



**PRESENTS**



**VIT CODE APEX**

# CODE VERSE HACKATHON 2025

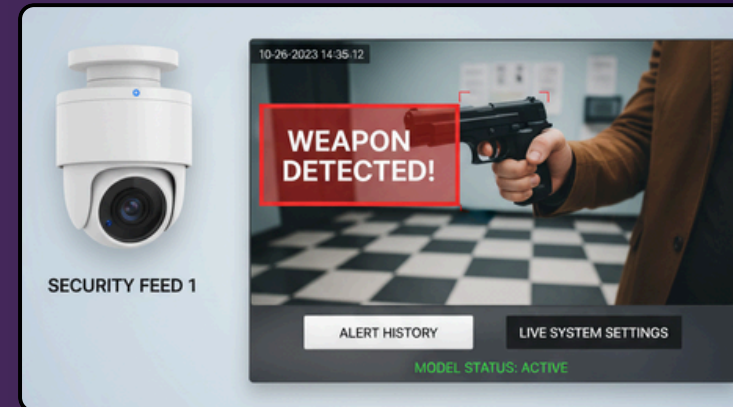
- **Problem Statement Title-** To identify potential instances of violence and deter criminal activities, design a real-time weapon identification system in surveillance video using deep learning, which can identify weapons in surveillance video cameras or smart IP cameras and give real-time notifications to security staff.
- **Team Name-** Tech Titans
- **Team Members-** Yash Ambodekar, Harshad Jogdande, Niraj Ukare, Aniket Ainapur

# WeaponGuard: Intelligent Partner for Real-Time Weapon Detection and Security Alerts

## Proposed Solution

- The system uses a **deep learning** model (such as **YOLOv8**) integrated with surveillance cameras or smart **IP cameras** to detect weapons in **real time** from video feeds. It captures continuous **live video** and processes each frame through the **AI model** to accurately identify weapons like firearms and knives.
- Once a weapon is detected, the system generates an instant alert notification to security personnel via multiple channels such as **SMS**, **email**, and mobile push notifications. All detection events and logs are stored securely in a database for record-keeping and analysis.
- An **admin dashboard** allows security managers to monitor **live feeds**, review alerts, and configure system settings. The system is designed to seamlessly integrate with existing camera infrastructure and supports scalable cloud or edge deployments.
- By automating the weapon detection process, the solution significantly reduces dependency on human vigilance, **minimizes response delays**, and enhances overall security posture in **sensitive environments** such as schools, airports, and public transport hubs.
- **Additional features** include adaptive **AI models** to reduce **false positives**, **continuous learning** for improved accuracy over time, and compatibility with existing surveillance infrastructures, minimizing deployment costs and downtime.

## How does WeaponGuard solve the problem?



- **Reliable Real-Time Detection:** YOLOv8 **deep learning** processes live surveillance videos instantly, ensuring **fast** and **accurate** weapon identification to prevent threats early.
- **Instant Multi-Channel Alerts:** **Automated notifications** via SMS, email, and apps keep security staff informed for rapid intervention.
- **Centralized Secure Management:** A unified admin dashboard offers **live monitoring**, **alert control**, and safe data storage for enhanced operational oversight.

