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AI-based Video Processing for Fight Detection in Colleges

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Abstract - The protection of civilians has always been a central issue, and, oftentimes, real-time detection of violence can help in diffusing a potentially major conflict. The Fight No Fight system is described herein as being the new calibre in fight detection and monitoring, analysing video materials through machine learning and deep learning. The system utilizes YOLO (You Only Look Once), a next-generation object detection model, on the hooting of any aggressive action shown in video streams. The system is therefore created as a web app based on Flask, allowing users to log in, upload videos, and view detected incidents in an easy-to-use dashboard. Doing so allows re-enforcement of the YOLO model's fine-tuning to ensure high accuracy for real-time fight detection by processing video frames and sending out live alerts. All detected incidents are stored within a relational database, timestamped, geo-tagged effectively, and confidence-scored to allow easy tracking and identification. The system employs parallel processing with adaptive thresholding for efficient performance to minimize false positives while integrating an API for connectivity with legacy security architecture. Future upgrades will incorporate sophisticated action recognition models that will distinguish amongst different types of aggression and sound-activated cues such as yelling detection to refine the model. Coupled with this will be an AI Analytics dashboard, allowing the generation of reports indicating fight behavioral patterns and supports predictive security measures for proactive decision-making.

***Key Words*:** Fight Detection, Surveillance, Machine Learning, Deep Learning, YOLO, Flask, Real-Time Processing, Analytics, Adaptive Thresholding, Multi-Threading, Action Recognition, Audio Detection, AI Analytics, Predictive Security, Public Safety.

1. INTRODUCTION

The rise in security threats in every class of public and private area has rendered the traditional methods of surveillance dependent on human monitoring inefficient and error-prone. This is the challenge we sought to address with Fight No Fight: an AI-based real-time fight recognition mechanism that enhances security through the automation of the identification of acts of violence. Using the YOLO (You Only Look Once) model for detection of objects based on deep learning, the system analyzes video streams, with much precision, for aggressive behaviors, making it an excellent choice for live processing of CCTV feeds. Then, the system is implemented in a web application based on Flask to provide a user-friendly interface for security personnel to effectively watch alerts and review flagged incidents. Geolocation tracking allows law enforcement agencies to pinpoint the site of the incidents and ensure rapid emergency response and lowering the risks of escalation. In automating the detection of fights, improving response time, and reducing reliance on manual surveillance systems, Fight No Fight provides a scalable and efficient security answer to academic institutions, public arenas, and high-risk environments. Recognizing the increasing need for intelligent surveillance, we aimed to develop a deep-learning-based system to improve public safety, thereby making security monitoring proactive and effective.

