Real-Time Surveillance System Iot Surveillance System With Motion Detection And Live Camera Streaming

Jorepalli Asha[1], Chopparapu Yogeswara Rao[2], Gangavarapu Pardha Saradhi[3], B Gujjarlapudi Surya Prakash[4], Guntanala Rahul Krishnadev[5]

[2,3,4,5]UG Student,ECE,Chalapathi Institute Of Engineering&Technology Guntur-Andhra Pradesh,India

[1] Assistant Professor ECE,Chalapathi Institute Of Engineering&Technology Guntur-Andhra Pradesh,India

Abstract—**In recent years, ensuring public safety through effective surveillance has become a critical concern due to the increasing number of violent incidents in public and private spaces. Traditional surveillance systems rely heavily on manual monitoring, which is time-consuming, inefficient, and prone to human error. To address these limitations, this project presents an intelligent real-time surveillance system that leverages deep learning and computer vision techniques for automated violence detection.The proposed system utilizes the YOLOv8 (You Only Look Once) object detection model to analyze live video streams captured through a webcam. The model is trained to classify scenes into violence and non-violence categories with high accuracy. When a violent activity is detected, the system immediately captures the corresponding frame and triggers an automated email alert to notify the concerned authorities. This alert includes the captured image as evidence, enabling faster response and decision-making.**

Keywords: Violence Detection, YOLOv8, Deep Learning, Computer Vision, Real-Time Surveillance, OpenCV, Machine Learning, Smart Security System, Automated Alert System, Image Processing.

I. INTRODUCTION

In the modern world, ensuring safety and security in public and private environments has become a major challenge due to the increasing number of violent incidents and criminal activities. Surveillance systems play a crucial role in monitoring such environments; however, traditional systems mainly rely on continuous human observation of CCTV footage. This approach is not only labor-intensive but also prone to human errors, delayed responses, and reduced efficiency over time.

With the rapid advancement of Artificial Intelligence and Machine Learning, intelligent surveillance systems have emerged as a powerful solution to overcome these limitations. These systems are capable of automatically analyzing visual data, identifying suspicious activities, and generating alerts without human intervention. Among various techniques, deep learning-based computer vision models have shown remarkable performance in real-time object detection and activity recognition.

This project focuses on the development of a real-time violence detection system using the YOLOv8 (You Only Look Once) model. The system captures live video streams through a webcam and processes each frame to detect violent activities. YOLOv8, being a state-of-the-art object detection algorithm, enables fast and accurate detection by analyzing the entire image in a single pass. This makes it highly suitable for real-time surveillance applications.

Upon detecting a violent event, the system automatically captures the relevant frame and sends an alert email to the authorized user, along with the detected image as evidence. This immediate notification mechanism significantly reduces response time and enhances situational awareness. Additionally, a delay mechanism is implemented to prevent redundant alerts, ensuring efficient system performance.

The proposed system is developed using Python and integrates various libraries such as OpenCV for image processing and smtplib for communication. By combining deep learning with automated alert mechanisms, the system provides a smart, reliable, and scalable solution for modern surveillance needs.

Overall, this project aims to reduce human dependency, improve detection accuracy, and enable real-time response to critical situations, making it suitable for applications in smart cities, educational institutions, public areas, and industrial environments.

Doi:10.48047/ijiee.2026.16.2.30

II. REVIEW LITERATURE SURVEY

Recent advancements in surveillance systems have focused on automation and real-time monitoring using Artificial Intelligence (AI) and Internet of Things (IoT) technologies. Traditional surveillance systems rely on CCTV cameras with manual monitoring, which requires continuous human attention and often results in delayed responses, fatigue, and missed critical events [1].

To overcome these limitations, several researchers have proposed intelligent surveillance systems using computer vision techniques. Early systems used motion detection and basic image processing algorithms to identify unusual activities. However, these methods lacked accuracy and failed to distinguish between normal and suspicious human behavior [2].

With the emergence of deep learning, more advanced approaches using Convolutional Neural Networks (CNNs) have been developed for human activity recognition. These systems are capable of analyzing video frames and detecting complex actions such as fighting, running, and abnormal crowd behavior. Although these approaches improve accuracy, they require high computational resources and complex model training [3].

