

HACKNOVA 2025 – PS-2

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Presented by CSA x GDG x Coder's Club

PS-2: Campus Access Control

Background

Educational institutes often face challenges in ensuring secure and smooth entry/exit of students and staff. Manual checks, such as guards physically verifying ID cards or vehicles, are inefficient, error-prone, and slow. With growing student populations and increasing vehicle traffic, maintaining security without causing congestion has become critical. An automated solution is needed that ensures only authorized individuals and vehicles enter, while reducing manual workload and improving reliability.

Objective

Design and develop a secure, automated system that:

- Captures vehicle number plates and ID card data at the main gate.
 - Verifies both against institutional records in real-time.
 - Grants or denies access automatically, minimizing manual checks.
 - Provides audit logs and monitoring tools for security teams.
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Technical Scope

- **Inputs:** CCTV camera feeds for vehicle entry; ID cards.
- **Processing:** Recognition of vehicle number plates; extraction and validation of ID card details.
- **Verification:** Cross-checking both inputs with institutional databases for students and staff.

- **Outputs:** Access logs, alerts for unauthorized attempts, and summarized entry reports.
 - **System Features:** Centralized monitoring dashboard, secure database, scalable design for multi-gate campuses.
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Detailed Description (Functional Workflow)

1. Capture & Input

- CCTV camera records vehicles at the entry gate.
- Students scan their ID cards at the same checkpoint.

2. Recognition & Extraction

- Extract vehicle plate details from CCTV feeds.
- Read and validate ID card data.

3. Verification

- Match both ID and vehicle details with institutional records.
- If valid, allow entry; else, raise an alert.

4. Logging & Monitoring

- Maintain secure entry/exit logs.
- Provide dashboards for real-time monitoring and audits.

5. Performance Requirements

- High accuracy in ID and number plate verification.
 - Low latency to ensure real-time operation.
 - Robust handling under varied environmental conditions.
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Key Performance Parameters

- Accuracy $\geq 95\%$ for ID verification and number plate recognition.
 - Real-time processing with response under 2 seconds.
 - Scalability for 5000+ student/faculty records and multiple CCTV inputs.
 - Reliability under night, rain, glare, or blurred conditions.
 - Secure handling of personal and vehicle data.
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Expected Solution

A fully integrated, automated access control solution with:

- Vehicle number plate recognition module.
 - Student ID card scanning and verification module.
 - Backend database for matching and secure storage.
 - Monitoring dashboard for the security team.
 - Alert and notification system for unauthorized attempts.
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Evaluation Criteria

- **Technical Innovation:** Effective integration of ID card scanning with vehicle recognition.
- **Accuracy & Efficiency:** Benchmarking against provided datasets.
- **User Experience:** Ease of use for students and security staff.
- **Scalability:** Extension to larger campuses or multiple entry gates.
- **Security & Privacy:** Strong data protection and access control.

- **Deployment Readiness:** Feasibility with existing infrastructure.
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Conclusion

The Smart Campus Access Verification System ensures secure, efficient, and reliable entry management by combining vehicle number plate recognition with ID card validation. It minimizes manual checks, prevents unauthorized access, and strengthens institutional security while maintaining smooth traffic flow. This solution enhances trust, reduces workload, and provides a scalable model for modern campus security.