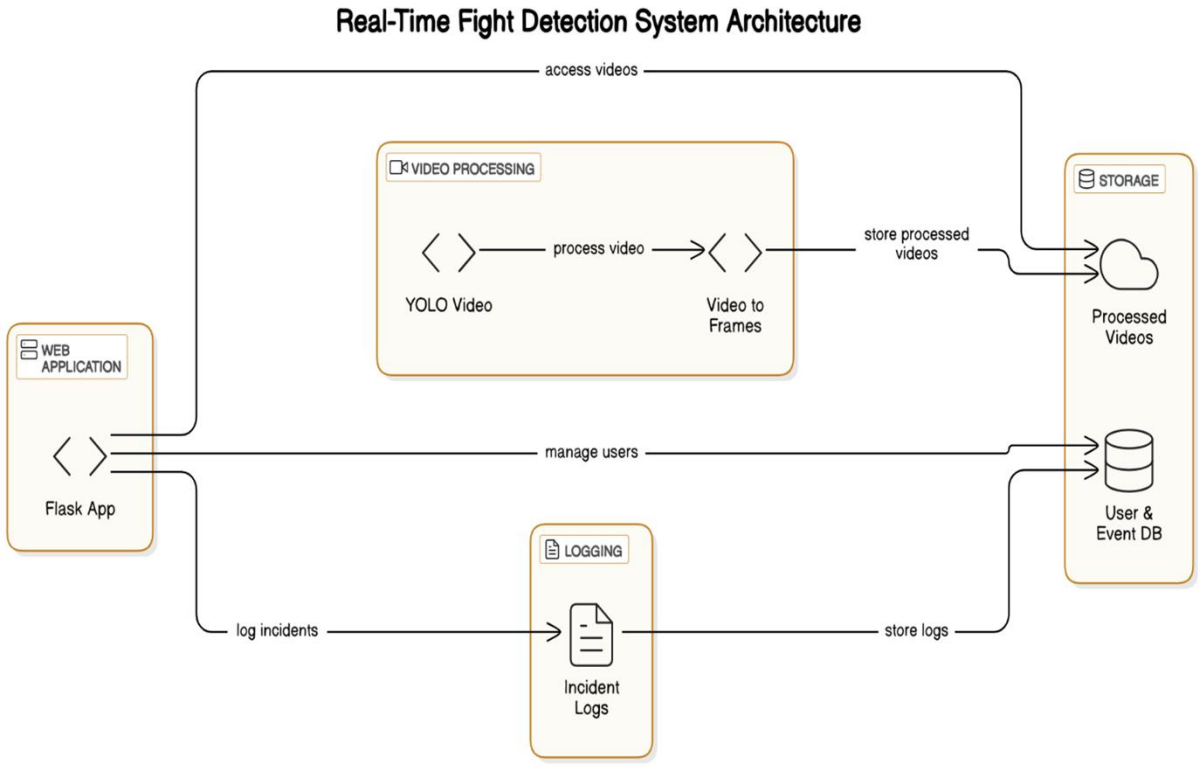
2. OBJECTIVES

1. **Real-Time Fight Detection:** Use surveillance with AI detection to find fights and altercations in real-time from CCTV video.
2. **High-Accuracy Deep Learning Model:** Train a deep learning model and fine-tune its performance for accurate detections of violence.
3. **Incident Geolocation Tracking:** Use latitude and longitude locations to accurately determine and report the incident site of any detected altercations.
4. **Web-Based Monitoring Dashboard:** Build an interactive web interface for security teams to assess fight alerts and view surveillance footage.
5. **Efficient Processing and Scalability:** Measure the performance of video frame processing and scalability across various surveillance configurations for rapid efficiency.