Recent studies have utilized object detection models such as YOLO (You Only Look Once) for real-time surveillance applications. YOLO-based systems provide faster detection with high accuracy by processing the entire image in a single pass. Additionally, integration with IoT devices like Raspberry Pi enables remote monitoring and automated alert systems [4].

Furthermore, alert mechanisms using email or GSM modules have been widely adopted to notify users instantly when suspicious activities are detected. These systems significantly reduce response time and improve security in real-world environments.

Based on the literature, it is evident that combining deep learning, computer vision, and IoT technologies provides an efficient, scalable, and intelligent solution for modern surveillance systems. The proposed system builds upon these techniques to develop a real-time violence detection and alert system.

III. RESEARCH METHODOLOGY

The proposed system is designed to detect violent activities in real time using a webcam, deep learning model (YOLOv8), and automated alert mechanism.

A. System Design

The system consists of a webcam for capturing live video, a YOLOv8 deep learning model for detection, and a processing unit (Raspberry Pi / computer). The system continuously monitors the environment and analyzes video frames.

B. Data Acquisition

Live video is captured using a webcam. The video stream is divided into frames, which are processed individually for analysis.

C. Data Processing

Each frame is passed to the YOLOv8 model, which detects and classifies activities as violence or non-violence. The model identifies patterns based on trained data.

D. Display Unit

The processed output is displayed on the screen with bounding boxes and labels indicating detected activities.

E. Alert Mechanism

When violence is detected, the system captures the image and sends an email alert to the authorized user. A delay mechanism prevents repeated alerts.

IV. PROPOSED METHODOLOGY

The proposed system presents an intelligent real-time surveillance solution using deep learning and computer vision techniques. The system continuously monitors the environment using a webcam and processes video frames using the YOLOv8 model.

The captured frames are analyzed to detect violent activities. The YOLOv8 model identifies objects and actions within the frame and classifies them based on trained patterns. When a violent activity is detected, the system performs the following actions:

- Displays detection results with bounding boxes
- Captures the detected frame as evidence
- Sends an automated email alert with the image
- Uses a delay mechanism to avoid repeated alerts

The system operates continuously without human intervention, making it efficient and reliable. It provides real-time monitoring and ensures quick response in critical situations.

Doi:10.48047/ijiee.2026.16.2.30

V. WORKING PRINCIPLE

The working principle of the proposed intelligent surveillance system is based on real-time video acquisition, deep learning-based activity analysis, and automated alert generation. The system continuously monitors the surroundings using a webcam and processes the captured video stream frame by frame.

Initially, the webcam captures live video, which is converted into a sequence of frames using the OpenCV library. Each frame acts as an input to the YOLOv8 deep learning model. The YOLOv8 (You Only Look Once) algorithm processes the entire frame in a single pass, enabling fast and efficient object detection and activity recognition.

The model has been pre-trained on datasets to distinguish between violent and non-violent activities. When a frame is passed to the model, it extracts features and identifies patterns such as human movements, interactions, and posture. Based on this analysis, the model classifies the scene and generates detection outputs in the form of bounding boxes, class labels, and confidence scores.

If the detected activity is categorized as non-violent, the system continues monitoring without interruption. However, when a violent activity is identified, the system immediately triggers a series of actions. First, the detected frame is captured and stored as an image file to serve as evidence. This image contains the annotated detection results for clarity.

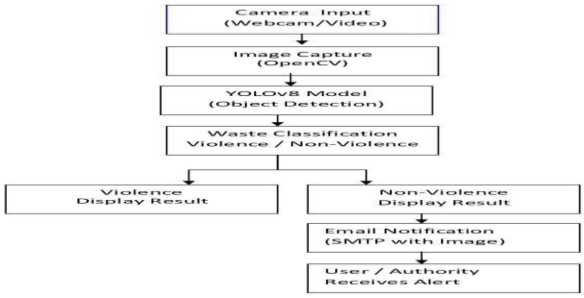
Next, the alert mechanism is activated. The system uses the Python-based SMTP protocol to send an automated email to the registered user. The email includes a warning message along with the captured image as an attachment. This ensures that the concerned authority is notified instantly about the incident.

