**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**](https://www.kaggle.com/datasets/vulamnguyen/rwf2000): Contains videos of real-world fights for training models to detect violent activities.
2. [**Smart City CCTV Violence Detection Dataset**](https://www.kaggle.com/datasets/toluwaniaremu/smartcity-cctv-violence-detection-dataset-scvd): 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

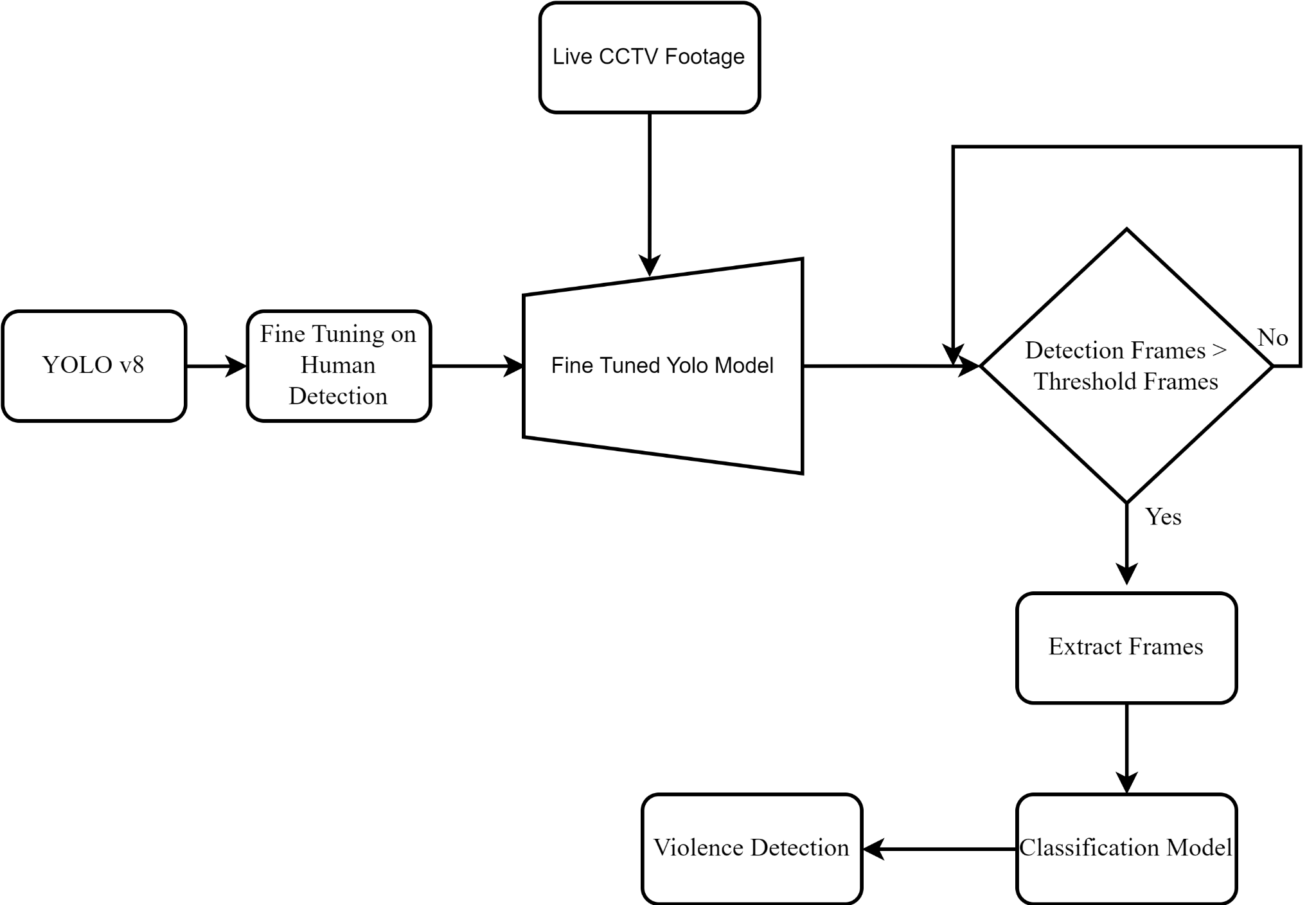
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| --- | --- | --- | --- | --- | --- | --- | --- |
| Title/Author/ Date | Conceptual Framework | Research Question(s)/ Hypotheses | Datasets | Methodology | Analysis & Results | Conclusions | Implications for Future Research |
| "You Only Look Once: 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 |
| "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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