.8, they are a match).

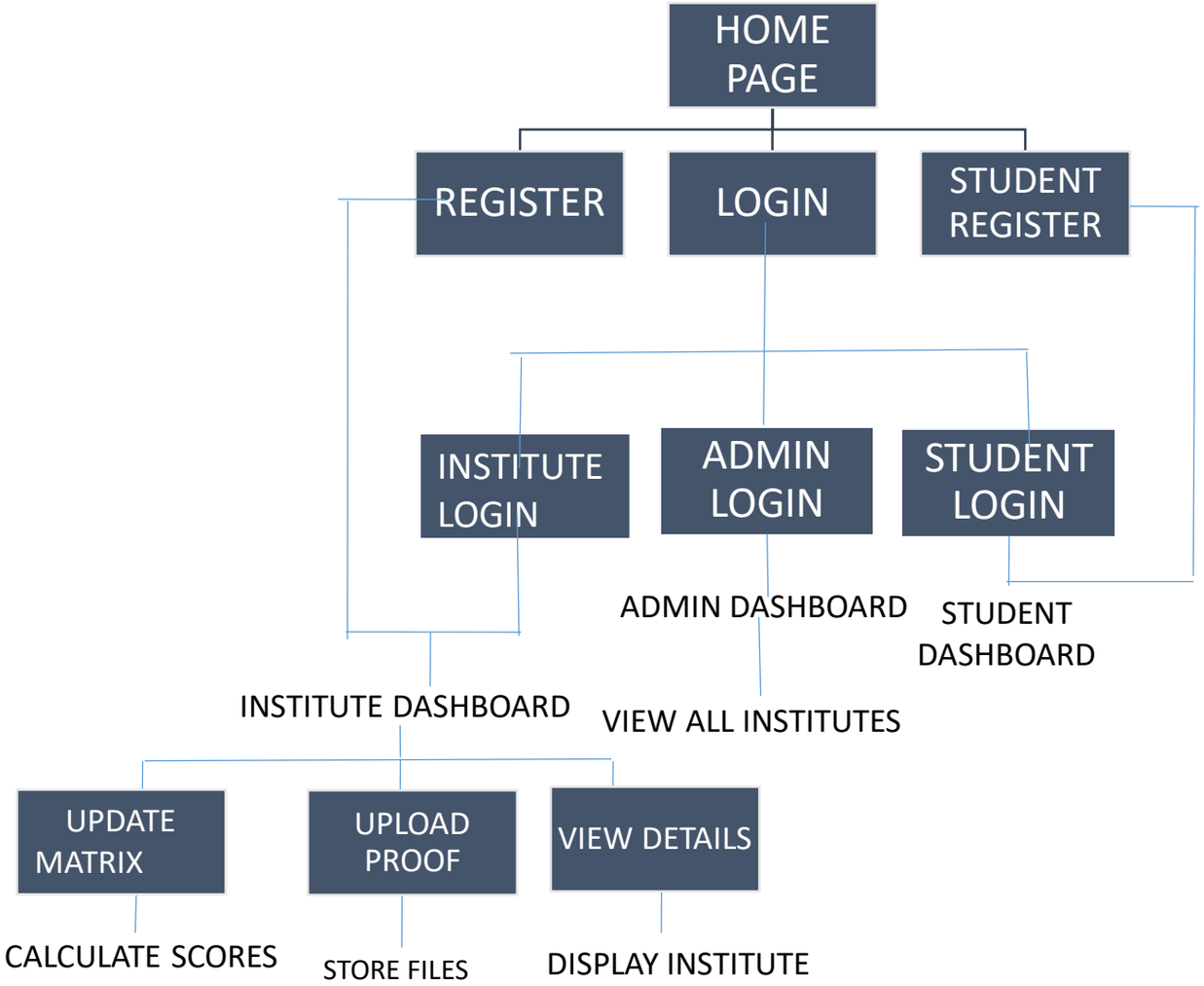
APP DEVELOPMENT

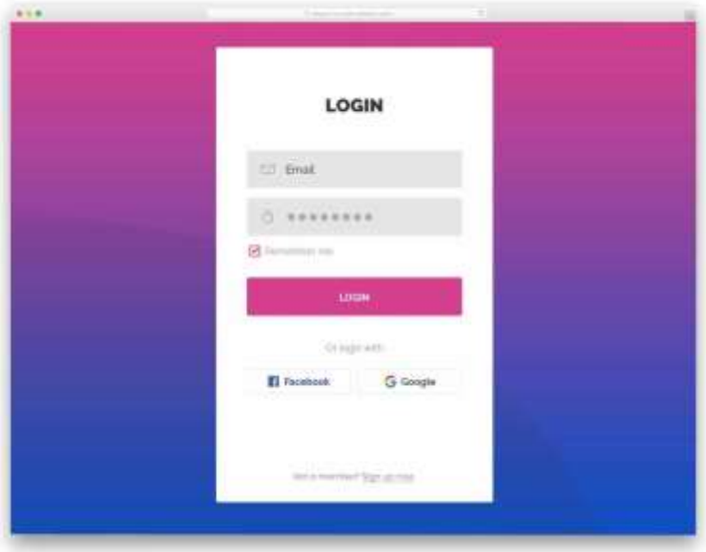
App development is the process of creating software applications that run on mobile devices (like smartphones and tablets) or desktop computers.

KEY FEATURES

- Registration
- Institute Infrastructure
- Student Learning Aids
- Attendance and Monitoring
- Speaker Curriculum Delivery
- Statistical Report

TECHNOLOGY STACK





Statistical Report & Material

Source: Microphone or pre-recorded audio file. Using noise reduction (NoiseFilter API) to preprocess.

API: Gemini Speech-to-Text API.

Parameters:

Audio data (Base64 encoded).

Language (en-US for English).

Model (general, lecture, etc.).

Translate Text: API: Gemini Language Translation API.

Parameters :

Source text (from Speech-to-Text).

Source language (en).

Target languages (fr, es, de, etc.).

Generate Report