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HUMAN BEHAVIOR AND ABNORMAL DETECTION

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Abstract:
Human behavior and abnormality detection is an emerging technology that utilizes advanced algorithms such as YOLO (You Only Look Once) and Convolutional Neural Networks (CNN) to extract features, handle temporal dependencies, and enhance the accuracy and efficiency of human behavior detection systems. This technology is specifically designed to be applicable in real-world scenarios, particularly for detecting abnormal activities in surveillance videos captured by closed circuit television (CCTV) cameras. The model leverages YOLOv3, an object detection technology, to detect human behaviors and abnormalities in the video data. Subsequently, a Convolutional Neural Network (CNN) is employed to extract action characteristics from each tracked trajectory. Finally, a Long Short-Term Memory Network (LSTM) is utilized to construct a model for identifying anomalous behaviors, thereby predicting abnormal activities performed by humans. In summary, this technology operates by taking video footage as input from surveillance cameras and applies a series of advanced algorithms to detect and classify abnormal activities. By utilizing YOLO and CNN for feature extraction and LSTM for anomaly identification, the system can accurately identify and predict abnormal human behavior.
Keywords : Human behavior, Abnormal,
YOLOv3, Surveillance, LSTM.

I. INTRODUCTION

Human behavior and abnormal detection are prominent fields of research aimed at automatically analyzing and identifying unusual patterns in human actions. With the continuous progress in computer vision and deep learning techniques, sophisticated algorithms have been developed to efficiently and accurately detect and recognize abnormal behavior. Human behavior encompasses a wide spectrum of actions, gestures, and movements exhibited by individuals in their daily lives. Understanding and analyzing human behavior has extensive applications in areas such as public safety, healthcare, and surveillance. Abnormal behavior, however, often indicates potential risks, threats, or emergencies, making the detection and recognition of such behavior crucial for effective decision-making and timely intervention.

YOLO is a renowned object detection algorithm that has gained significant popularity in the field of computer vision. It enables real-time detection of objects and has been successfully applied to the analysis of human behavior. YOLO utilizes a single neural network to divide an input image into a grid and directly predicts bounding boxes and class probabilities. On the other hand, Conv2DNet is a convolutional neural network architecture commonly employed in deep learning for video analysis. It excels at learning spatial hierarchies of features through multiple layers of convolutional and pooling operations. Conv2DNet has found widespread applications in various computer vision tasks, including abnormal behavior detection.

The combination of YOLO and Conv2DNet offers a powerful framework for human behavior and abnormal detection. YOLO facilitates fast and precise object detection, while Conv2DNet leverages the capabilities of deep learning to learn and classify abnormal behavior patterns. By integrating these methods, researchers and practitioners can develop robust systems that analyze video data, detect abnormal behavior, and provide valuable insights for decision-making and intervention. In conclusion, the utilization of YOLO and Conv2DNet in human behavior and abnormal detection demonstrates the advancements made in computer vision and deep learning techniques. These methods enable real-time and accurate identification of abnormal behavior patterns, thereby contributing to enhanced security, safety, and situational awareness in various domains.

Figure 1: Different Human Behavior Activities

II. LITERATURE SURVEY

Rongyong Zha, Yan Wang, Ping Jia, Cuiling Li , Yunlong Ma, Zhishu Zhang proposed abnormal human behavior recognition based on image processing technology in their paper [1]. They address the advancements in human behavior analysis driven by the rapid development of computer information technology. The increasing concern for public safety in society

has expanded the application range of target detection and gesture recognition technologies, making abnormal human behavior analysis crucial in safety management. To meet this requirement, the authors propose a model that leverages computer vision and image processing techniques. The model records and stores human postures and behaviors, mimicking the way human brains perceive them. The authors employ the Principal Component Analysis (PCA) method to extract features from the edges of the human body. They also utilize the Support Vector Machine (SVM) method to classify behaviors into normal and abnormal categories. The paper contributes to highlights the importance of using computer vision and image processing to enhance safety management in various public environments. By employing PCA and SVM, the authors propose methodology for extracting features and classifying behaviors, respectively, contributing to the field of human behavior analysis.

Weihu Zhang,Chang Liu presented a paper[2]proposing a research on human abnormal behavior detection based on deep learning. The authors' approach involves utilizing the effective information present in the video to improve behavior recognition. They employ a mixed Gaussian model to detect clear foreground moving target contours and apply Gaussian filtering to eliminate noise effects. By calculating the center point of the foreground pixels and drawing a bounding box, the key area of human motion in the video is extracted. To capture spatiotemporal information, the authors utilize the farneback dense optical flow algorithm. This algorithm provides insights into the motion patterns within the key area over time. The model takes the original image and the superimposed optical flow image of the key area in the video sequence as inputs, allowing it to learn dynamic and static features, as well as timing information from the spatiotemporal data. The authors employ a weighted fusion method that performs a weighted calculation on the softmax output of the two-stream network to obtain results. This fusion technique combines the predictions from both streams, improving overall accuracy. In conclusion, the paper demonstrates a deep learning-based method for detecting human abnormal behavior in videos. By utilizing a mixed Gaussian model, extracting key areas, and combining CNN and LSTM in a hybrid two-stream network, the authors successfully capture and analyze spatiotemporal information, leading to enhanced recognition rates.

