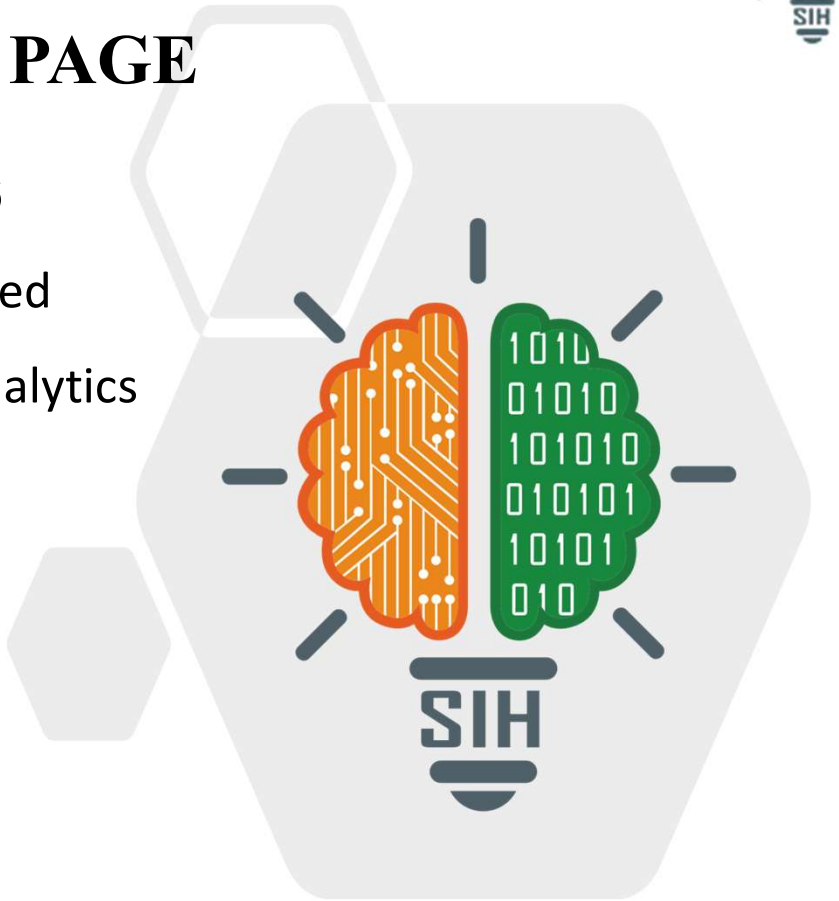
SMART INDIA HACKATHON 2025

TITLE PAGE

- **Problem Statement ID –** SIH25016
- **Problem Statement Title -** Automated Student Attendance Monitoring and Analytics System for Colleges
- **Theme -** Smart Education
- **PS Category -** Software
- **Team ID -** 64909
- **Team Name (Attendrix)**



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Automated Attendance and Management System

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❖ Proposed Solution (Describe your Idea/Solution/Prototype)

NEXT GEN - Automated Attendance and Management System

Automated Attendance System (Offline + Online)

- **Class Hours Attendance** → **Entry/exit cameras** automatically capture student's faces for attendance; **dashboards** in each class- verifies class presence (Dashboards--Faculty can connect via Bluetooth); Online sessions auto-mark attendance in database
- **Library** → Library attendance is auto-logged via cameras, secured with blockchain-based institutional ID, eliminating manual entry
- **Examination Room** → Student scans QR (Hall Ticket) + Biometric → System validates & auto-marks attendance in Faculty/Admin Portal

