# ANOMALOUS BEHAVIOR TRIGGERS PUBLIC SURVEILLANCE ALERT USING NEURAL NETWORK AND FACE EXPRESSIONS

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## ABSTRACT

In an era marked by heightened concerns regarding public safety, the development of effective surveillance systems capable of detecting and responding to anomalous behavior is paramount. This paper proposes a novel approach to enhancing public safety through the integration of advanced facial expression and weapon detection technologies. The system described herein utilizes cutting-edge computer vision algorithms to analyze live video feeds from surveillance cameras deployed in public spaces. The proposed system operates in real-time, continuously monitoring individuals within its field of view. By leveraging facial expression recognition algorithms, the system can detect signs of distress, agitation, or other emotional State indicative of potential threats. Furthermore, the integration of weapon detection algorithms enables the system to identify the presence of firearms or other dangerous objects in the vicinity. Upon detection of anomalous behavior, such as aggressive facial expressions or the brandishing of a weapon, the system triggers an immediate alert. This alert is relayed to law enforcement agencies, security personnel, and other relevant authorities, facilitating a rapid and targeted response to potential threats. Key features of the proposed system include its scalability, adaptability to diverse environments, and minimal reliance on human intervention. By harnessing the power of artificial intelligence and machine learning, this system represents a significant advancement in the realm of public safety and security.

***KEYWORDS:*** Anomalous Behaviour Detection, Facial Expression Recognition, Weapon Detection, Public Surveillance, Real-time Monitoring, Artificial Intelligence, Public Safety.

## 1.INTRODUCTION

In an era of ever-increasing technological capabilities, the surveillance landscape has evolved significantly. With the proliferation of cameras, sensors, and advanced algorithms, public surveillance systems play a crucial role in maintaining safety and security. These systems are designed to detect anomalous behavior that could potentially pose a threat to public safety or indicate criminal activity. The triggering of a public surveillance alert is a pivotal moment, signifying the convergence of technology and public safety. Anomalous behavior, whether it be erratic movements, suspicious packages, or deviations from established patterns, can serve as indicators of potential threats. When such behavior is detected, surveillance systems spring into action, alerting authorities and enabling rapid response to mitigate risks and ensure the safety of individuals within the monitored area. However, the implementation of public surveillance systems raises important questions regarding privacy, civil liberties, and the ethical use of technology. Balancing the need for security with respect for individual rights is a complex challenge that requires careful consideration and ongoing dialogue. In this paper, we will explore the dynamics of public surveillance alert systems, examining their capabilities, limitations, and implications for society. We will delve into the technological advancements

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driving these systems, the legal and ethical frameworks governing their use, and the broader societal impact of ubiquitous surveillance. By gaining a deeper understanding of these issues, we can better navigate the complexities of modern surveillance and work towards a future where safety and privacy are mutually reinforced rather than mutually exclusive.

## 2.DEEP LEARNING

Deep learning algorithms can be employed in public safety surveillance systems to detect anomalous behavior and trigger alerts in real-time. These systems typically involve monitoring video feeds from surveillance cameras in public spaces, such as streets, airports, or train stations. The deep learning models are trained on large datasets of normal behavior, learning to recognize typical activities and patterns in the monitored environment. When they detect behavior that deviates significantly from what is considered normal, such as suspicious movements, abandoned objects, or crowd disturbances, they trigger an alert. These alerts can be sent to law enforcement personnel or security teams, enabling them to respond quickly to potential threats or incidents. By using deep learning for anomaly detection in surveillance, authorities can enhance public safety by identifying and addressing security concerns in a timely manner. Additionally, these systems can help prevent crimes or accidents before they occur by providing early warnings.