To improve system efficiency and avoid redundant notifications, a time-based delay mechanism is implemented. This prevents multiple alerts from being sent for the same continuous event within a short period. The system then resumes monitoring and continues processing incoming frames.

The entire process operates in a continuous loop, enabling real-time surveillance without human intervention. By integrating computer vision, deep learning, and communication technologies, the system provides a reliable, efficient, and automated solution for detecting and responding to violent activities.

VI. BLOCK DIAGRAM

Fig. 6.2. Block Diagram



VII. RESULTS AND OUTCOMES

The proposed intelligent surveillance system was successfully developed and tested in a real-time environment. The YOLOv8 model accurately detected violent activities from live video streams with high precision.

Fig. 1. The system displayed detection results in real time using bounding boxes and labels. When violence was detected, the system successfully captured the image and sent an alert email without delay.

Fig. 2. The system demonstrated stable performance during continuous operation. The delay mechanism effectively prevented repeated alerts, improving efficiency.

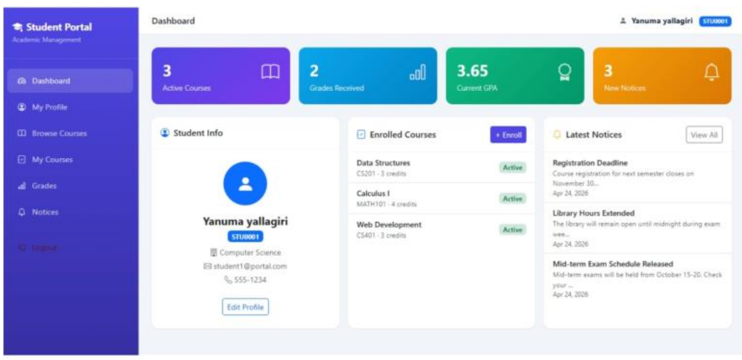


Fig. 7.1. Output1

Doi:10.48047/ijiee.2026.16.2.30

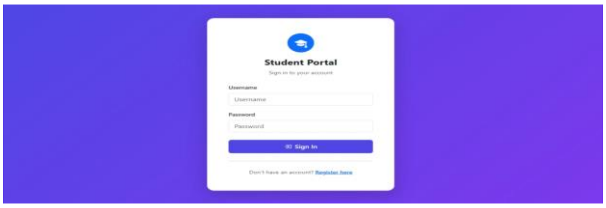


Fig. 7.2. Output2

Overall, the outcomes indicate that the proposed system is reliable, scalable, and suitable for real-world deployment. It can be effectively used in applications such as public surveillance, educational institutions, offices, transportation hubs, and smart city environments to enhance security and monitoring capabilities.

VIII.CONCLUSION

The developed system successfully demonstrates an intelligent and automated approach to real-time surveillance using deep learning and computer vision techniques. By integrating the YOLOv8 model with live video streaming, the system is capable of accurately detecting violent activities and generating immediate alerts.

One of the key achievements of this project is the reduction of human dependency in surveillance systems. Traditional monitoring methods require continuous attention, which often leads to fatigue and delayed responses. In contrast, the proposed system provides continuous, real-time monitoring with automated decision-making, ensuring faster and more reliable detection of critical events.

The incorporation of an email-based alert mechanism enhances the practical usability of the system. Upon detecting a violent activity, the system captures evidence and notifies the concerned authority instantly. This feature is particularly useful in emergency situations where quick action is required. The implementation of a delay mechanism further improves system efficiency by preventing redundant alerts.

The system also demonstrates scalability and flexibility. It can be easily deployed in various environments such as schools, colleges, offices, public areas, railway stations, and smart cities. Additionally, the use of Python and open-source libraries makes the system cost-effective and easy to maintain.

Despite its advantages, the system has certain limitations, such as dependency on the quality of training data and performance variations under extreme conditions. However, these limitations can be addressed in future work by improving model training, incorporating more datasets, and integrating advanced technologies.