Role Based Login

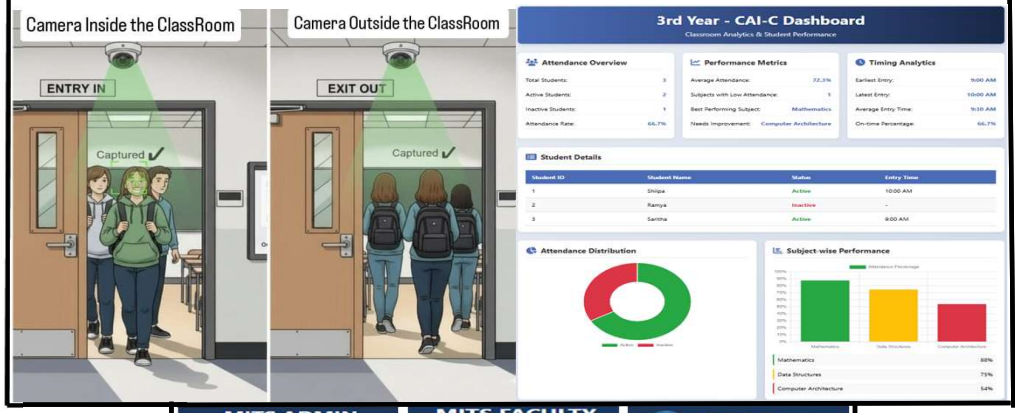
- **Admin** - Analyze department/class wise attendance
- **Faculty** - Spot students at risk due to low attendance
- **Students** - view attendance analytics, get low-attendance alerts, focus subjects, and engagement insights
- Parents → Notify parents via SMS

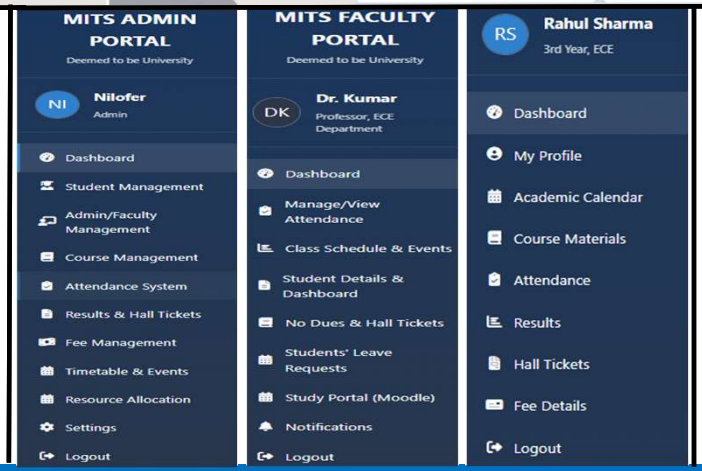
Better Academic Planning (Every thing managed from their respective portals only)

- **Automatic TimeTable Schedular** → Automatically generate class timetable, allot courses, faculty, and classrooms based on total classes, workload, and resource availability.
- **System driven Hall Ticket Generation** → Self-generate hall tickets with HOD sign with unique QR in student's portal once students clear no dues (online); students notified to download/print
- **Fee Receipt Automation** → Counter admin issues fee receipt from their portal, student auto-receives and can view all receipts in their portal
- **Leave Management & Notification** → Student requests leave (from their portal) → HOD notified (in their portal) → If approved: DB updated as leave; if rejected: remarks notified to student
- **Portal Updates & Student Registration** → Faculty/Admin posts updates (events, internships, competitions, hackathons) from their portal; students notified and can register in their portal (Registrations managed)
- **Moodle:** Personalized Learning Portal → Study portal: Faculty uploads resources & assignments → Students submit (auto-graded by AI based on their content) and can create notes, Flow Charts, Mind maps as per their learning style for each subject.
- **Faculty Cabin Access** → Faculty cabins auto-allocated based on availability → Admin can edit → Students access via portal for mentorship or records.

Additional Features → Syllabus, previous papers, campus news, academic calendar, Faculty/College Feedback and other resources via portal.

