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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-** Neuro Nova
- **Team Name -** Neuro Nova

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IDEA TITLE

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Proposed Solution

Attendance in most colleges is still tracked manually using roll calls or paper registers. This approach:

- Consumes valuable teaching time.
- Is prone to errors like incorrect entries and proxy attendance.
- Becomes harder to manage in large classes.
- Provides little to no analytics for identifying at-risk students or monitoring engagement.

As education shifts towards digital transformation, continuing with outdated systems creates inefficiencies, delays, and lack of transparency.

Why Unique?

Enhanced Accuracy – By integrating QR codes (~95% accuracy), biometrics (~98% accuracy), and facial recognition (~97% accuracy), the system ensures a combined accuracy rate of 99%+. This multi-technology approach guarantees that students never face issues in marking attendance, even if one method fails.

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TECHNICAL APPROACH

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Technologies to be Used

- **Programming Languages:** Python, JavaScript
- **Frameworks:** React (frontend), Node.js/Express (backend)
- **Database:** MySQL / Firebase / MongoDB (cloud-based)
- **AI/ML:** OpenCV / TensorFlow / MediaPipe / FaceNet / DeepFace / InsightFace
- **Hardware**: Biometric scanner, Camera, QR code scanner.
- **Cloud Services:** AWS / Google Cloud for storage & dashboards

Methodology & Process

- **Student Registration** → Enroll with photo/biometrics/QR ID.
- **Attendance Capture** → QR scan / face recognition / biometric.
- **Data Storage** → Records stored in cloud database securely.
- **Dashboard Access** → Faculty & admin track attendance in real-time.
- **Analytics** → Reports on trends, defaulters, & engagement levels.

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PROCESS FLOW DIAGRAM

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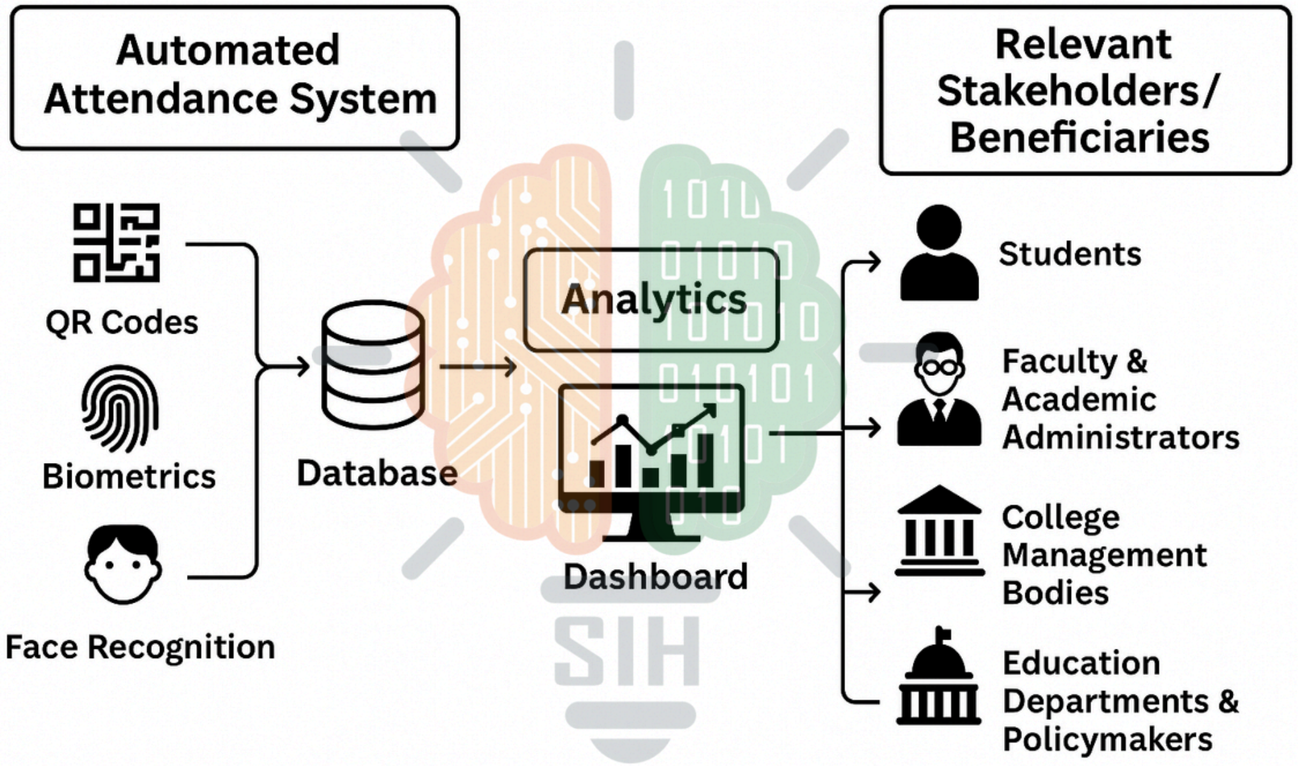

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FEASIBILITY AND VIABILITY

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Feasibility

- Technically viable with existing tools (QR, biometrics, face recognition).
- Affordable with cloud-based & open-source solutions.
- Scalable across classrooms, departments, and online platforms.

Potential Challenges & Risks

- High Initial Cost (biometric/face recognition hardware).
- Data Privacy Concerns (student biometric data security).
- Internet Dependency (for real-time cloud updates).
- Resistance to Change from faculty/students.

Strategies to Overcome

- Start with low-cost QR system, scale to biometrics later.
- Use secure encryption & compliance (GDPR/Indian IT laws) for data.
- Provide offline backup mode with sync once internet is available.
- Conduct training & awareness sessions for smooth adoption.

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IMPACT AND BENEFITS

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Potential Impact on Target Audience

- Students → Fair, transparent, and error-free attendance records.
- Faculty → Saves time, reduces workload, and provides insights.
- Administrators → Better monitoring, accountability, and planning.
- Institutions → Digital transformation and improved reputation.

Benefits of the Solution

- Social → Promotes fairness, transparency, and student accountability.
- Economic → Saves operational costs and reduces manual effort.
- Environmental → Paperless system reduces register/record-keeping waste.
- Educational → Early identification of disengaged/at-risk students.

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RESEARCH AND REFERENCES

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References & Research Work

1. Automated Attendance Systems – Research papers on QR code & biometric-based solutions.
   - International Journal of Computer Applications (IJCA) – "Attendance Management System using QR Code Authentication"
   - IEEE Xplore – "Facial Recognition based Smart Attendance System"

Education Technology & Analytics

- SpringerLink – "Digital Transformation in Higher Education Institutions"
- ScienceDirect – "Student Engagement Analytics for Academic Improvement"

Data Privacy & Security

- GDPR Guidelines – Data protection in educational systems.
- Indian IT Act (2000) – Compliance for biometric data handling.