### CONVOLATIONAL NEURAL NETWORK

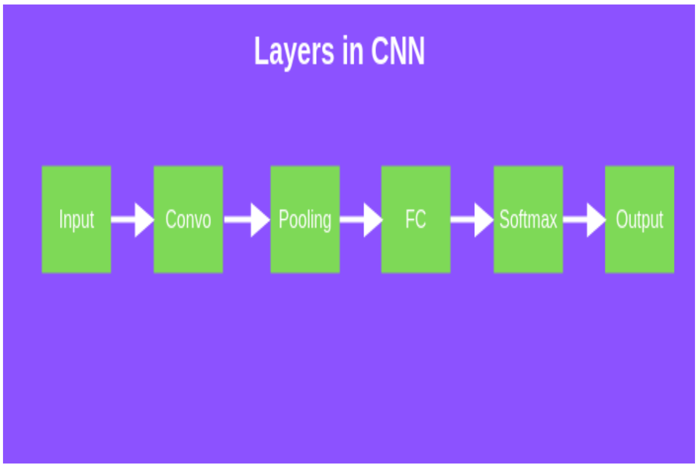



**Fig -1**: Figure

### DIFFERENTS LAYER OF CNN

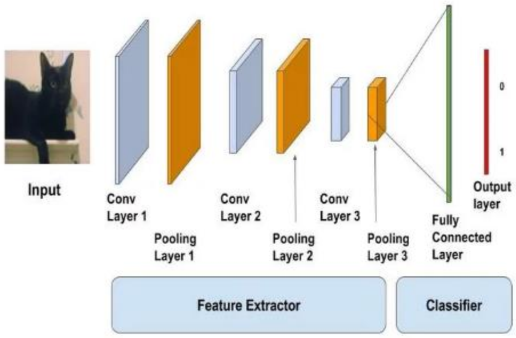



**Fig -2**: Figure

## 3. RELATED WORK

Akhilesh Kumar Verma, Abhishek Soren, [1] Abnormal activity detection is an area of study that focuses on finding abnormal activities like theft, vandalism, abuse, etc in video and CCTV footage. In this paper, a combination of skeleton based and transformer-based approach is used. The skeletons are used to enrich the motion of human bodies in the video. The transformer is used to model dynamic convolutions which helps to overcome the problems associated with fixed size kernels. To preserve the background information the architecture also uses feature extraction. The methodology used in the paper, also proposed a way to use transfer learning in the transformer network. The proposed framework provides excellent results outperforming many of existing methodologies. ROC (AUC score) attained by the proposed method for some classes of actions are up to 97.71%, which is even higher than current state of art approaches. The average ROC (AUC score) of our method is better than many of the approaches which are considered in the paper.

Christy D, Karen K, [2] Polymer layers displaying a specific swelling response in the presence of nitroaromatic compounds are integrated into microscale sensors. Blanket layers of the polymer are grown using initiated chemical vapor deposition, and lithographic techniques are used to define microscale polymer lines. A nanoscale metal line is perpendicularly overlaid across each polymer line. Exposure to nitroaromatic analytes causes the polymeric device component to expand, resulting in plastic deformation of the metal and a permanent change in the resistance measured across the device. The response is rapid and selective for nitroaromatic compounds; additionally, the small area, simplicity, and interchangeability of the device design facilitate the fabrication of sensors selective for other analytes and device arrays. Calculated limits of detection for 2,4,6-trinitrotoluene are 3.7 ppb at 20 ° C or 0.8 pg in a proof-of-concept device; methods for optimization are explored.

Mohamed [3] As life expectancy increases, people can live a longer life. However, ageing is associated with various health problems. As a result, older people are vulnerable to emergencies. To ensure the security of older people, it is necessary to analyze abnormal activities. Accordingly, vision sensors serve in elderly care and assisted living. Hence, this study allows the researchers to better understand the field of elderly emergency detection through abnormal activity analysis. In this work, we investigate and compare existing visual approaches and their performance. In addition, we explore available and interesting datasets. Moreover, we discuss existing approaches and datasets to improve real-world applications. We also present challenges to be tackled for future studies in monitoring applications.

R.I. Minu, [4] Currently, CCTV (Closed Circuit Television) cameras are used for surveillance by alerting the security officer if any malfunction or abnormal activity happens. Abnormal activities may be theft, violence, or explosion. CCTV cameras are used in public places like city streets, parks, communities, and neighborhoods to help detect crime and enhance public safety. Manual surveillance for this is tedious and time consuming. Detecting abnormal crowd behavior in real-time is an exciting research area. Presently, most researchers are interested in developing Dynamic abnormal detection mechanisms to ensure security. However, this is challenging due to climate change, human movement, occlusions, and low video quality. Due to the high dimensionality of video data, Space and time complexity are also increased. This paper explains the various methods of abnormal activity detection under deep learning and the handcrafted approach.

Sai Chandana, [5] Data and computer science advancements in recent years have greatly benefited people’s day-to-day lives. On the other hand, criminals are embracing new technologies to bolster and broaden their operations. There is a great deal of promise in applying the Deep Learning (DL) paradigm to the analysis of highly structured data. However, the availability of public datasets in the crime detection area is low and task specific, making it difficult to study and develop DL-assisted solutions that are both accurate and robust. This study aims to adapt the popular UCF-crime dataset for use with video subtitling and propose a hybrid model GITAAR (Generative Image-to text Transformer for abnormal activity recognition), a new transformer-architecture for video-caption-generation. In this paper, UCF crime dataset that compares a recently suggested video captioning system against a large number of state-of methods, describing both the qualitative and quantitative aspects.

