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DEEP LEARNING APPROACH FOR SUSPICIOUS ACTIVITY DETECTION FROM SURVEILLANCE VIDEO

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Abstract - *Suspicious Activity is predicting the body part or joint locations of a person from an image or a video. This project will entail detecting suspicious human activity from real-time CCTV footage using neural networks. Human suspicious activity is one of the key problems in computer vision that has been studied for more than 15 years. It is important because of the sheer number of applications that can benefit from Activity detection. For example, human pose estimation is used in applications including video surveillance, animal tracking, behavior understanding, sign language detection, advanced human-computer interaction, and marker less motion cap turning. Low-cost depth sensors have limitations limited to indoor use, and their low resolution and noisy depth information make it difficult to estimate human poses from depth images. Hence, we plan to use neural networks to overcome these problems. Suspicious human activity recognition from surveillance video is an active research area of image processing and computer vision. Through visual surveillance, human activities can be monitored in sensitive and public areas such as bus stations, railway stations, airports, banks, shopping malls, schools and colleges, parking lots, roads, etc. to prevent terrorism, theft, accidents, and illegal parking, vandalism, fighting, chain snatching, crime, and other suspicious activities. It is very difficult to watch public places continuously, therefore intelligent video surveillance is required that can monitor human activities in real time and categorize them as usual and unusual activities and can generate an alert. Mostly, the research being carried out is on images and not videos. Also, none of the papers published tries to use CNNs to detect suspicious activities.*

Key Words: *Suspicious Activity, Neural networks, Image processing, surveillance video.*

1. INTRODUCTION

In today's digital age, ensuring public safety has emerged as a paramount concern, with intelligent video surveillance systems playing a pivotal role. Detecting and predicting suspicious human activity from real-time CCTV footage has become a focal point of research in the domain of computer vision and artificial intelligence. This research paper delves into the multifaceted realm of neural network-based technology and its application in addressing the critical issue of suspicious human activity detection, focusing primarily on video surveillance.

Overcoming the Limitations of Depth Sensors: While low-cost depth sensors have paved the way for advanced human pose estimation, their limitations are apparent, particularly in terms of being confined to indoor usage and offering low-resolution and noisy depth information. This paper presents a novel approach that leverages neural networks to surmount these constraints, resulting in more accurate and robust human pose estimation. Real-World Applications: The research primarily addresses the domain of suspicious human activity recognition in video surveillance, an actively evolving field within image processing and computer vision. Through the lens of visual surveillance, human behavior in sensitive and public areas, including transportation hubs, commercial establishments, and educational institutions, is closely monitored. This proactive approach serves as a deterrent to a wide spectrum of potential threats, ranging from terrorism and theft to accidents and illegal activities. The Need for Intelligent Video Surveillance: Continuous, manual surveillance of public spaces is a formidable challenge. This research advocates for the integration of intelligent video surveillance systems equipped with neural networks, capable of real-time monitoring and categorization of human activities as either usual or unusual. Furthermore, these systems are poised to generate alerts, ensuring a swift response to suspicious behavior Addressing the Gap in Research: It's noteworthy that while extensive research has focused on image-based activity detection, the application of Convolutional Neural Networks.

2. PROBLEM STATEMENT

Recognition of the criminal and preventing suspicious activities during Examination using CCTV footage.

3. MOTIVATION

The motivation behind developing a Suspicious Activity Detection System (SADS) utilizing Convolutional Neural Networks (CNNs) as input for video analysis is rooted in the urgent need for advanced security measures in today's

complex and rapidly evolving world. Traditional security systems often struggle to keep pace with emerging threats, making it essential to harness the capabilities of AI and deep learning technologies. SADS aims to provide a proactive and intelligent solution that goes beyond conventional surveillance methods. By employing CNNs, which excel at recognizing patterns and anomalies in visual data, this system can automatically identify suspicious activities that might otherwise go unnoticed. The motivation behind SADS is to enhance public safety, protect critical infrastructure, and improve overall security by enabling rapid response to potential threats. Whether in crowded public spaces or high-security facilities, this innovative system offers the promise of a more secure and vigilant environment, ultimately contributing to the well-being and peace of mind of individuals and organizations alike. In an era were security.