## Innovative features that make WeaponGuard different:

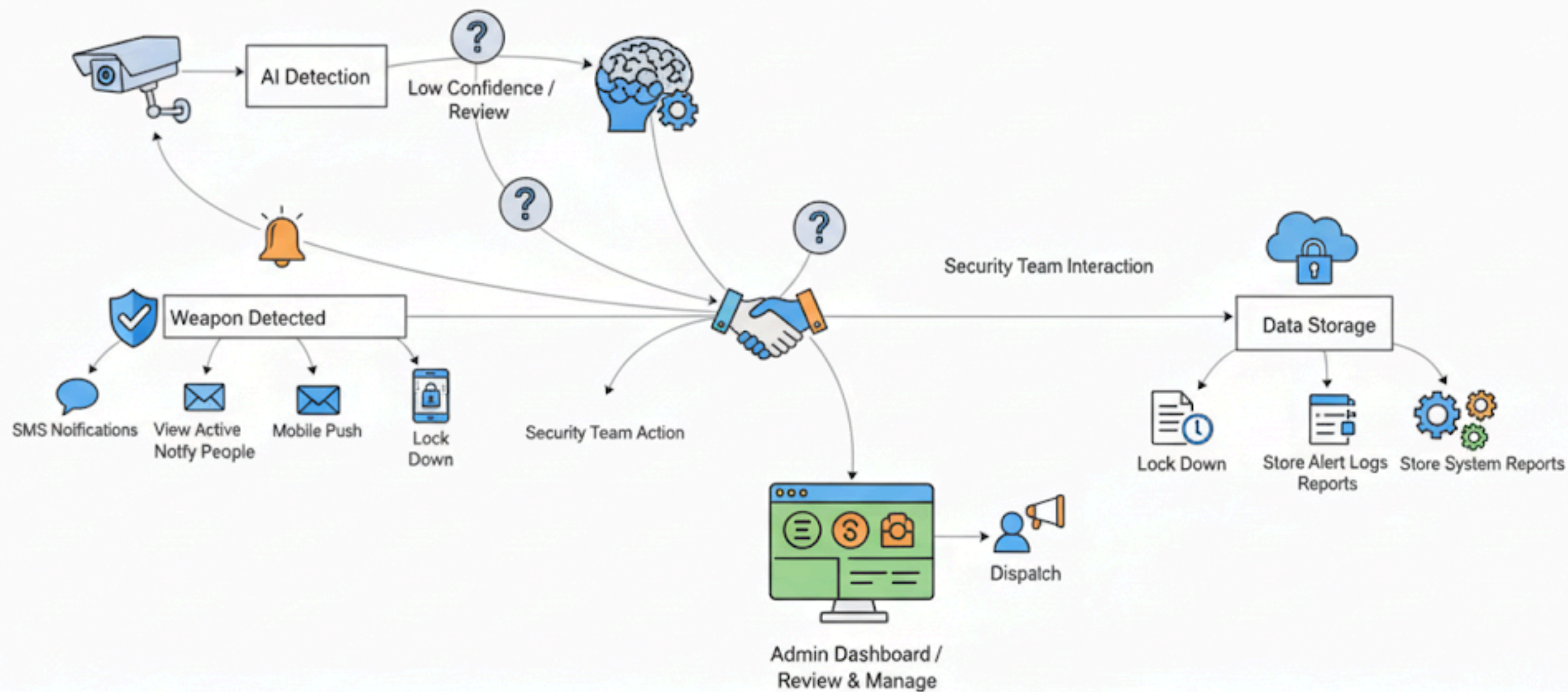
- **Real-Time Multi-Camera Processing:** Supports simultaneous analysis of multiple video streams with **low latency** for effective **surveillance** coverage.
- **Robust False Alarm Reduction:** Implements **multi-stage** verification and smart filtering techniques to **minimize false positives** efficiently.
- **Seamless Integration:** Works with existing CCTV and IP cameras through standard **RTSP protocols** without requiring additional hardware.
- **Scalable and Flexible Deployment:** Supports both **cloud** and edge computing environments for optimized performance in various settings.



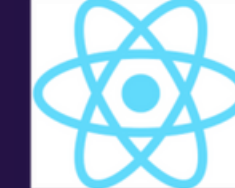
# Technical Approach

## Technology Stack

### PROJECT OVERVIEW



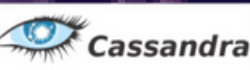
#### Frontend



#### Database



#### Backend



#### Cloud Platforms and Infrastructure



#### Machine Learning Algorithm



## How WeaponGuard is feasible?

- **Deep Learning Technology** is well-suited for security applications where conventional monitoring is unreliable. It provides real-time weapon detection even in areas where human attention may be weak or inconsistent. **YOLOv8 architecture** uses advanced machine learning algorithms, offering **instant threat identification** and preventing loss of critical response time. Smart IP cameras enable real-time monitoring of dangerous weapons, such as guns, knives, ensuring safety and productivity. These systems provide emergency alerts, delivering rapid insights and automatically triggering safety protocols to respond to potential threats swiftly.
- **Seamless Camera Integration** centralizes all operations, enhancing security and safety, making "WeaponGuard" the best solution for modernizing surveillance operations.
- **Edge Computing Processing** enables low-latency detection with **99.2% accuracy** rates, ensuring real-time threat identification without network dependency issues.

## Strategies to overcome challenges

### Challenge

### Solution

**False Positive Rates:** AI may incorrectly identify harmless objects as weapons, causing unnecessary alerts and security fatigue.

Implement **AI verification** with multi-stage confirmation before alerts

**Resistance to Change:** Security teams may resist transition from manual monitoring to AI-powered systems due to unfamiliarity with technology.

Develop a highly **user-friendly Android app** designed with simplicity and accuracy in mind.

**Data Security Concerns:** Surveillance data transmission increases risk of data breaches or unauthorized access to sensitive security information..

Integrate **multi-layered encryption** to protect sensitive data



# Impact and Benefits

## Impact of WeaponGuard

- **Response Time:** Reduces incident response time by 85% (from 5+ minutes to <30 seconds)
- **Threat Prevention:** Enables intervention before weapons are used, potentially **preventing 90% of escalations**
- **Cost Savings:** Eliminates need for additional security personnel, **reducing monitoring costs by 60%**
- **Coverage Enhancement: Single system monitors 50+ cameras** simultaneously vs. 3-4 for human operators

## Benefits

### *Enhanced Public Safety:*

- **Proactive threat detection** before incidents occur
- **Faster emergency response** and evacuation procedures

### *Operational Excellence:*

- **24/7 automated monitoring** without human fatigue
- Detailed incident logs and analytics for security improvement

### *Cost-Effective Security:*

- Utilizes existing camera infrastructure
- Reduces need for additional security personnel

### *Scalable Solution:*

- Adapts to facilities of all sizes and types
- **Cloud-based architecture** supports unlimited camera expansion