## 4.EXISTING SYSTEM

Unlike traditional security surveillance methods that rely on post-event analysis or backend server processing SCSS operates actively in the field, utilizing a combination of cutting-edge algorithms and advanced hardware components. At its core, SCSS integrates the Deep SORT and YOLOv4 algorithms to create the DS-YOLO aberrant behavior detection algorithm. To facilitate its operations, SCSS is equipped with essential hardware components including GPS, WIFI connectivity, and an Uninterruptible Power Supply (UPS). These components ensure continuous operation and seamless communication with the cloud infrastructure.

## DISADVANTAGES

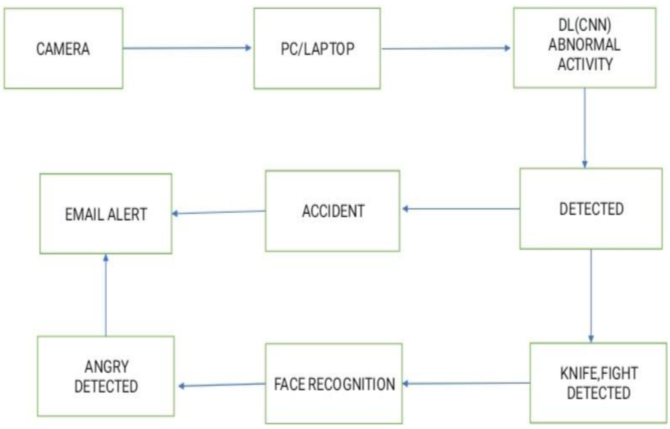
- The system's performance may vary depending on environmental conditions, lighting, camera positioning, and the complexity of the observed behaviors.
- Storing sensitive surveillance data in the cloud could expose it to unauthorized access, hacking attempts, or breaches, leading to potential privacy violations or misuse of personal information.

## 5.PROPOSED SYSTEM

These algorithms would be trained to recognize patterns of behavior that deviate from normalcy, such as sudden movements, erratic behavior, or objects left unattended for prolonged periods. Additionally, the system could be integrated with other surveillance technologies, such as facial recognition or license plate recognition, to further enhance its capabilities in identifying. Upon detecting potentially anomalous behavior, the system would automatically trigger an alert to relevant authorities, such as law enforcement agencies or security personnel, enabling them to promptly investigate the situation and take appropriate action if necessary. Moreover, the system would adhere to legal and ethical guidelines regarding the use of surveillance technology, with mechanisms in place to prevent misuse or abuse.

## ADVANTAGES

- Anomalous behavior detection enhances security by real-time threat identification.
- It raises public safety awareness, improves emergency response and deters illegal activities.
- Public surveillance alerts also provide valuable real time information for emergency responders.




**BLOCK DIAGRAM**

## 6. IMPLEMENTATION

### Public Safety Enhancement

The proposed system aims to significantly enhance public safety by integrating advanced facial expression and weapon detection technologies into surveillance systems.

### Real-time Monitoring

Operating in real-time, the system continuously monitors individuals in public spaces, utilizing cutting-edge computer vision algorithms to analyze live video feeds from surveillance cameras.

### Anomalous Behavior Detection

Leveraging facial expression recognition algorithms, the system can detect signs of distress, agitation, or other emotional states indicative of potential threats, enabling the identification of anomalous behavior.

### Immediate Alert System

Upon detection of aggressive facial expressions or the presence of weapons, the system triggers an immediate alert to law enforcement agencies, security personnel, and relevant authorities, facilitating a rapid and targeted response to potential threats.

### Scalability and Adaptability:

Key features of the proposed system include scalability and adaptability to diverse environments, along with minimal reliance on human intervention, making it suitable for deployment in various public spaces to enhance safety and security.

## 7.CONCLUSION

Public surveillance alerts serve as a vital mechanism for safeguarding communities against potential risks. By leveraging technology to detect anomalous behavior, these systems enhance the overall security infrastructure. Nevertheless, it is essential to strike a balance between security imperatives and individual rights. Transparency, oversight, and adherence to ethical guidelines are paramount to ensure that public surveillance remains a tool for protection rather than a threat to privacy. As technology continues to evolve, it is incumbent upon society to adapt regulatory frameworks that uphold both security and civil liberties, thereby fostering a safer and more inclusive environment for all.

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