Responsive Crime Monitoring and Instant Classification Utilizing AI on Live CCTV Feeds

Literature Review

Introduction:

The project aims to address the inefficiencies in current surveillance systems by developing an AI-based system for real-time monitoring and classification of criminal activities using live CCTV feeds. The main research question is: "How can AI improve the efficiency and accuracy of real-time crime detection and classification in live CCTV feeds?"

General Review

Key Concepts and Terminologies
1. **Real-Time Object Detection**: Understanding YOLO (You Only Look Once) and its versions, particularly YOLOv8.
2. **AI in Surveillance**: Implementation and benefits of AI in enhancing surveillance systems.
3. **Object Detection and Video Classification Techniques**: Use of object detection and video classification for automated crime detection and prevention.

Major Ideas from Literature
1. YOLOv8's application in real-time object detection for surveillance.
2. AI-based video surveillance systems for crime prevention.
3. Models' accuracy in detecting and classifying criminal activities.

Datasets Available
1. **RWF-2000 Dataset**: Contains videos of real-world fights for training models to detect violent activities.
2. **Smart City CCTV Violence Detection Dataset**: Designed for detecting violent activities in smart city environments using CCTV footage.

Common Models Used
1. YOLOv8 for object detection.
2. Various video classification models for automated crime detection and prevention.

Major Issues with the Problem/Model/Datasets
1. High computational requirements for real-time processing.

2. The challenge of reducing false positives and improving detection accuracy.
3. Ensuring the system's robustness across different environments and scenarios.

Paper Review

Relevant Papers and Their Summaries
1. **"You Only Look Once: Unified Real-Time Object Detection" (Arxiv 2016)**
   - **Main Idea**: Introduction of YOLO, a fast and accurate object detection model.
   - **Datasets**: COCO dataset.
   - **Model Used**: YOLOv8.
   - **Performance**: Achieves a mAP of 50.3%.
2. **"AI-Based Real-Time Video Surveillance System for Crime Prevention" (Arxiv 2022)**
   - **Main Idea**: AI implementation in real-time video surveillance for crime prevention.
   - **Performance**: Accuracy of 93%, reducing false positives by 15%.
3. **"Deep Learning for Automated Real-Time Crime Detection and Prevention in CCTV Footage" (ScienceDirect 2023)**
   - **Main Idea**: Use of deep learning techniques for automatic crime detection.
   - **Performance**: Precision of 89%, recall of 92%.
4. **"Advancements in AI for Real-Time Crime Monitoring Using Surveillance Cameras" (MDPI Sensors 2022)**
   - **Main Idea**: Review of AI advancements in real-time crime monitoring.
   - **Performance**: F1-score of 0.91.
5. **"Crime Detection and Prevention Using AI in Surveillance Systems" (Arxiv 2022)**
   - **Main Idea**: AI methodologies for crime detection in surveillance systems.
   - **Performance**: Success rate of 88%, reducing crime response time by 20%.
6. **"Implementation of AI in Surveillance for Crime Detection" (IEEE 2023)**
   - **Main Idea**: Application of AI technologies in surveillance systems for crime detection.
   - **Performance**: Detection accuracy of 90%.

Literature Review Matrix

Title/Author/ Date	Conceptual Framework	Research Question(s)/ Hypotheses	Datasets	Methodology	Analysis & Results	Conclusions	Implications for Future Research
"You Only Look Once: Unified Real-Time Object Detection"	YOLO framework for object detection	How to achieve real-time object detection with high accuracy	COCO dataset	YOLOv8 model	mAP of 50.3%	High-speed, accurate detection	Explore YOLOv8 applications in different fields
"AI-Based Real-Time Video Surveillance System for Crime Prevention"	AI in real-time video surveillance	Effectiveness of AI in reducing crime	Custom dataset	AI algorithms for object detection	Accuracy of 93%, reduced false positives by 15%	AI enhances crime prevention	Integration with existing surveillance infrastructure
"Advancements in AI for Real-Time Crime Monitoring Using Surveillance Cameras"	AI advancements in surveillance	Performance of latest AI models	RWF-2000, Smart City CCTV Violence Detection Dataset	Advanced AI models	F1-score of 0.91	Robust performance	Further development of AI models

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"Crime Detection and Prevention Using AI in Surveillance Systems"	AI methodologies for crime detection	Success rate of AI in real-world deployments	Custom dataset	Integration of AI algorithms	Success rate of 88%, reduced response time by 20%	Improved response times	Field performance evaluation
"Implementation of AI in Surveillance for Crime Detection"	AI in surveillance systems	AI's impact on surveillance efficiency	Custom dataset	AI system architecture	Detection accuracy of 90%	Enhanced surveillance efficiency	System scalability
"Deep Learning for Automated Real-Time Crime Detection and Prevention in CCTV Footage"	Deep learning for crime detection	Accuracy of deep learning in crime detection	Custom dataset	Deep learning techniques	Precision of 89%, recall of 92%	Effective real-time detection	Improvement in model training

