Digital and Communication Engineering
Senior Project Proposal Form

*School of Applied Digital Technology, Mae Fah Luang University*

มหาวิทยาลัยแม่ฟ้าหลวง
MAE FAH LUANG UNIVERSITY

# Online Exam Proctoring System


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BACHELOR OF ENGINEERING IN MAJOR OF

**DIGITAL AND COMMUNICATION ENGINEERING**

SCHOOL OF APPLIED DIGITAL TECHNOLOGY

MAE FAH LUANG UNIVERSITY

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# 1. Senior Project Title

Online Exam Proctoring System

# 2. Background

Online examinations are now widely used in universities because they reduce time, cost, and allow flexible learning. However, online exams also increase the risk of cheating, such as switching tabs to search answers, using another device, receiving help from others, or letting another person take the exam. Traditional online quiz systems cannot effectively confirm student identity or detect suspicious behaviors during the exam.

Therefore, a secure online exam platform is needed to support both lecturers and students, while also monitoring exam behaviors in real time. This project proposes an online exam proctoring system that combines browser activity monitoring (tab switching detection) and webcam-based face monitoring (multiple faces and head turning detection). The system also provides lecturers with an admin dashboard to create exams, monitor results, and review evidence of suspicious actions.

# 3. Objectives

- Develop an online exam platform that supports students and lecturers with secure login and exam management.
- Implement lecturer features such as creating and uploading exam questions (single choice, multiple choice, fill in the blank, setting up restrictions).
- Implement student verification and monitoring, requiring login with student email format (@lamduan.mfu.ac.th) and permission for webcam access (if students don't have webcam, they cannot access exam).

Detect cheating behaviors using:

- Tab-switching monitoring, allowing lecturers to configure the maximum number of permitted tab switches.
- Face monitoring (terminate exam if multiple faces are detected or head turns around and away from camera).
- Enforcement of cursor boundary constraints within the examination interface, generating warnings upon boundary violations and allowing lecturer-controlled activation or deactivation.
- Provide an evidence-based report for lecturers, including suspicious actions logs and recorded/captured webcam evidence.

# 4. Scope of Project

## 4.1 Lecturer Side (Admin Dashboard)

- Lecturer authentication and dashboard access with SSO (e.g. MFU SSO).
- Exam creation and management (CRUD).
- Question management with multiple formats:
    - Single choice
    - Multiple choice
    - Fill in the blank
- View student exam status (Active/Terminated/Submitted).
- Review terminated cases with:
    - Tab-switch logs (Timestamps and Count)
    - Face monitoring logs (Multiple faces / Head turn events)
    - Captured images and recorded video evidence

### 4.2 Student Side (Exam Portal)

- Student login using Student ID email domain (@lamduan.mfu.ac.th).
- Exam page with permission request:
    - Webcam access
    - Browser monitoring for tab switches
- Start the exam only after the system confirms the webcam is active and monitoring is enabled.
- Automated exam termination rules (lecturer-configurable):
    - Exceeding the maximum number of allowed tab switches → exam termination
    - Detection of multiple faces or repeated head-turning beyond lecturer-defined limits → exam termination
    - Repeated cursor boundary violations exceeding lecturer-defined limits → exam termination

### 4.3 Out of Scope (Not included in this project)

- Full AI behavior analysis such as emotion detection or voice detection.
- Mobile application version (the system focuses on web).
- Integration with external university grading systems (optional future work).

# 5. Methodology

1. Requirement Analysis

- Collect functional requirements for lecturers and student modules.
- Define proctoring rules and termination thresholds.

2. System Design

- System architecture design, including full-stack web development, database design, and cloud hosting infrastructure.
- UI/UX design for the lecturer dashboard and student examination portal.
- Plan cloud cybersecurity architecture based on the CIA Triad (Confidentiality, Integrity, Availability).

3. Implementation

- Full-Stack Web Development
    - Develop front-end components using JavaScript for login, exam interface, tab-switch detection, and cursor boundary monitoring.
    - Implement back-end services using Python for authentication, exam management APIs, and activity logging.
    - Integrate face detection and monitoring modules into the examination workflow.

- Cloud Engineering (Huawei Cloud)
    - Deploy the web application and database on Huawei Cloud.
    - Configure server resources for scalability and performance during concurrent exams.
    - Monitor system availability and manage cloud resources.