3. ANALYSIS AND FEASIBILITY

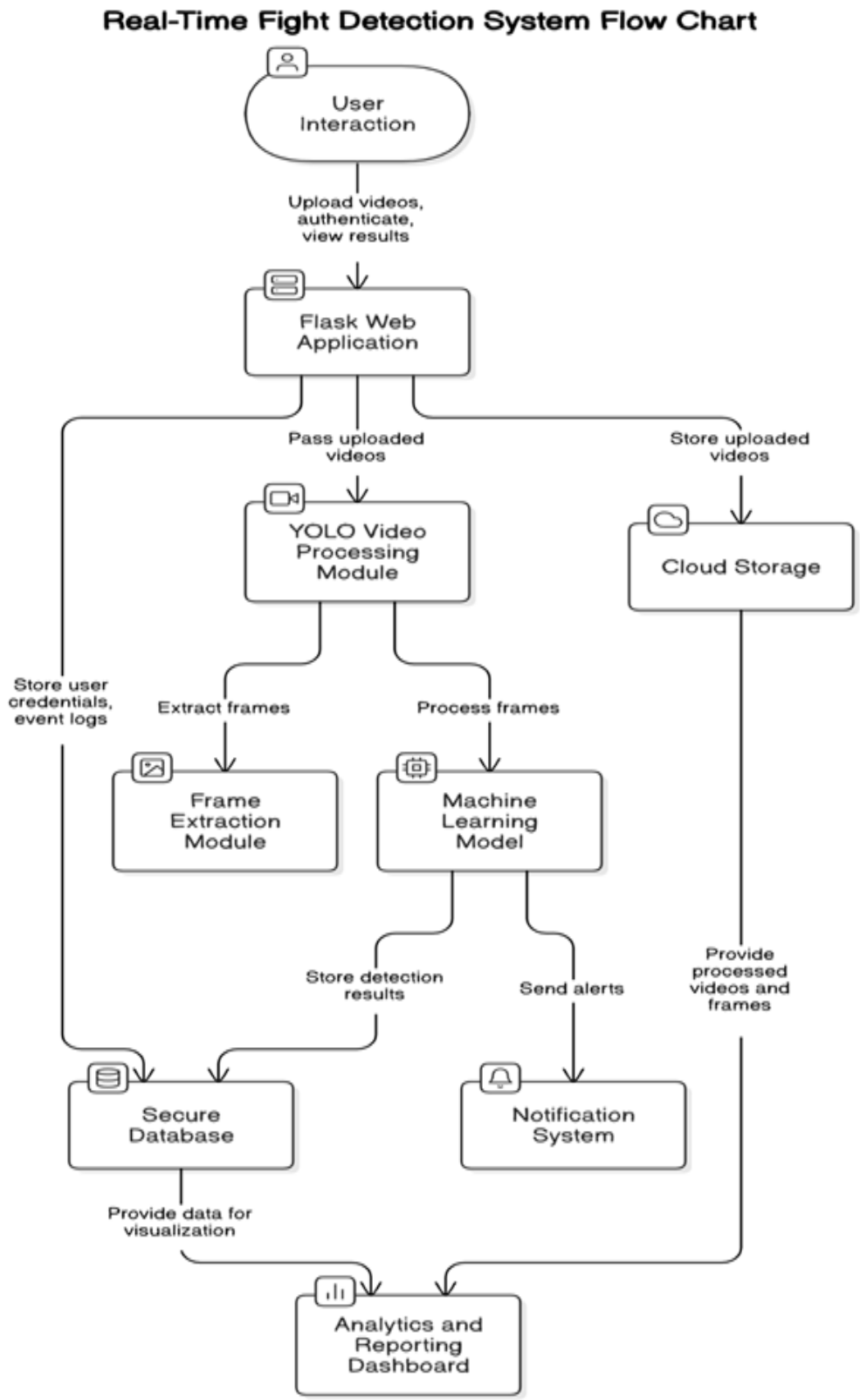
1. **Technology Feasibility:** The system will implement deep learning models specifically YOLO for near real-time fight detection. The system will use a web application based on Flask that allows for minimal user interface. Overall feasibility depends on hardware specifications and system components such as GPU acceleration for real-time video processing and storage resource to maintain stored video footage.
2. **Operational Feasibility:** Users of the system will have a user-friendly dashboard for security personnel to reduce the amount of manual monitoring time. The automated alerts and the location of an emergency allow for a quick response time for an incident, establishing a viable system for educational institutions and public places.
3. **Economic Feasibility:** The project will be economical in nature, as AI models such as YOLO and web frameworks in use for production such as Flask and OpenCV are open sources. Project costs will primarily consist of infrastructure needed for hosting, storage, and cloud services, which can be scaled depending on use, making large implementations feasible.
4. **Legal Feasibility:** The system should comply with privacy and data protection guidelines as it pertains to video footage. In addition to secure processing of video data, we will ensure permissions are obtained before deploying and operating the system, respecting any regional legal requirements.
5. **Environmental Feasibility:** The system is a software solution, which decreases requirements for physical security enhancements. Through cloud processing, we can also manage electrical usage to a lesser extent, and is thus a greener solution than traditional security enhanced solutions.
6. **Feasibility of Scalability:** Given the modular structure of the system, it can scale well, as multiple CCTV can be added to various areas to capture video if needed. The scalability will continue to grow when features, such as multi-camera sync, edge computing, and model enhancements, are created or improved upon, and this becomes an advantage, particularly for larger environments.

