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DETECTING SUSPICIOUS ACTIVITY FROM SURVEILLANCE VIDEO USING DEEP LEARNING

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ABSTRACT :

In a world where ensuring public safety is of paramount importance, the use of surveillance cameras for violence detection has gained significant attention. One critical aspect of this is the detection and prevention of violent activities in various settings, such as public spaces, schools, and commercial establishments. Surveillance cameras play a pivotal role in monitoring these environments, but the sheer volume of footage generated can overwhelm human operators. To address this challenge, here propose a novel approach to violence activity classification using weapons detection through surveillance camera systems. This proposed work presents an innovative approach that leverages the YOLO (You Only Look Once) object detection method to address this imperative. Modern surveillance systems generate vast volumes of data, necessitating efficient methods to monitor and respond to potential threats. To confront this challenge, this method capitalizes on cutting-edge computer vision techniques, specifically employing the YOLO algorithm to automatically analyze real-time video streams from surveillance cameras. Beyond object detection, it also designed to interpret the context of the detected weapons. It analyzes the temporal aspects of video sequences, distinguishing between benign handling and threatening behavior involving the detected weapons. When the system identifies potential violence, it generates real-time alerts to notify security personnel or relevant authorities. These alerts can include visual cues highlighting the suspicious activity in the surveillance feed, enhancing response time and Training loss 5.9 % ,Training Accuracy 95.96%

Keywords: Weapon Detection, Smart Alert System, Face Recognition.

INTRODUCTION

In the landscape of public safety, the project "Intelligent Weapons Detection for Violent Activity Alert System using YOLO Model" emerges as a crucial initiative to address the growing concerns surrounding violence in public spaces. The prevalence of security challenges necessitates a paradigm shift in surveillance systems, and the utilization of the cutting-edge YOLO (You Only Look Once) model offers a promising solution. This project's core objectives revolve around enhancing the efficiency of security measures by leveraging YOLO for real-time weapons detection, with a focus on refining the model for heightened accuracy. The project's methodology involves the adaptation of a pre-trained YOLO model, tailored specifically for recognizing weapons, allowing for seamless integration with existing surveillance infrastructure. A key emphasis is placed on achieving low-latency processing, ensuring that potential threats are identified and communicated to relevant authorities in real-time. The synergy between advanced deep learning techniques and a responsive alert system aims to redefine the dynamics of public safety, minimizing response times and maximizing the potential for mitigating security threats.

Anticipated outcomes include a marked improvement in public safety through the implementation of an intelligent weapons detection system. By fine-tuning the YOLO model, the project aims to minimize false alarms, ensuring that alerts are triggered only in genuine cases of concern. Moreover, scalability is a key consideration, allowing for the seamless integration of the system into diverse surveillance ecosystems. By harnessing the capabilities of the YOLO model, this initiative aspires to create a comprehensive and responsive Violent Activity Alert System, setting the stage for a safer and more secure environment in public spaces.

LITERATURE SURVEY

2.1 Title: Face detection in security monitoring based on artificial intelligence video retrieval technology
Authors: Dong, Zuolin, Jiahong Wei, Xiaoyu Chen, and Pengfei Zheng
Proposes a video oriented cascaded intelligent face detection algorithm, which builds deep learning network by cascading multiple features, from edge features, contour features, local features to semantic features, and advances layer by layer.
.2 Title: Vehicle-damage-detection segmentation algorithm based on improved mask RCNN
Authors: Zhang, Qinghui, Xianing Chang, and Shanfeng Bian Bian.

A vehicle-damage-detection segmentation algorithm based on transfer learning and an improved mask regional convolutional neural network (Mask RCNN) is proposed in this paper. The experiment first collects car damage pictures for preprocessing and uses Labelme to make data set labels, which are divided into training sets and test sets

2.3 Title: Fall detection system with artificial intelligence-based edge computing

Authors: Lin, Bor-Shing, Tiku Yu, Chih-Wei Peng, Chueh-Ho Lin, Hung-Kai Hsu, I-Jung Lee, and Zhao Zhang.