4. SYSTEM ARCHITECTURE

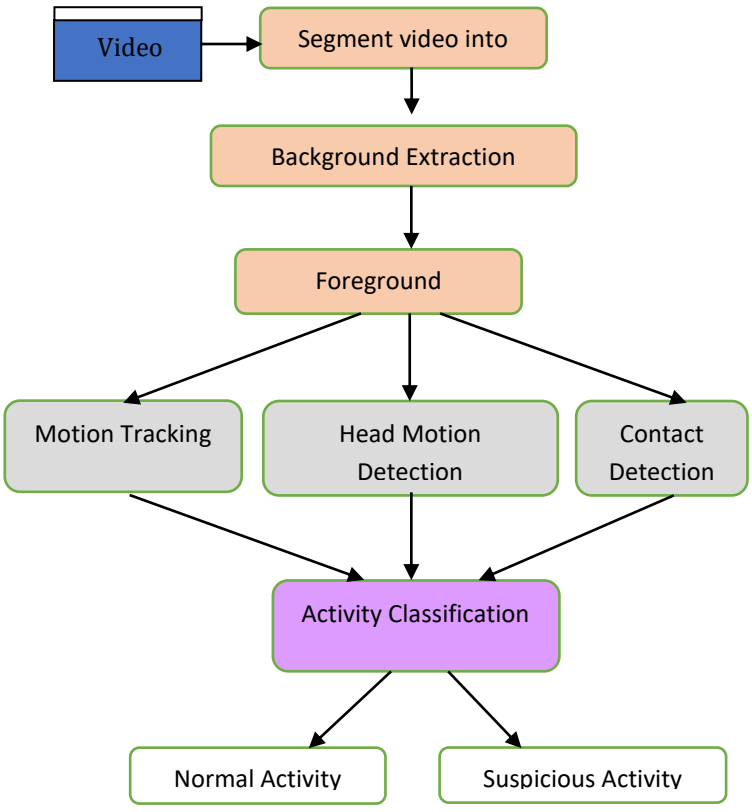

Fig 1. Flow chat.

5. METHODOLOGY

The methodology of this project revolves around a systematic and iterative process, beginning with data collection and preprocessing. Surveillance video datasets will be gathered to train and validate deep learning models, and preprocessing steps will be applied to enhance the quality and relevance of the data. The core of the methodology involves designing and training deep learning models, such as convolutional neural networks (CNNs) or recurrent neural networks (RNNs), to recognize and classify various activities in the surveillance videos. Transfer learning may be employed to leverage pre-trained models for improved efficiency. Anomaly detection mechanisms will be integrated into the models to identify unusual patterns or behaviors. Real-time processing capabilities will be a focus, ensuring the system can operate efficiently in dynamic environments. The scalability of the solution will be addressed to handle the simultaneous processing of data from multiple surveillance cameras. Integration with existing surveillance infrastructure will be a pivotal step, allowing for seamless deployment. Throughout the development, rigorous testing and validation procedures will be implemented, and the models will be fine-tuned based on performance evaluations. Ethical considerations, including privacy protection and compliance with regulations, will be embedded into the methodology. Continuous feedback loops and improvements will be established, creating an adaptable and effective methodology for the development and deployment of the deep learning-based suspicious activity detection system.

6. PROPOSED ALGORITHM

• **Real World Input Video:** The initial input is a video stream from a real-world setting, like a security camera recording.

• **Segmenting Video into Frames:** The video is divided into individual frames, each representing a single still image.

• **Background Extraction:** This step isolates static elements like walls and floors, extracting the background from each frame.

• **Foreground Extraction:** After background removal, dynamic elements like people or vehicles, known as the foreground, remain.

• **Motion Tracking:** This block monitors the movement of foreground objects over time, identifying paths and trajectories.

• **Head Motion Detection**: Specifically detects motion related to heads, useful for tracking people's head movements within the scene.

• **Contact Detection:** Identifies interactions or contacts between objects, such as when a person touches an object or another person.

• **Activity Classification**: Utilizes outputs from motion tracking, head motion detection, and contact detection to

classify overall scene activity, potentially using machine learning algorithms.

• **Normal Activity:** If classified as "normal," observed behavior aligns with expected, routine patterns, like walking or standing.

• **Suspicious Activity:** If classified as "suspicious," observed behavior deviates from normal, including actions like running, fighting, or other potentially dangerous or unusual activities.