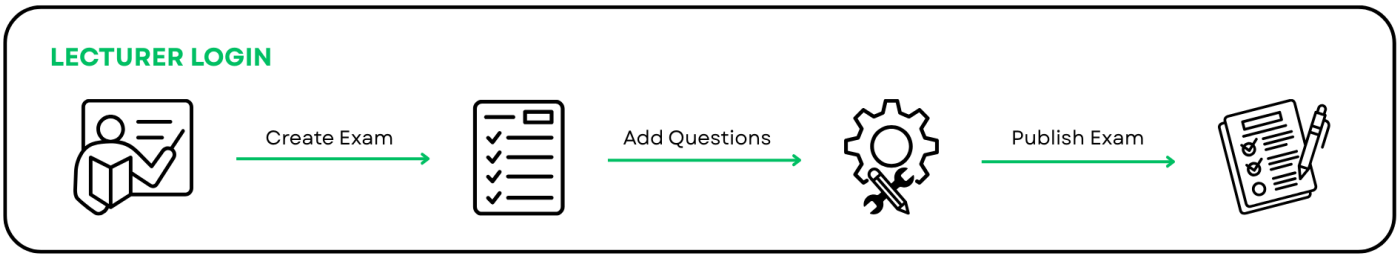
- Cybersecurity
    - Implement secure authentication and role-based access control.
    - Configure encrypted communication (HTTPS) and secure API access.
    - Apply cloud security policies, including firewall and access restrictions.

4. Testing and Evaluation

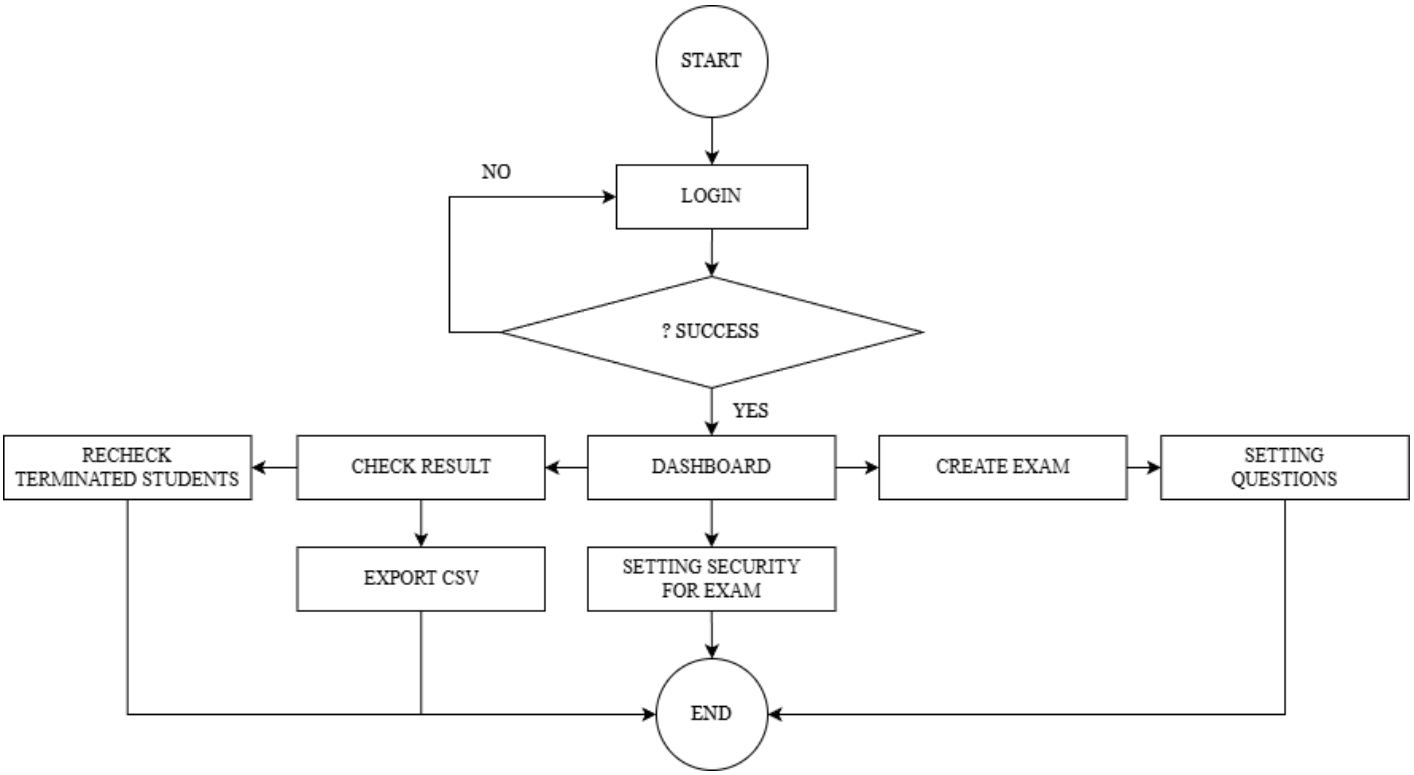
- Test system functionality and monitoring features.
- Evaluate detection accuracy for tab switching, cursor boundary violations, and facial behaviors.
- Assess system security, data integrity, and availability under exam conditions.

