**Smart Banking Security System using Laser Tripwire**

*August 2024 – October 2024 | Hardware Designer & IoT Programmer*

**Problem Statement:**

Physical intrusion in banks and ATMs is still a huge risk. Traditional CCTV systems are reactive and passive. This system provides real-time laser-based intrusion detection with automatic evidence capture

**Key Features:**

* Laser Tripwire with LDR Sensor: Detects any physical interruption.
* ESP32-CAM Module: Instantly captures and processes an image.
* Wireless Alerts: Sends photo to authorized personnel/device.
* Intrusion Logs: Maintains log with timestamps for future audit.
* Standalone Operation: No reliance on heavy networking.

**My Contributions:**

* Designed and implemented Laser + LDR intrusion circuit.
* Programmed the ESP32-CAM to detect beam breaks and auto-capture images.
* Set up cloud-based Firebase DB for logging intrusion events.
* Calibrated hardware for stable light sensitivity under variable lighting.
* Developed Android viewing app using MIT App Inventor.

**Technologies Used:**

* ESP32-CAM (Microcontroller with camera)
* Laser Module
* LDR Sensor
* Firebase Realtime Database
* MIT App Inventor (Mobile App)
* IoT Security Architecture

**Challenges & Learnings:**

* Aligning laser beam accurately across long distances.
* Filtering out false positives from ambient daylight.
* Ensuring image transmission in low-signal environments.
* Balancing power efficiency and reliability.