REFERENCES

1. Vellela, S. S., & Balamanigandan, R. (2024). Optimized clustering routing framework to maintain the optimal energy status in the wsn mobile cloud environment. Multimedia Tools and Applications, 83(3), 7919-7938.
2. Vellela, S. S., & Balamanigandan, R. (2023). An intelligent sleep-awake energy management system for wireless sensor network. Peer-to-Peer Networking and Applications, 16(6), 2714-2731.
3. Vellela, S. S., & Balamanigandan, R. (2024). An efficient attack detection and prevention approach for secure WSN mobile cloud environment. Soft Computing, 28(19), 11279-11293.
4. Vellela, S. S. (2023). Enhanced speckle noise reduction in breast cancer ultrasound imagery using a hybrid deep learning model. Ingénierie des Systèmes d'Information.
5. Polasi, P. K., Vellela, S. S., Narayana, J. L., Simon, J., Kapileswar, N., Prabu, R. T., & Rashed, A. N. Z. (2026). Data rates transmission, operation performance speed and figure of merit signature for various quadurature light sources under spectral and thermal effects. Journal of Optics, 55(1), 633-643.

Doi:10.48047/ijiee.2026.16.2.30

6. Praveen, S. P., Nakka, R., Chokka, A., Thatha, V. N., Vellela, S. S., & Sirisha, U. (2023). A novel classification approach for grape leaf disease detection based on different attention deep learning techniques. International Journal of Advanced Computer Science and Applications (IJACSA), 14(6), 2023.
7. Vellela, S. S., Rao, M. V., Mantena, S. V., Reddy, M. J., Vatambeti, R., & Rahman, S. Z. (2024). Evaluation of Tennis Teaching Effect Using Optimized DL Model with Cloud Computing System. International Journal of Modern Education and Computer Science (IJMECS), 16(2), 16-28.
8. Vellela, S. S., & Krishna, A. M. (2020). On Board Artificial Intelligence With Service Aggregation for Edge Computing in Industrial Applications. Journal of Critical Reviews, 7(07).
9. Madhuri, A., Jyothi, V. E., Praveen, S. P., Sindhura, S., Srinivas, V. S., & Kumar, D. L. S. (2024). A new multi-level semi-supervised learning approach for network intrusion detection system based on the 'goa'. Journal of Interconnection Networks, 24(supp01), 2143047.
10. Raju, V. V. K., Bhavani, Y. V. K. D., Nandikonda, P., Kareemunnisa, F. N. U., Brahmeswara, K. B., & Sindhura, S. (2026). Iterative and Statistical Analytical Review of Predictive Modeling Approaches in Educational Systems: A Comprehensive Benchmark of AI-Driven Methods. International Journal of Innovative Technology and Interdisciplinary Sciences, 9(1), 490-522.
11. Biyyapu, N., Veerapaneni, E. J., Surapaneni, P. P., Vellela, S. S., & Vatambeti, R. (2024). Designing a modified feature aggregation model with hybrid sampling techniques for network intrusion detection. Cluster Computing, 27(5), 5913-5931.
12. Praveen, S. P., Vellela, S. S., & Balamanigandan, R. (2024). SmartIris ML: harnessing machine learning for enhanced multi-biometric authentication. Journal of Next Generation Technology (ISSN: 2583-021X), 4(1).
13. Vuyyuru, L. R., Purimetla, N. R., Reddy, K. Y., Vellela, S. S., Basha, S. K., & Vatambeti, R. (2025). Advancing automated street crime detection: a drone-based system integrating CNN models and enhanced feature selection techniques. International Journal of Machine Learning and Cybernetics, 16(2), 959-981.
14. Vellela, S. S., Roja, D., Purimetla, N. R., Thalakola, S., Vuyyuru, L. R., & Vatambeti, R. (2025). Cyber threat detection in industry 4.0: Leveraging GloVe and self-attention mechanisms in BiLSTM for enhanced intrusion detection. Computers and Electrical Engineering, 124, 110368.
15. Vellela, S. S., Pushpalatha, D., Sarathkumar, G., Kavitha, C. H., & Harshithkumar, D. (2023). Advanced intelligence health insurance cost prediction using random forest. ZKG International, 8.
16. Vellela, S. S., Babu, B. V., & Mahendra, Y. B. (2024). IoT-based tank water monitoring systems: enhancing efficiency and sustainability. International Journal for Modern Trends in Science and Technology, 10(02), 291-298.
17. Vellela, S. S., Varshini, K., Jeevana, M., Kadheer, S. K., & Kumar, T. P. (2024). Iot based smart irrigation and controlling system. IoT Based Smart Irrigation and Controlling System, International Journal for Modern Trends in Science and Technology, 10(02), 77-85.
18. Vellela, S. S., Chaganti, A., Gadde, S., Bachina, P., & Karre, R. (2022). A Novel Approach for Detecting Automated Spammers in Twitter. Mukt Shabd, 11, 49-53.
19. Vellela, S. S., Narapasetty, S., Somepalli, M., Merikapudi, V., & Pathuri, S. (2022). Fake News Articles Classifying Using Natural Language Processing to Identify in-article Attribution as a Supervised Learning Estimator. Mukt Shabd Journal, 11.
20. Vellela, S. S., Vineeth, S., & Suresh, V. (2024). IoT Based ICU Patient Monitoring System. IoT Based ICU Patient Monitoring System,