- **SYSTEM ARCHITECTURE:**



- **DFD DIAGRAM:**

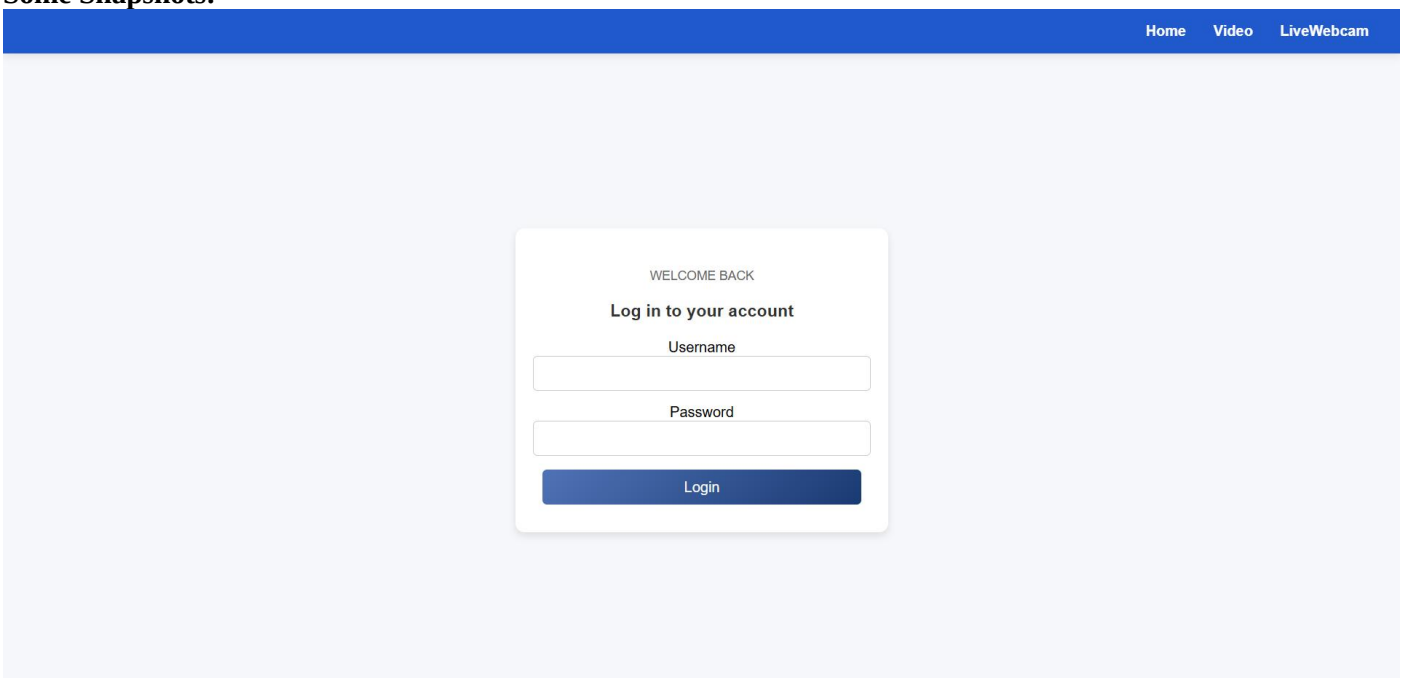
Level 1 DFD:

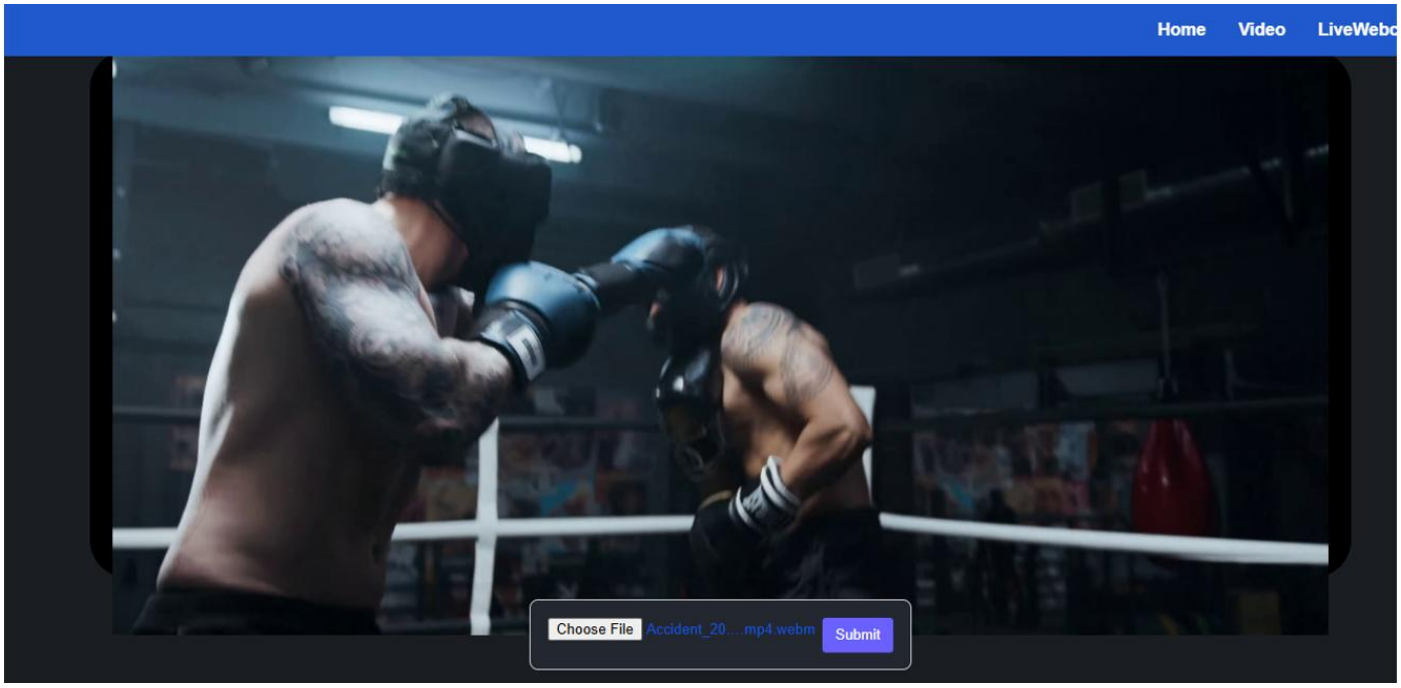


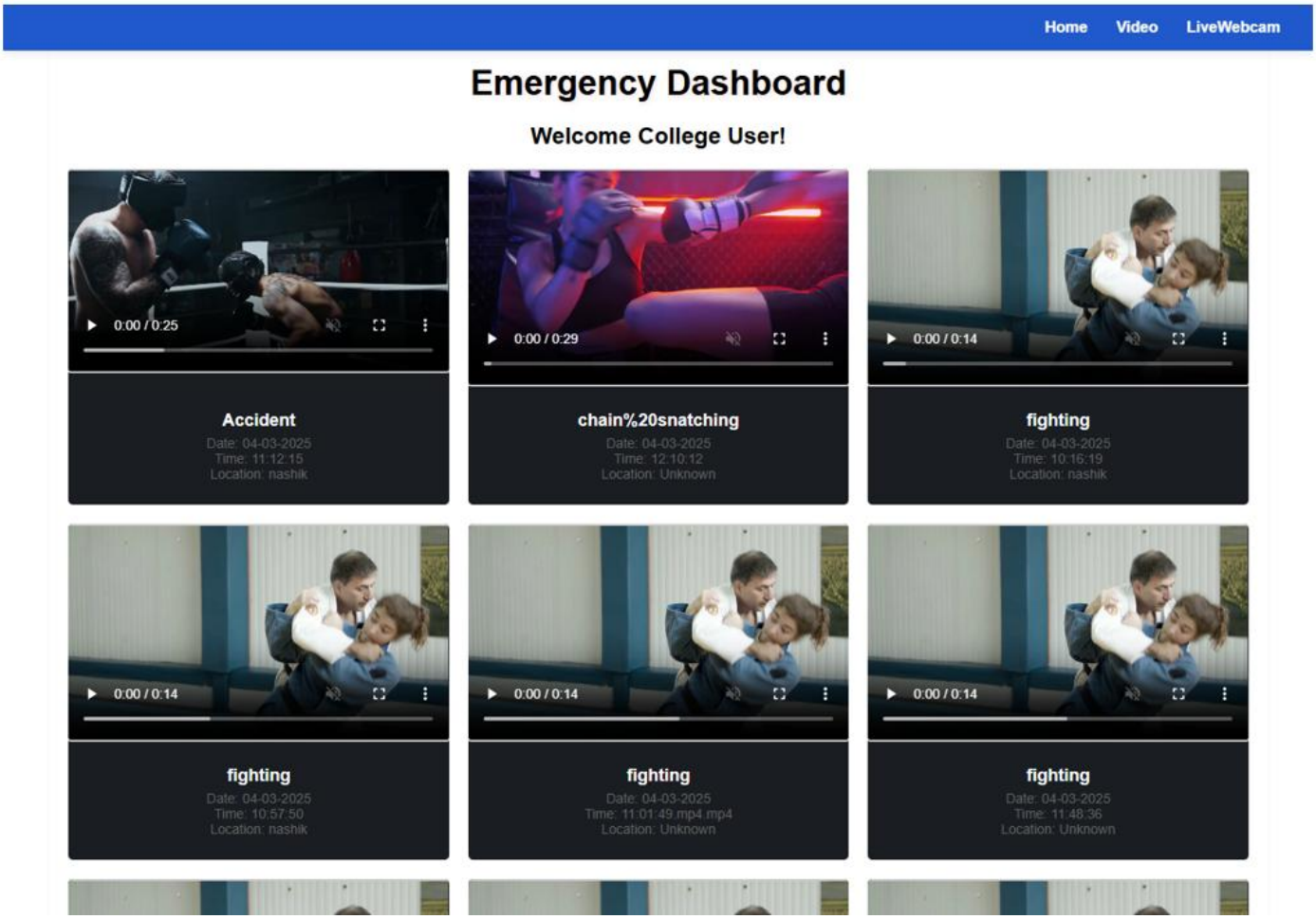
4. WORKING OF PROJECT

The "Fight No Fight" approach involves real-time video capturing from surveillance cameras, followed by analyzing it with deep learning techniques. The video frames are preprocessed using OpenCV for detection accuracy enhancement via resizing, noise filtering, and feature extraction. The frames are processed and entered into the YOLO model for classification as "Fight" or "No Fight" according to the pre-trained database of violent and non-violent actions. If there is a fight, the system records the incident on a Flask-based web app that allows security personnel to get real-time alerts and view flagged incidents. Integrated geolocation tracking lets security teams identify the precise location of an altercation for quick response. The detected events with their timestamps and locations are stored in a MongoDB/MySQL database for future referents and analysis. A REST API allows notifications to the relevant authority and integrates smoothly with existing security systems. The system is optimized for GPU acceleration, ensuring low latency in detection with under two seconds per frame response time. With a modular design from the very beginning, the system is designed for scalability and hence can be deployed at various locations with higher surveillance needs.

Some Snapshots:







5. ADVANTAGES OF SYSTEM

1. **Real-Time Fight Detection:** A 2-sec/frame fight detection from video feeds on the live-streaming environment were accomplished, allowing security personnel to respond very quickly to the incident under our processes.
2. **AI Smart Surveillance:** The AI-based system works for the autonomous detection of violence; hence, it considerably reduces human intervention and the chances of errors during detection.
3. **Accurate Geolocation Tracking:** The geolocation tracking, in combination with system capabilities, ensures teams on the ground can pinpoint the site of conflict and take appropriate action.
4. **Scalability for Multi-Camera Networks:** Suitable for mass deployment, a multi-camera networking solution should enable the linking of several CCTV cameras for use in institutions and on public premises.
5. **Flask Monitoring Dashboard:** The web dashboard has been developed through Flask and will help security personnel with real-time alerts, incident investigation, and historical fight records.
6. **Optimized Performance with GPU Acceleration:** This acceleration helps provide fast frame processing by the very important role in preventing substantial computational delay.
7. **Secure Incident Logging & Alerts:** All fight detections are timestamped and stored in a structured database, ensuring data integrity while automated alerts are being sent out via REST API.