# 6. Workflow

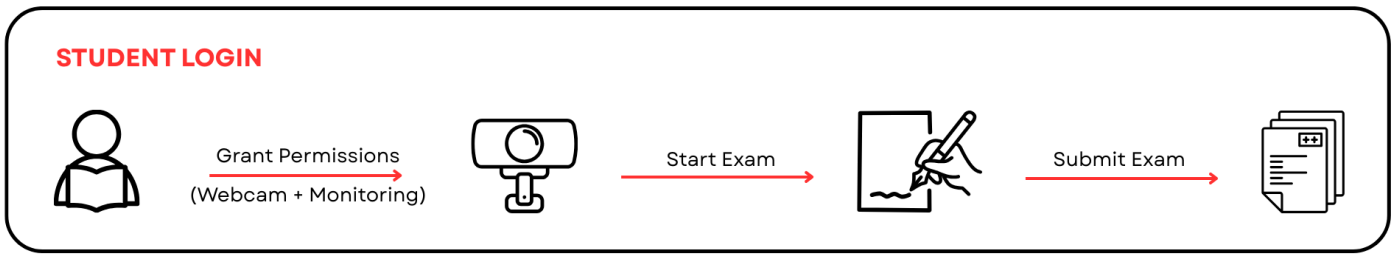
Lecturer Workflow



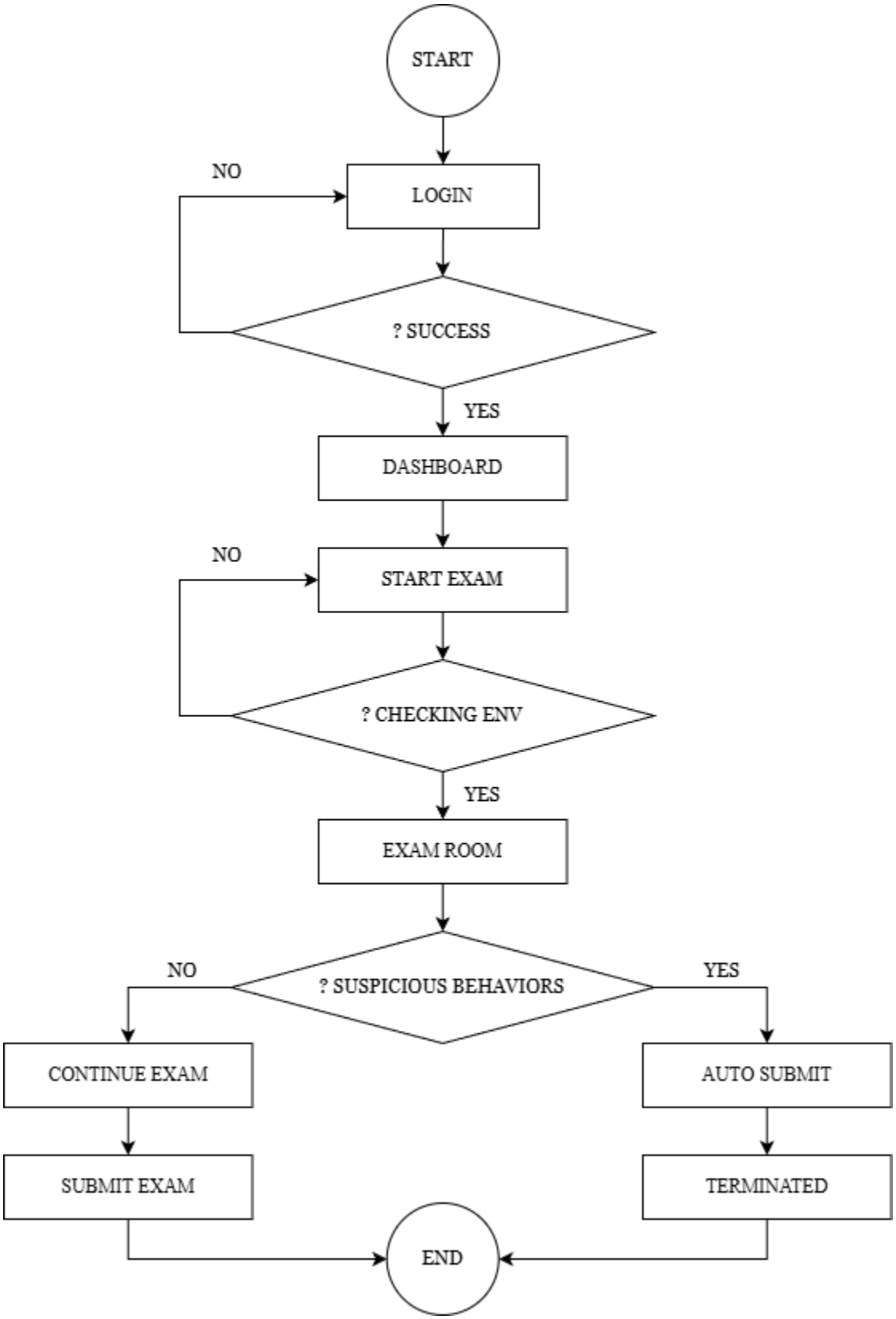

1. The process starts when the lecturer accesses the system (Start).
2. The lecturer performs Login using valid credentials.
3. The system checks whether the login is successful.
    - If NO, the system redirects the lecturer back to the login process.
    - If YES, the lecturer is redirected to the Dashboard.
4. Create Exam, then proceed to Setting Questions.
    - Check Result of completed examinations.
    - From the result page, the lecturer can Export results as CSV.
    - The lecturer can also Recheck Terminated Students.
    - Set Security for Exam, including monitoring rules and termination conditions.
5. After completing the required actions, the system completes the process and reaches End.




Student Workflow



1. The process begins when the student accesses the system (Start).
2. The student performs Login using valid credentials.
3. The system verifies whether the login is successful.
    - If NO, the student is redirected back to the login page.
    - If YES, the student is directed to the Dashboard.
4. From the dashboard, the student selects Start Exam.
5. The system performs an Environment Check, including permission validation and monitoring readiness.
    - If NO, the system prevents exam access and returns the student to the start exam process.
    - If YES, the student enters the Exam Room.
6. During the examination, the system continuously monitors for Suspicious Behaviors.
    - If NO suspicious behavior is detected, the student continues the exam and may Submit Exam normally.
    - If YES suspicious behavior is detected, the system automatically Auto Submits the exam and marks the student as Terminated.
7. The process ends after exam submission or termination (End).


START
NO
LOGIN
? SUCCESS
YES
DASHBOARD
NO
START EXAM
? CHECKING ENV
YES
EXAM ROOM
NO
? SUSPICIOUS BEHAVIORS
YES
CONTINUE EXAM
AUTO SUBMIT
SUBMIT EXAM
TERMINATED
END

## 7. Expected Results

- A fully functional Online Exam Proctoring System with Face Recognition deployed on Huawei Cloud.
