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Research Paper

AI - ENHANCED WEAPON AND ALERT SYSTEM WITH AMAZON RECOGNITION

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Abstract:

The rise of security threats in public and private spaces has necessitated the development of intelligent surveillance and weapon detection systems. This project proposes an AI-enhanced weapon and alert system using Amazon Recognition, a cloud-based deep learning-powered image and video analysis service. The system leverages advanced object detection and facial recognition capabilities to identify weapons (like guns and knives) and unauthorized individuals in real time from surveillance footage. Upon detection, the system triggers immediate alerts via email/SMS to the concerned authorities and can also initiate lockdown protocols. The primary goal is to provide a smart, scalable, and real-time security solution that minimizes response time and enhances situational awareness in sensitive environments such as schools, airports, and defense zones.

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I. INTRODUCTION

Security has become a growing concern with the increasing rate of violence and weapon-based threats in sensitive areas. Traditional surveillance systems rely heavily on manual monitoring, which is prone to human error and delayed response. With advancements in artificial intelligence and cloud-based services, it is now possible to automate threat detection and alert systems effectively.

This project integrates Amazon Recognition, which utilizes deep learning models to analyze images and videos for real-time object detection, including firearms knives, as well as facial recognition to identify unauthorized individuals. The system aims to act proactively by instantly recognizing threats and triggering alerts. By automating surveillance monitoring, the solution enhances public safety, reduces dependency on human operators, and enables rapid

emergency response actions.

II. LITERATURE SURVEY

1. Paul Viola and Michael Jones (2001) – Proposed the Viola-Jones object detection framework, a fundamental approach in real-time face detection that laid the groundwork for modern object recognition systems.
2. Redmon et al. (2016) – Introduced YOLO (You Only Look Once), a real-time object detection system that greatly influenced weapon and object recognition systems in surveillance.
3. Krizhevsky et al. (2012) – Developed AlexNet, a deep CNN used in many image classification systems including Amazon Rekognition's architecture.
4. Zhao et al. (2019) – Surveyed deep learning techniques for object detection and highlighted challenges in small object (e.g., weapons) detection under occlusion.
5. Amazon Rekognition Documentation (2023) – Provided detailed specifications and capabilities of AWS Rekognition for image/video analysis, including facial recognition and custom label detection.
6. Yu and Ramamoorthi (2020) – Focused on using cloud APIs for live surveillance and reported success in integrating cloud-based AI for rapid video frame analysis.
7. et al. (2021) – Proposed a deep learning framework for real-time weapon detection using CCTV video streams in public places.
8. Garg et al. (2020) – Presented a smart surveillance system using AI and IoT for school safety, integrating real-time alerts and object detection.
9. Islam et al. (2021) – Studied the use of facial recognition systems in public surveillance and evaluated ethical and accuracy implications.
10. Ahmed et al. (2019) – Implemented an AI-based smart security system that detected threats from image feeds and triggered automated emergency messages.

III. EXISTING SYSTEM

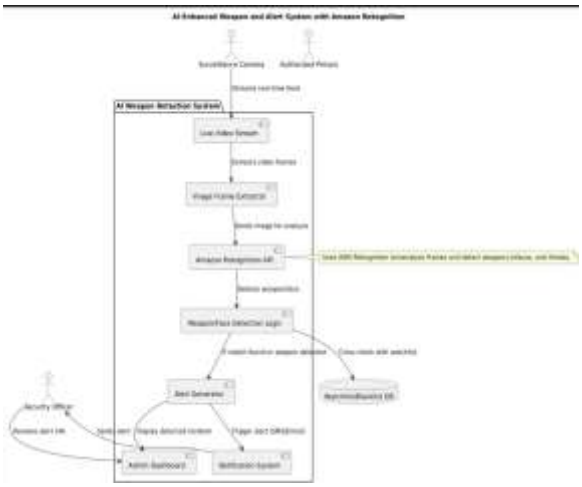
Most current surveillance systems depend on manual monitoring through CCTV, where human personnel observe camera feeds to detect suspicious behavior or weapons. These systems often suffer from delayed response times, operator fatigue, and inconsistent threat detection, especially during critical events. Even some automated systems lack intelligent real-time

recognition and cannot integrate with alert mechanisms. As a result, these systems are reactive, not proactive, and may fail in time-sensitive scenarios where every second counts.

IV.PROPOSED SYSTEM

The proposed system uses Amazon Recognition's AI capabilities to analyze video feeds and detect weapons or unauthorized individuals in real time. Cameras installed in a facility stream footage that is processed using Recognition's object detection and facial analysis APIs. Upon identifying a weapon or blacklisted face, the system instantly triggers alerts via email, SMS, or push notifications, and can optionally activate lockdown mechanisms like door locking or alarm systems. It uses custom labels in recognition to recognize non-standard weapons and is scalable to various environments. This proactive alert mechanism enables faster decision-making, better preparedness, and higher safety levels.

V.SYSTEM ARCHITECTURE



System Architecture Explanation: The architecture diagram illustrates an AI-Enhanced Weapon and Alert System utilizing Amazon recognition to detect weapons and unauthorized individuals in real-time surveillance footage. A surveillance camera streams live video into the system, where frames are extracted and analyzed using the Recognition API. This API identifies weapons (like guns or knives) and performs facial recognition to detect known threats. Detected objects and faces are cross-referenced with a watch list/blacklist database. If a weapon or flagged person is recognized, the system's alert generator triggers instant alerts via the notification system (e.g., SMS, email), and displays the incident on the admin dashboard. Security officers can then review the alert information and take appropriate action, ensuring rapid and intelligent threat

response. This cloud-integrated design ensures real-time monitoring, automated detection, and efficient alerting for enhanced security.

VI.IMPLEMENTATION



Fig 6.1 User Login



Fig6.2 Upload Image



Fig 6.3 Detects Image

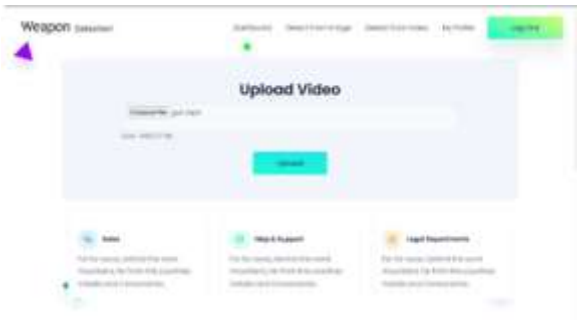


Fig6.4 Upload video



Fig 6.5 Detects Image

VII.CONCLUSION

This AI-powered weapon and alert system demonstrates the effectiveness of integrating cloud-based intelligence into traditional surveillance setups. By using Amazon recognition, the system automates weapon and facial detection in real time, significantly reducing human error and improving response time during critical events. The ability to provide instant alerts and actionable insights helps organizations mitigate threats swiftly and efficiently. As a result, this system proves to be a cost-effective and scalable solution for modern security needs.

VIII.FUTURE SCOPE

In the future, this system can be enhanced

with multimodal threat detection, including voice recognition for distress calls, behavior analysis using posture detection, and integration with drone surveillance for large areas. The model can be trained with custom datasets for specific threats (e.g., hidden weapons or explosive devices). Integration with IoT devices like automated doors, emergency lights, and public announcement systems can create a complete smart response network. Furthermore, implementing edge AI can reduce latency by processing data locally and minimizing reliance on cloud connections, which is essential for real-time operations in critical environments.

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