Doi:10.48047/ijiee.2026.16.2.30

International Journal for Modern Trends in Science and Technology, 10(02), 265-273.

21. Vellela, S. S., & Balamanigandan, R. (2025). Designing a Dynamic News App Using Python. Available at SSRN 5250912.
22. Vellela, S. S., Rao, M. V., Krishna, C. V. M., Rao, T. S., & Dasthavejula, R. (2026). Piezoelectric and Shape-Memory Materials for Actuators and Energy Harvesting in Mechanical, Electronics, and Biomedical Engineering Using AI-Based Design. In Advanced Materials for Biomedical Devices (pp. 195-206). CRC Press.
23. Vellela, S. S., Singu, K., Kakarla, L. S., Tadikonda, P., & Sattenapalli, S. N. R. (2025). NLP-Driven Summarization: Efficient Extraction of Key Information from Legal and Financial Documents. Available at SSRN 5250908.
24. Vellela, S. S., Anusha, P., Vullam, N. R., Jala, J., Bellapu, V. S., & Vindhya, A. S. (2025, October). Quantum Cryptography and Key Distribution for Secure Communication in the Post Quantum World. In 2025 International Conference on Sustainable Communication Networks and Application (ICSCN) (pp. 619-624). IEEE.
25. Roja, D., Jidugu, S. K., Rao, T. S., Vuyyuru, L. R., Vellela, S. S., & Ranjani, B. S. (2025, December). High-Fidelity Image Synthesis using Enhanced Generative Adversarial Networks with Attention Mechanisms. In 2025 International Conference on NexGen Networks and Cybernetics (IC2NC) (pp. 885-890). IEEE.
26. Vellela, S. S., Vuyyuru, L. R., Jidugu, S. K., Rao, M. P., & Srinivas, B. R. (2025, November). The Impact Of Quantum Computing On Blockchain Security And Quantum Resistant Protocols. In 2025 2nd International Conference on Intelligent Systems for Cybersecurity (ISCS) (pp. 1-6). IEEE.
27. Yanamadala, N., & Vellela, S. S. (2025, June). Ensuring Authenticity and Confidentiality in Images using SHA-ECC Fusion. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 684-689). IEEE.
28. Vellela, S. S. (2024). A Comprehensive Review of AI Techniques in Serious Games: Decision Making and Machine Learning.
29. Burra, R. S., APCV, G. R., & Vellela, S. S. (2024). Strategic Insights: Unleashing the Power of Big Data Analytics for Credit Investigation and Risk Mitigation in Commercial Banking. International Journal of Progressive Research in Engineering Management and Science, 4(01), 458-464.
30. Vellela, S. S., Purimetla, N. R., Vindhya, A. S., Vullam, N. R., Srinivas, B. R., & Vuyyuru, L. R. (2025, October). Design and Simulation of Quantum Error Correction Codes for Scalable Quantum Architectures. In 2025 7th International Conference on Innovative Data Communication Technologies and Application (ICIDCA) (pp. 1570-1575). IEEE.
31. Vellela, S. S., Purimetla, N. R., Rao, P. V., Daniel, V. A. A., Koppolu, H. K. R., & Janani, B. (2025). AI-Enabled Wearable Hemodynamic Monitoring System for Early Identification of Thrombotic Events. Vascular and Endovascular Review, 8(16s), 321-336.
32. Venkatesh, N., Maheswari, S., & Triveni, P. (2024). Harnessing IoT for Real-Time Plant Health Monitoring: Challenges and Opportunities.
33. Reddy, B. V., Kumar, A. H., Gopi, C., Prasad, Y. V. D., Vellela, S. S., & Roja, D. (2025, April). Machine learning based automated liver fibrosis stage diagnosis with prediction. In 2025 International Conference on Advances in Modern Age Technologies for Health and Engineering Science (AMATHE) (pp. 1-6). IEEE.
34. Rao, M. V., Sreeraman, Y., Mantena, S. V., Gundu, V., Roja, D., & Vatambeti, R. (2024). Brinjal Crop yield prediction using Shuffled shepherd optimization algorithm based ACNN-OBDLSTM model in Smart Agriculture. Journal of Integrated Science and Technology, 12(1), 710-710.