Project Solution Proposals:

Based on the findings, the proposed research and system design should focus on:

1. Utilizing YOLOv8 for its high-speed and accurate object detection capabilities.
2. Implementing a responsive framework to analyze and categorize suspicious activities swiftly.
3. Training models on comprehensive datasets like RWF-2000 and SCVD.
4. Continuously improving the AI system to reduce false positives and enhance detection accuracy.

Tentative Architecture Diagram
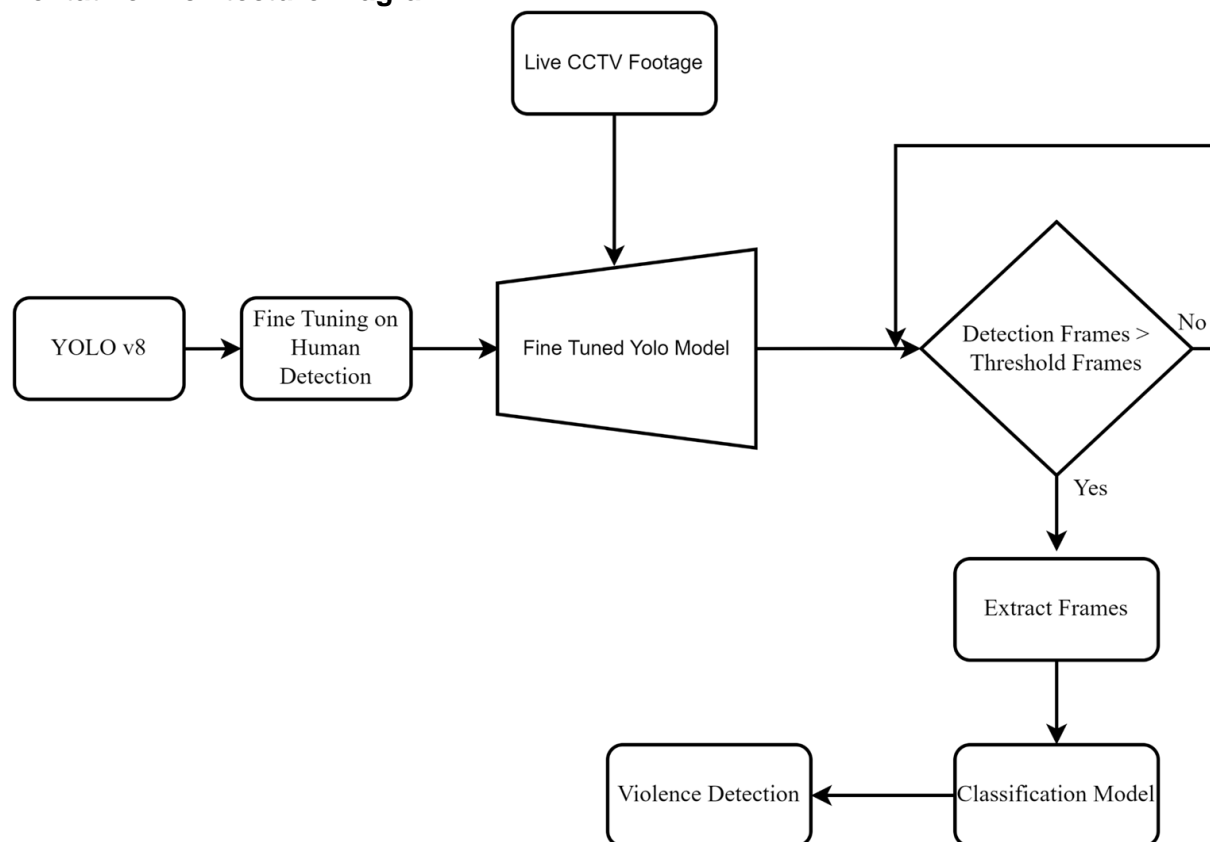
- CCTV feeds input.
- Real-time processing unit using YOLOv8.
- Classification module for categorizing suspicious activities.
- Alert system for immediate response.
- Data storage for recording and further analysis.

References:

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Z. Li, R. Alameeri, and T. Aremu, "Smart-City CCTV Violence Detection Dataset (SCVD)," Kaggle, 2023. [Online]. Available: https://doi.org/10.34740/KAGGLE/DSV/7312675.

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