Capture student's face at entry in/out at Class Room doors





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TECHNICAL APPROACH

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Web App & App

- **Frontend Web App:** React.js
- **Mobile App:** Flutter for Web app, Andrios/iOS App
- **Backend:** Node.js, PostgreSQL, Redis, S3, Kafka, Socket.io for real-time updates.
- **API Gateway** → Nginx/Kong with JWT-based authentication
- **Notifications** → Firebase Cloud Messaging (FCM) for push notifications (students/parents)
- **Offline-first** → Local storage in app (SQLite or Hive for Flutter) with sync when online

Automated Attendance

Better Academic Planning

1. Hardware :

- Existing cameras fixed at door entry in/outs of the classrooms
- **Raspberry PI** : Low latency cameras with edge processing
- Bluetooth Beacon to pair class room dashboards.
- QR code scanners, Biometric scanners, Ethereum private blockchain

2. Software and AI:

- **Face detection + Recognition:** OpenCV (MTCNN) + RIRS algorithm for twin-resistant facial recognition in attendance marking, Dlib, TensorFlow (DeepFace) for embedding & recognition.
- **Anti-spoofing:** Blink/Head-movement detection or 3D depth sensing.
- Integrate with Zoom/Google Meet/MS Teams API to capture active participation.
- **Deployment:** Docker + Kubernetes, secured with HTTPS + JWT auth

3. Integration:

- PostgreSQL (Local Server)
- Cloud : Amazon S3, Aurora PostgreSQL, Amazon ElastiCache (Redis), Amazon CloudWatch, other services from AWS

- **Authentication & Role Management** – Keycloak/Auth0 with OAuth2.0, JWT, RBAC.
- **Timetable Auto-Scheduler** – OR-Tools/OptaPlanner with PostgreSQL backend.
- **Hall Ticket & Exam Validation** – QR + PKI-signed PDF via ReportLab/wkhtmltopdf.
- **Fees & Receipts Automation** – Razorpay/Stripe APIs with auto PDF receipts.
- **No Dues & Clearance System** – Microservice with PostgreSQL + event-driven updates.
- **Leave Management** – Portal-based requests, FastAPI backend, DB auto-sync.
- **Event & Internship Management** – Node.js microservice + Kafka for registrations.
- **Learning Management (LMS)** – Moodle APIs, AI auto-grading, MongoDB storage.
- **Faculty Cabin Allocation** – Resource allocation algorithm with editable DB.
- **Portal Content & Academic Resources** – S3/MinIO + Elasticsearch for fast retrieval.
- **Analytics & Reporting** – D3.js/Recharts frontend + Grafana dashboards.
- **Notifications & Communication** – Firebase (push), Twilio/Msg91 (SMS), SMTP (email).
- **Media & File Management** – S3/MinIO with CDN + signed URL access.
- **Infrastructure, Security & Monitoring** – Docker, Kubernetes, ELK, Prometheus, Vault.

Working Prototype

Face Recognition using Raspberry PI &Cam

FEASIBILITY AND VIABILITY

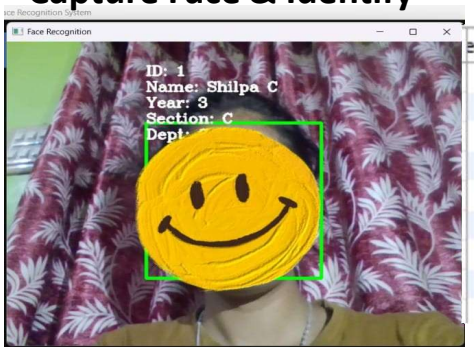
Analysis of the feasibility of the idea

- Environmental factors like low light or poor connectivity may affect performance. The system must accurately distinguish between identical twins to maintain integrity.
- Data security, regulatory compliance, and potential user resistance are also key considerations.

Strategies for Overcoming Challenges

- An intelligent fallback to offline mode with auto-sync ensures reliability in poor conditions.
- Advanced liveness detection and behavioral analysis are employed to effectively mitigate the twins challenge.
- Robust encryption and built-in compliance protocols address security, while a user-friendly design promotes smooth adoption.