7. LITERATURE SURVEY

Sr No.	Paper Name	Authors	Abstract
1	Real-Time Suspicious Detection and Localization in Crowded Scenes	Mohammad Sabokrou, Mahmood Fathy	In this paper, we propose a method for real-time suspicious detection and localization in crowded scenes. The approach involves using local and global descriptors to capture video properties, and Gaussian classifiers to distinguish normal activities from anomalies.
2	Learning Temporal Regularity in Video Sequences	Mahmudul Hasan, Jonghyun Choi	This paper addresses the challenge of perceiving meaningful activities in long video sequences by learning generative models for regular motion patterns. Two methods based on auto encoders are proposed, one using handcrafted spatial temporal local features and the other using a fully convolutional feed forward auto encoder. The model captures regularity from multiple datasets and shows competitive performance in suspicious detection applications.
3	Suspicious Detection in Video Using Predictive Convolutional Long Short-Term Memory Networks	Jefferson Ryan Medel	The paper presents end-to-end trainable composite Convolutional Long Short-Term Memory (Conv-LSTM) networks for automating the detection of anomalous events in video sequences. The models predict the evolution of video sequences and derive regularity scores from reconstruction errors. The paper explores the effectiveness of Conv LSTM units for modeling and predicting video sequences and demonstrates competitive results on suspicious detection datasets
4	Abnormal Event Detection in Videos using Spatiotemporal Auto encoder	Yong Shean Chong	This method focuses on detecting anomalies in videos, particularly in crowded scenes. It employs a spatiotemporal architecture, consisting of components for spatial feature representation and learning the temporal evolution of these features.
5	A Review of Human Suspicious Activity from Single Image.	Naimat Ullah Khan, Wanggen Wan	This review discusses significant contributions in Human Pose

			Estimation methods from single two-dimensional images. It covers traditional pictorial structures, Deep Neural Networks, and the Stacked Hourglass approach. The paper provides a comprehensive study of influential deep learning methods for human pose estimation, starting from the earliest practical models and progressing to the most recent advancements.

8. CONCLUSION

A system to process real-time CCTV footage to detect any suspicious activity will help to create better security and less human intervention. Great strides have been made in the field of human Suspicious Activity, which enables us to better serve the myriad applications that are possible with it. Moreover, research in related fields such as Activity Tracking can greatly enhance its productive utilization in several fields.

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REFERENCES

[1] Naimat Ullah Khan, Wangen Wan: "A Review of Human Pose Estimation from Single Image"- 978-1-5386-5195-7/18/ 2018 IEEE

[2] Qiuhui Chen, Chongyang Zhang, Weiwei Liu, and Dan Wang," Surveillance Human Pose Dataset and Performance Evaluation for Coarse-Grained Pose Estimation", Athens 2018.

[3] E. Eksioglu. Decoupled algorithm for MRI reconstruction using nonlocal block matching model: BM3DMRI. Journal of Mathematical Imaging and Vision, 56(3):430–440, 2016.

[4] Y. Yang, J. Sun, H. Li, and Z. Xu. Deep ADMM-Net for compressive sensing

[5] MRI. In Advances in Neural Information Processing Systems, pages 10–18, 2016.

[6] P.Bhagya Divya, S.Shalini, R.Deepa, Baddeli Sravya Reddy,"Inspection of suspicious human activity in the crowdsourced areas captured in surveillance cameras", International Research Journal of Engineering and Technology (IRJET), December 2017.

[7] Jitendra Musale,Akshata Gavhane, Liyakat Shaikh, Pournima Hagwane, Snehalata Tadge, "Suspicious Movement Detection and Tracking of Human Behavior and Object with Fire Detection using A Closed Circuit TV (CCTV) cameras ", International Journal for Research in Applied Science & Engineering Technology (IJRASET) Volume 5 Issue XII December 2017.

[8] U.M.Kamthe,C.G.Patil "Suspicious Activity Recognition in Video Surveillance System", Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), 2018.

[9] Zahraa Kain, Abir Youness, Ismail El Sayad, Samih Abdul-Nabi, Hussein Kassem, "Detecting Abnormal Events in University Areas", International conference on Computer and Application,2018.

[10] Tian Wanga, Meina Qia, Yingjun Deng, Yi Zhouc, Huan Wangd, Qi Lyua, Hichem Snoussie, "Abnormal event detection based on analysis of movement information of video sequence", Article-Optik, vol-152, January-2018.

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