Developed a fall detection system based on neuromorphic computing hardware, which streamlines and transplants the neural network model of the back-end computer to the edge computing platform.

2.4 Title: Efficient Deep Learning Approach to Recognize Person Attributes by Using Hybrid Transformers for Surveillance Scenarios

Authors: Raghavendra, S., S. K. Abhilash, Venu Madhav Nookala, and S. Kaliraj.

Presents a current method applied to networks of primary convolutional neurons to locate the area connected to the Person attribute. Using Individual Feature Identification, the features of a person, such as gender, age, fashion sense, and equipment, have received much attention in video surveillance analytics.

2.5 Title: Enhanced Vehicle Re-Identification for Smart City Applications Using Zone Specific Surveillance

Authors: Holla, B. Ashutosh, MM Manohara Pai, Ujjwal Verma, and Radhika M. Pai.

A framework is developed that performs vehicle re-identification across a group of cameras that monitors varying traffic movements over an area. These areas defined as ‘‘strategic zones’’ comprise a subset of non-overlapping cameras that are installed to monitor non-uniform vehicle movements. The re-identification framework is evaluated on a novel dataset developed to understand the performance of vehicle re-identification across strategic zones.

2.6 Title: An Elderly Fall Detection Method Based on Federated Learning and Extreme Learning Machine (Fed-ELM).

Authors: Yu, Zhigang, Jiahui Liu, Mingchuan Yang, Yanmin Cheng, Jie Hu, and Xinchi Li.

Propose a fall detection algorithm combining Federated Learning and Extreme Learning Machine (Fed-ELM). First, the online extreme learning machine can use a small amount of misclassified user data to update the parameters so that its performance is improved for individual users.

PURPOSE

The primary purpose of this project is to address the pressing need for enhanced surveillance and security measures in public spaces in response to the rising instances of violence. By leveraging advanced deep learning techniques, specifically the YOLO object detection method, the project aims to achieve the following objectives:

- **Swift and Accurate Threat Detection:** Implementing a real-time surveillance system capable of swiftly and accurately detecting weapons in video feeds to identify potential threats as they emerge.
- **Proactive Intervention:** Enabling security personnel to proactively intervene in volatile situations by providing timely alerts upon detecting weapons and classifying violent activities in progress.
- **Public Safety Enhancement:** Enhancing public safety by deploying advanced surveillance technologies that can effectively monitor and mitigate the risk of violence in crowded areas, such as transportation hubs, public events, and urban centers.
- **Resource Optimization:** Optimizing resource allocation by automating the process of threat detection and classification, thereby enabling security personnel to focus their efforts on responding to identified threats promptly.
- **Deterrence and Prevention:** Serving as a deterrent to potential perpetrators by increasing the visibility of surveillance measures and deterring the initiation or escalation of violent activities in public spaces.

OBJECTIVES

With the rising instances of violence in public spaces, there is a growing need for advanced surveillance and security measures. Traditional surveillance systems often struggle to provide real-time insights, leading to delayed responses in critical situations. The integration of deep learning models, such as YOLO, offers a promising solution by enabling swift and accurate detection of weapons in images and video feeds.

- Implementing YOLO, a highly efficient object detection algorithm, to identify and locate weapons in real-time surveillance footage.
- Achieving low-latency processing to enable timely response in emergency situations, ensuring that potential threats are identified as quickly as possible.
- Developing a seamless integration with an alert system that can immediately notify relevant authorities and stakeholders when a potential violent activity is detected.

