

# Executive Summary

## Anomaly Detection in CCTV Footage for Snatching Incident Identification

This executive summary outlines a project aimed at enhancing urban safety through real-time anomaly detection in CCTV footage, with a focus on identifying snatching incidents involving weapons. The system leverages advanced YOLO object detection models (v5–v12) trained on a custom dataset of over 5,000 annotated CCTV images.

**\*\*Background & Motivation:\*\*** Urban centers face a growing challenge of firearm-related snatching incidents. Traditional CCTV monitoring is inefficient due to issues such as occlusion, low lighting, and motion blur. Automated AI-based detection is necessary for rapid response and improved public safety.

**\*\*Problem Statement:\*\*** Manual surveillance systems often fail to identify threats promptly, leading to delayed intervention. This project addresses the critical need for scalable and efficient anomaly detection in real-time surveillance.

**\*\*Dataset & Methodology:\*\*** The project uses a novel dataset of CCTV frames resized to 420x420 pixels, augmented for robustness. YOLO models (v8–v12) were fine-tuned with SGD and Ciou loss, trained on NVIDIA Tesla T4 GPUs, and optimized for real-time inference at 60 FPS with high accuracy.

**\*\*Results & Key Contributions:\*\*** The proposed system achieved a peak mAP@0.5 of 0.898 (89.8%) with YOLOv10, effectively handling environmental challenges. Contributions include:

- Creation of a custom surveillance dataset for weapon detection.
- Integration of attention-based mechanisms for spatiotemporal learning.
- Optimized loss function improving detection by 15% mAP.
- Development of an ethical, privacy-preserving AI framework.

**\*\*Conclusion & Future Work:\*\*** This project demonstrates the feasibility of real-time, high-accuracy weapon detection in CCTV footage, enabling proactive crime prevention. Future work will expand the dataset, integrate human action recognition, and explore deployment in smart city networks for scalable security solutions.