Doi:10.48047/ijiee.2026.16.2.30

35. Haritha, K., Geethika, N. S., Venkateswarlu, K., Kumar, R. H., & Ramakrishna, Y. Enhancing Public Safety with AI & ML-Based CCTV Surveillance.
36. Haritha, K., Prakash, P. B., Pravallika, D., Venkatesh, K., & Venkatesh, G. Enhancing Object Detection in Autonomous Vehicles Under Low-Light Conditions Using Federated Learning and YOLOv5.
37. Ram, C. S., Vellela, S. S., Sravanthi Javvadi, D. V., Rashid, S. Z., & Madhumathi, S. M. (2025). Integrated Robotic–Imaging Platforms in Endovascular Surgery: Current Capabilities and Future Directions. Vascular and Endovascular Review, 8(16s), 285-298.
38. Roja, D., Navya, G., Srujana, B. S., Mamatha, P., & Sai, C. Y. K. Deep Learning for Hotel Reviews: A Framework for Sentiment Classification and Fake Review Detection.
39. Pakalapati, S., Rani, C. J., Vellela, S. S., Thanuja, N., & Bindu, M. N. H. (2025, November). Progressive GAN-based Framework for Realistic Image Generation and Style Transfer. In 2025 5th International Conference on Evolutionary Computing and Mobile Sustainable Networks (ICECMSN) (pp. 474-479). IEEE.
40. Balamanigandan, R., Vellela, S. S., Gorintla, S., Vuyyuru, L. R., Thanuja, N., & Rao, T. S. (2025, September). Quantum-Enhanced Data Security for Electronic Health Records: A Framework for Post-Quantum Cryptography in Healthcare Systems. In 2025 6th International Conference on Smart Electronics and Communication (ICOSEC) (pp. 1924-1929). IEEE.
41. Roja, D., Amulya, P., Nagasai, M., Prasad, D. D., & Babu, A. V. Machine Learning-Based Early Diagnosis of Fish Diseases via Water Quality Data.
42. Sai, M. B., & Vellela, S. S. (2025, December). Hybrid ML Driven Multi-Cloud Service Work Load Prediction For Financial Systems. In 2025 1st International Conference on Advancement in Futuristic Technologies (ICAFT) (pp. 1-6). IEEE.
43. Kareemunnisa, D., Haritha, K., Ranjani, B. S., Venkateswarlu, K., & Bindu, M. N. H. DUAL-STAGE PRIVACY PROTECTION FOR GRAPH NEURAL NETWORKS AGAINST INFERENCE ATTACKS.
44. Mandava, R., Haritha, K., Vellela, S. S., Purimetla, N. R., Mohan, B. K., & Harinadh, T. (2025, June). Analysing User Perceptions of Trust in Financial Systems Using Explainable AI. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 26-30). IEEE.

Doi:10.48047/ijiee.2026.16.2.30