EXISTING SYSTEM

Video classification using Human Activity Recognition (HAR) is a popular research topic in recent years and is analogous to the field of violence detection. In these methods, sensor data is used to provide information on simple or complex physical activities of humans, such as standing, talking and cooking. Earlier techniques for HAR involved detecting and tracking human body parts in consecutive video frames using image-level descriptors. Existing system is designed to interpret the context of the detected weapons. It utilizes recurrent neural networks (RNNs) or convolutional neural networks (CNNs) to analyze the temporal aspects of video sequences, distinguishing between benign handling and threatening behavior involving the detected weapons. For accurate violence detection, it is important to a have properly labeled dataset containing a large number of diverse examples for training a deep learning model. In this work efficient violence detection for automated surveillance applications was implemented by

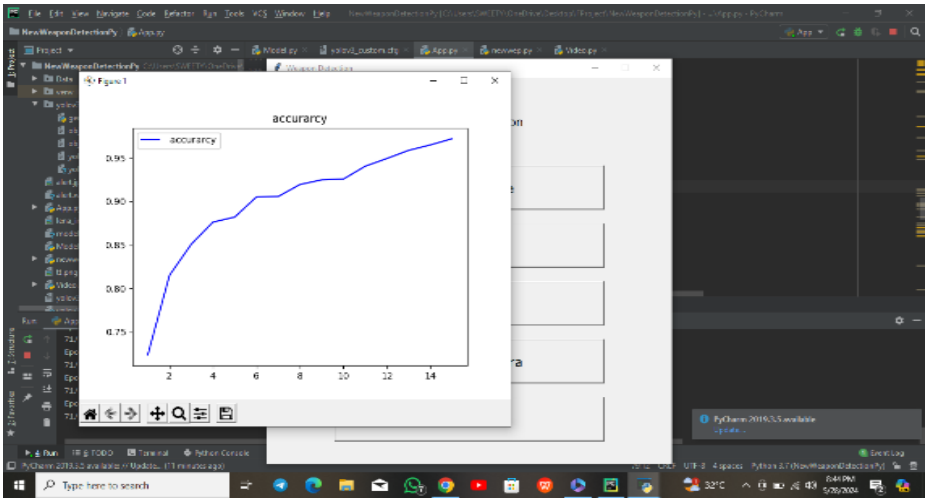
adapting the computationally lightweight X3D-M deep learning architecture for learning and detecting violence patterns from videos. The X3D-M model is convolutional neural network architecture designed for action recognition in video data. It builds upon the foundation of the Xception model and is tailored for spatiotemporal feature extraction. This model excels in capturing both spatial and temporal information within video sequences, making it highly effective in recognizing complex actions and events, including violent behaviors. The X3D-M model offers exceptional capabilities for video-based violence detection, but its implementation must be accompanied by careful consideration of computational, data, and interpretability challenges to ensure its effectiveness and ethical use in surveillance systems.

DISADVANTAGES

- Training X3D-M on custom datasets can demand substantial computational resources
- It can be time-consuming and resource-intensive to acquire or create.
- The X3D-M model may be susceptible to overfitting when trained on limited data.
- Limiting the deployment of X3D-M in scenarios with strict real-time requirements.