6. APPLICATIONS

1. **Scope of Violence Detection in Educational Institutions:** Automatically identifies fights in schools, colleges, and universities, thereby creating a safe environment for the students and staff.
2. **Public Surveillance and Safety:** Enhance real-time fight detection and alerts within public open spaces, such as streets and parks.
3. **Smart-City Security:** Strengthening the situation of law and order across pieces of AI-based stitching of surveillance along with geolocation to fast-track responses toward incidents.

4. **Crowd Monitoring in Stadiums Events:** Ensure public safety through the detection of violent altercations within large venues such as sporting arenas and concerts.
5. **Large Scale Deployment through Multi-Camera Integration:** Facilitates fast detection across various CCTV networks, thus making it flexible for the city's needs.

7. FUTURE SCOPE

1. **AI Movement and Behavior Analysis:** Accuracy in tracking subjects greatly enhances outcomes by recording their aggressive movements and subsequent behavior.
2. **Real Time Multi-Camera Integration:** Combining multiple camera streams as one video output to cover a larger area in the surveillance.
3. **Audio-Visual Fusion Improved Detection:** This is a fusion system with speech and distress signals used for improving the accuracy of fight detection.
4. **Edge Computing, Near-Instantaneous Processing Time:** On-device AI processing minimizes cloud dependency and latency.
5. **Integration With Law Enforcement and Emergency Response:** The system alerts and intervenes in near real-time by security teams and authorities.

8. CONCLUSION

The Fight Detection System is a step forward in the provision of AI-enabled surveillance for improved public safety. Combining deep learning, real-time analysis of video, and cloud storage, the system is capable of efficiently detecting incidences of violence and triggering a rapid response. The Flask-based web application provides a smooth and scalable monitoring platform for security teams to efficiently review and manage alerts. The multi-threaded optimized and adaptive thresholding system serves to minimize false alarms while sustaining high detection accuracy. The system's geolocation tracking and cloud computation integration make it widely applicable within educational institutions, corporate offices, public spaces, and law enforcement agencies. The future will enhance the system with higher AI models and real-time audio-video fusion to make this system even more reliable and robust in automated fight detection and security management.

9. ACKNOWLEDGEMENT

We sincerely extend our gratitude to everyone who played a crucial role in the successful development of our Fight Detection System. This project would not have been possible without the continuous support, guidance, and encouragement from various individuals and institutions. Firstly, we express our heartfelt appreciation to our mentors and faculty members for their invaluable technical insights and expertise in artificial intelligence, computer vision, and deep learning, which greatly contributed to refining and enhancing the system’s functionality. Their constructive feedback and unwavering support were instrumental in shaping the project. We also acknowledge our institution and department for providing essential resources, computational infrastructure, and research materials that enabled the effective implementation and testing of the system. A special thanks to our peers and colleagues for their constructive discussions and feedback, which helped us optimize our approach. Lastly, we recognize the contributions of open-source AI communities and developers for providing access to datasets, frameworks like YOLO, Flask, and OpenCV, and comprehensive technical documentation. Their work has been fundamental in building a real-time, AI-powered fight detection system. This project stands as a testament to the power of collaboration, innovation, and technology in enhancing security and public safety.

10. REFERENCES

1. **J. Redmon and A. Farhadi**, "YOLOv4: Optimal Speed and Accuracy of Object Detection," IEEE Transactions on Pattern Analysis and Machine Intelligence, 2020.
2. **W. Kim, K. Park, and J. Kim**, "Violence Detection in Videos Using Deep Learning Models," Journal of AI Research, vol. 25, no. 3, pp. 45-57, 2021.
3. **T. Hassner, Y. Itcher, and O. Kliper-Gross**, "Violent Flows: Real-Time Detection of Violent Crowd Behavior," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 34, no. 8, pp. 1505-1517, 2019.
4. **S. K. Singh and M. Sharma**, "Deep Learning-Based Video Surveillance for Security Enhancement," International Conference on Computer Vision and Image Processing (ICCVIP), 2022.
5. **R. Gupta and N. Verma**, "Automated Fight Detection Using Object Detection Models," Springer Lecture Notes in Computer Science (LNCS), vol. 1345, pp. 75-90, 2023.