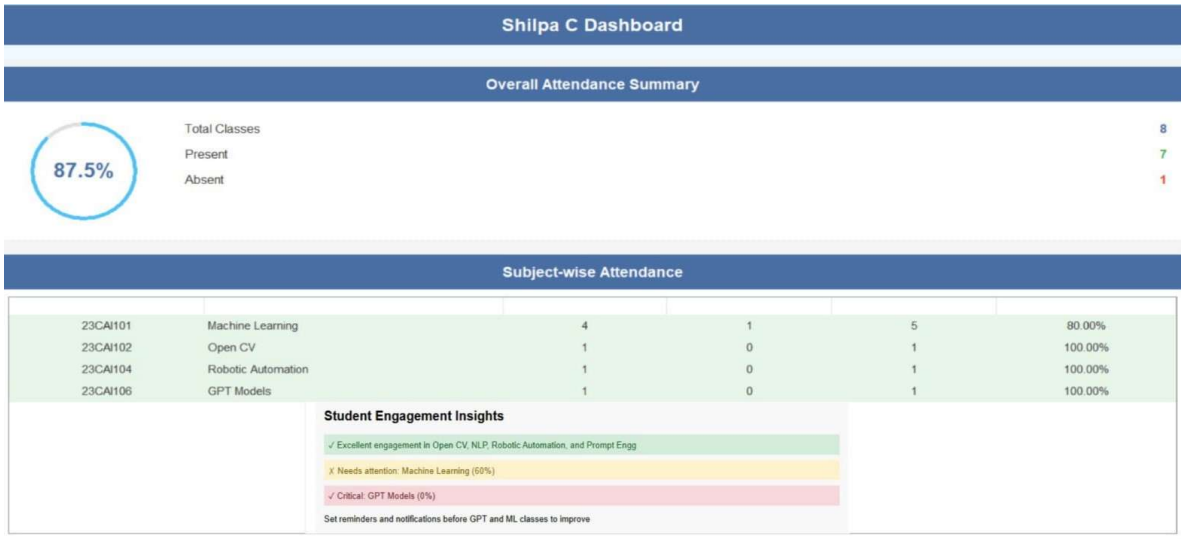
Capture Face & Identify



Attendance in Database

ent_id	student_name	department	year	section	courseCode	courseName
	Shilpa C	CAI	3	C	23CAI106	GPT Models
	Shilpa C	CAI	3	C	23CAI101	Machine Learning
	Shilpa C	CAI	3	C	23CAI101	Machine Learning
	Shilpa C	CAI	3	C	23CAI101	Machine Learning
	Shilpa C	CAI	3	C	23CAI101	Machine Learning
	Shilpa C	CAI	3	C	23CAI101	Machine Learning
	Shilpa C	CAI	3	C	23CAI102	Open CV
	Shilpa C	CAI	3	C	23CAI104	Robotic Automation
	NULL	NULL	NULL	NULL	NULL	NULL

Student Page Attendance Analytics



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IMPACT AND BENEFITS

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Potential Impact:

- **Boosts Academic Efficiency:** Saves valuable teaching hours by automating roll calls and completely eliminating proxy attendance.
- **Enables Proactive Intervention:** Empowers faculty to identify disengaged students early, allowing for timely support and improved outcomes.
- **Ensures Institutional Integrity:** Provides administrators with a transparent, tamper-proof audit trail for reliable record-keeping and compliance.

