

# Summary Report

## Summary Report for Real-time Anomaly Detection in Video Surveillance

### I. Introduction

The increasing use of surveillance cameras in the United States, driven by technology and security concerns, has led to a reliance on human operators for monitoring and anomaly detection. However, human operators have limitations such as fatigue and distraction. To address this, real-time automatic anomaly detection in video surveillance is crucial. This system can continuously monitor and promptly respond to unusual activities, enhancing security by detecting crimes like shootings, shoplifting, assault, and robbery. Furthermore, it serves as an early threat detection tool, identifying suspicious events like robbery, unusual vehicle movements, etc. Rapid anomaly detection enables quicker responses from security personnel and law enforcement, reducing the risk of danger or damage.

### II. Objectives

- **Early Threat Detection:** to build a real-time anomaly detection system that can identify unusual events and quickly respond to possible threats and reduce the chance of damage.
- **Scalability:** to build a real-time anomaly detection system that can process multiple video surveillance streams at once, which provides a scalable solution that retains accuracy.
- **Reduced False Positives:** to build a real-time anomaly detection system that can learn from past data and normal behavior patterns to decrease the number of false positives.
- **Emergency Notification:** to build a real-time anomaly detection system that can send a notification to users when an anomaly action is detected.

### III. Methodology

- **I3D (Inflated 3D ConvNet)**
  - **3D Convolutional Layers:** I3D uses 3D convolutional layers that operate on video data, capturing spatial and temporal features simultaneously.
  - **Inflated Weights:** Initializing the 3D convolutional layers with 2D convolutional filters pretrained on large-scale image classification datasets. These pretrained weights help in transfer learning and faster convergence.
  - **Two-Stream Architecture:** I3D typically employs two parallel streams of networks: one for RGB frames and another for optical flow. This enables the model to analyze both frame content and motion patterns.
- **Video Explainability Methods:**
  - Use LIME, sharp, or CLAD to explain why the detection decision was made

#### **IV. Conclusion**

In conclusion, this paper has underscored the critical importance of real-time anomaly detection in video surveillance systems, emphasizing its role in enhancing societal security. We have discussed the significance of early threat detection, scalability, reduced false positives, proactive response, and emergency notification as key objectives in the context of this technology.

#### **V. References**

- [1] <https://www.crcv.ucf.edu/projects/real-world>