PROPOSED SYSTEM

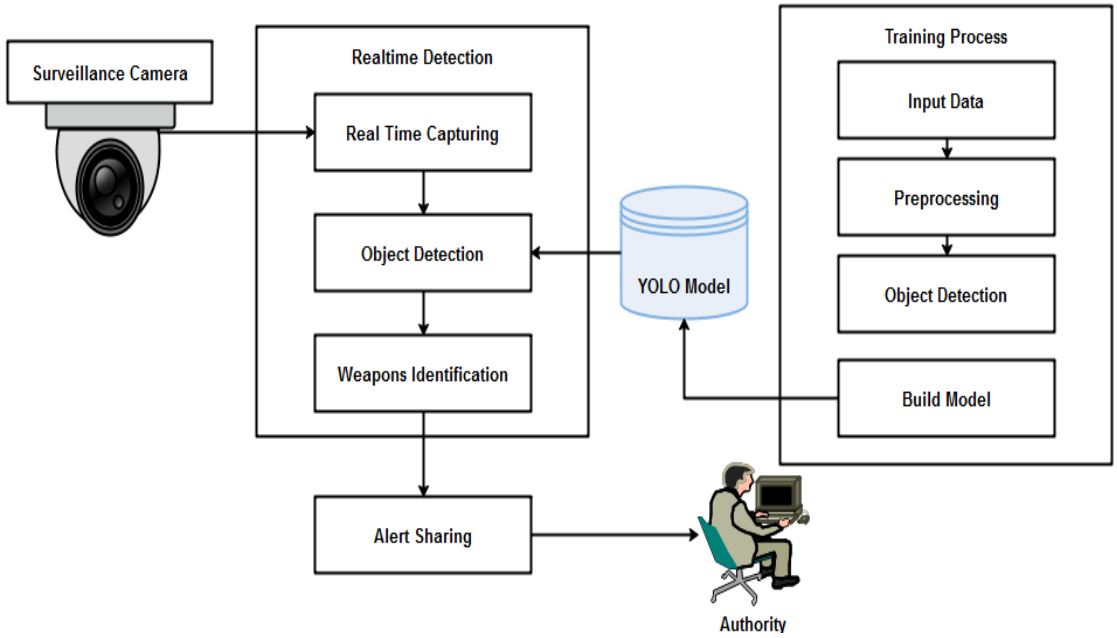
Modern surveillance systems generate vast volumes of video data, necessitating efficient methods to monitor and respond to potential threats. In response to the pressing need for heightened security and the efficient monitoring of public spaces, critical infrastructures, and sensitive environments, here introduce an innovative system designed for violence activity detection through weapons recognition. At its core, this system harnesses the robust capabilities of the YOLO (You Only Look Once) algorithm, renowned for its exceptional speed and accuracy in object detection tasks. Proposed YOLO model has been meticulously trained to excel in identifying a diverse range of weapons, including knife and gun instruments, within surveillance camera footage. The system integrates seamlessly with existing surveillance camera networks or can be effortlessly deployed in new installations, operating in real-time to continuously analyze video streams. It stands as an unblinking sentinel, capable of promptly detecting potential threats and triggering immediate responses from security personnel or relevant authorities. Beyond mere weapons detection, the system incorporates violence activity classification, using advanced deep learning techniques to differentiate between benign weapon handling and actual violent behaviors. This contextual understanding enhances threat assessment accuracy. Furthermore, the system is designed with scalability and adaptability in mind, accommodating various surveillance camera setups and environments. To address privacy and ethical concerns, privacy-preserving techniques are incorporated, ensuring that non-relevant individuals in video feeds remain anonymous, thus upholding privacy standards. In summary, our proposed system redefines the landscape of violence prevention and public safety. By leveraging the YOLO algorithm and deep learning, it optimizes threat detection, reduces response times, and enhances the overall security posture of our public spaces and critical facilities.



ADVANTAGES

- This approach provides real-time weapons detection and immediate response capabilities.
- It can accommodate various surveillance camera setups and environments.
- Balances accuracy and computational efficiency for practical use cases.
- Improves the overall security of public spaces and critical facilities.

SYSTEM ARCHITECTURE



VI. RESULT ANALYSIS

In Result analysis the proposed project overcome the problem of indequacies in traditional surveillance systems to promptly detect and respond the training loss is 5.0 and training accuracy is 95.9

VII.CONCLUSION

In conclusion, the proposed project overcome the problem of inadequacies in traditional surveillance systems to promptly detect and respond to potential violent threats, particularly those involving weapons, underscores the critical need for innovative solutions. By leveraging the power of the YOLO (You Only Look Once) model, this project aims to redefine the landscape of security infrastructure. The refined and specialized adaptation of YOLO for weapons detection offers the promise of real-time identification and localization, addressing the crucial time gap in threat response. The envisioned Violent Activity Alert System, seamlessly integrated with existing surveillance setups, holds the potential to revolutionize how authorities and security personnel approach and mitigate security threats in crowded public spaces.

FUTURE ENHANCEMENT

In future, expanding the system to include behavioral analysis and anomaly detection algorithms can enhance the system's ability to identify abnormal patterns or activities that may precede criminal behavior. This proactive approach could enable early intervention and prevention of potential threats.

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