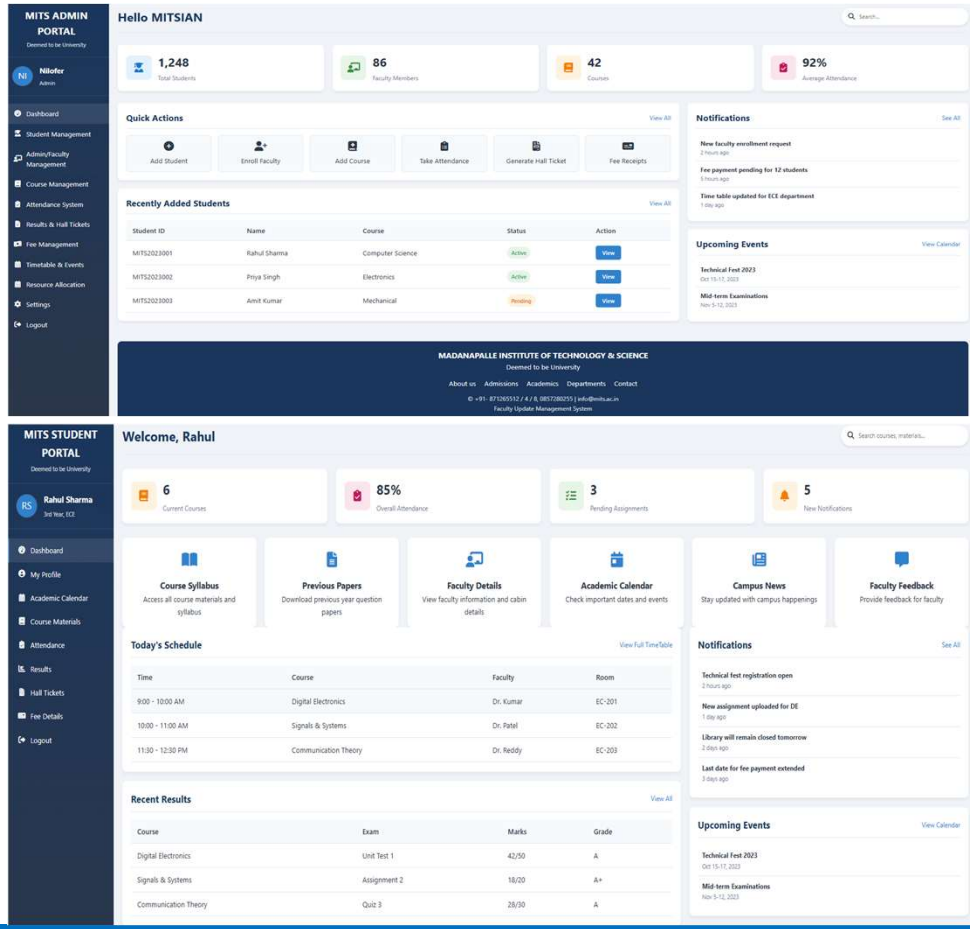
Benefits:

- Students -> Fair & error-free attendance.
- Faculty -> More teaching time, less admin work.
- Colleges -> Digital transformation, compliance.
- Policy makers -> Better insights into student engagement.

Project Video Overview:

A video showcasing the project's key features, implementation, and outcomes will be shared via **Google Drive** (Click Me)
(Or) **Copy and only Paste the link** in the Web Browser (**Don't click link below – It might not open**)
https://drive.google.com/file/d/1IntQ0lbf9yMT5otlC5hFlRRFTibhj7G3/view?usp=sharing

The Web App we developed
(ADMIN & STUDENT PORTAL**)**



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RESEARCH AND REFERENCES

- **Automated Attendance System Using Image Processing** by Smit Hapani,

Our system aims to improve accuracy with hybrid methods (Face + QR/biometric fallback), IRJET-V4I1286-libre.pdf

- **Automated Attendance Systems using Face Recognition**

S. K. Singh et al., *Automated Attendance Management System Based on Face Recognition Algorithms.* *https://www.researchgate.net/publication/358722010_Face_Recognition_Based_Automated_Attendance_Management_System*

MY EARLIER WORK ON AUTOMATED ATTENDANCE

The GitHub link includes prototype, based on my previous work, which has been implemented for the past six months. I am now upgrading it to align with the SIH problem statement and expected outcomes. This serves as a reference to my past work on GitHub and is not the final version.

Automated Attendance System - Git Hub Link (Click Me) (Or)
Copy this in the Web Browser : **https://github.com/ShilpaChinnakkagari/Automated_Attendance**