- A lecturer dashboard capable of creating and managing exams, configuring security rules, and reviewing student behavior evidence.
- A student examination portal that enforces secure login and required proctoring permissions.
- Automated cheating detection with lecturer-configurable thresholds that:
    - Detects excessive tab switching and terminates the exam when lecturer-defined limits are exceeded.
    - Detects multiple faces or repeated head-turning behavior and terminates the exam based on lecturer-defined thresholds.
- Reliable logging and evidence capture to support transparent and fair decision-making by lecturers.

## 8. Budget

The project utilizes GitHub Education and open-source technologies, resulting in zero direct development cost. All tools, platforms, and resources are accessed through educational licenses and free-tier cloud services. Implemented, and tested without incurring infrastructure costs. Therefore, no direct monetary budget is required for the development of this project.

GitHub Education. (n.d.). GitHub Student Developer Pack. https://education.github.com/pack

## 9. Conclusion

This project presents the design and development of a secure online examination proctoring system aimed at reducing academic dishonesty in remote assessments. The system integrates browser-based monitoring and webcam-enabled face recognition to identify suspicious behaviors during examinations. Automated rule-based detection mechanisms such as tab-switch monitoring and facial behavior analysis are combined with a lecturer dashboard that supports evidence review and fair decision-making.

By utilizing Huawei Cloud for scalable deployment, Python-based computer vision for monitoring, and JavaScript for front-end interaction and behavior detection, the project demonstrates a complete and practical cloud-based proctoring solution. Overall, the proposed system enhances examination integrity, increases trust in online assessments, and highlights the effective application of cloud computing, cybersecurity, and web technologies in real-world educational environments.