Ioana Alexandra Bozdog, Todea Daniel-Nicusor, Marcel Antal, Claudia Antal, Tudor Cioara, Ionut Anghel, Ioan Salomie[3] proposed human behavior and anomaly detection using machine learning and wearable sensors. The goal is to identify potential anomalies in order to support the independence of older adults and delay institutionalization, allowing them to live alone with minimal caregiver support. The authors propose an experimental web-based distributed system that integrates data from wearable sensors and machine learning algorithms to monitor and detect anomalies in a person's behavior. They explore various configurations of feature selection techniques and features, as well as manual labeling for supervised learning. When an anomaly is detected in the behavior of an older adult, the caregiver is notified. The system implementation and functionality are illustrated using the Fitbit smart band sensor and integration with the Fitbit Cloud platform. This paper has potential implications for supporting independent living for older adults and providing timely intervention when abnormal behavior is detected.

Huifang Qian, Xuan Zhou, Mengmeng Zheng proposed a system for detection and recognition of abnormal behavior based on multi-level residual network. They address the important challenge of real-time detection and recognition of abnormal behavior in video monitoring systems within the context of intelligent monitoring systems. The authors propose a network framework that utilizes a multi-level residual network to detect and recognize abnormal human behavior in video footage. The framework consists of two main modules: the human body detection module and the posture recognition module. For human body detection, the authors introduce the detection residual network (d-Res), which employs a multi-scale target detection strategy to ensure efficient and accurate detection of human bodies. This strategy enhances both the speed and effectiveness of human body detection in video streams. The posture recognition module is designed to extract spatial features of abnormal behaviors. The recognition residual network (r-Res), based on transfer learning, is employed to extract deep features from images, enabling efficient classification of abnormal behaviors. By leveraging the knowledge learned from pre-trained models, the system can effectively identify abnormal behaviors.

III. PROPOSED SYSTEM

The proposed system uses YOLO and CONV2d to detecthuman behaviors and abnormalities. YOLO identifies individuals and body parts, while CONV2d detects behaviors and anomalies. CNN models can extract features and patterns from images without the need for human feature engineering, making them more robust to variations in image quality and lighting conditions. LSTM models can handle sequences of input data and capture temporal dependencies, making them suitable for analyzing human behavior over time.

The working of proposed system is as follows:

1. Data Collection:
Gather a dataset that contains examples of normal human behaviors. This dataset should include a diverse range of activities and scenarios to capture variations in normal behavior.

2. Preprocessing:
Process and prepare the dataset for training. This involves resizing images to a consistent resolution, normalizing pixel values to a common scale, and potentially augmenting the data to increase its diversity and generalization.

3. Model Design:
Construct a Conv2D network architecture suitable for analyzing human behavior. This typically involves stacking multiple convolutional layers,

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followed by pooling layers to reduce spatial dimensions. Optionally, fully connected layers can be added for classification tasks.

4. Training:
Feed the preprocessed dataset into the Conv2D network and optimize its parameters using back propagation and gradient descent algorithms. During training, the network learns to recognize patterns of normal behavior by minimizing a predefined loss function.

5. Anomaly Detection:
Apply the trained Conv2D network to new, unseen images or videos to detect anomalies. Feed the test data into the network and observe the output predictions. If the observed behavior deviates significantly from the learned normal patterns, it is flagged as an anomaly.

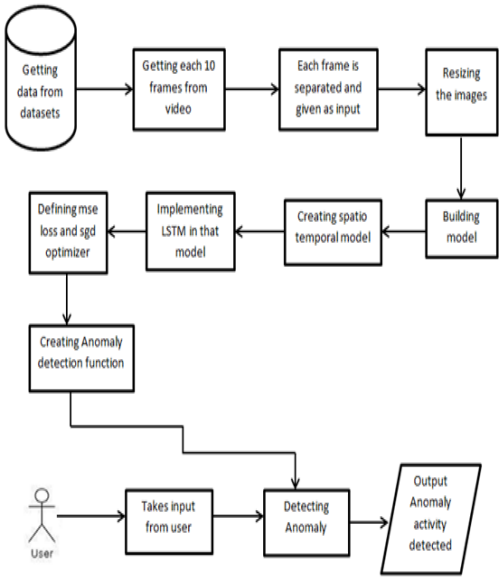

Figure 2: Architecture of System

IV. RESULT

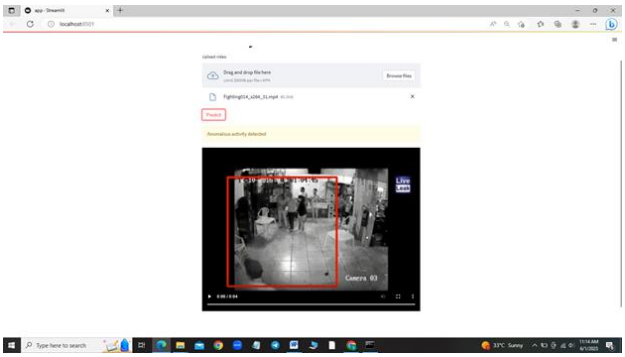

Figure 3: Output Screen of Fighting Activity

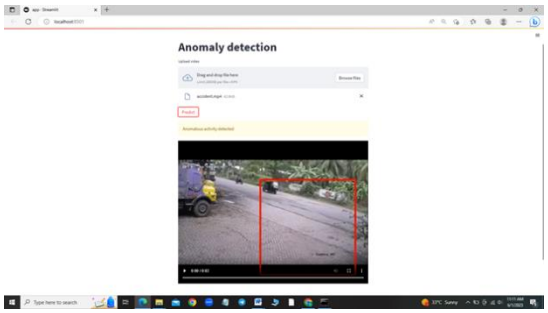

Figure 4: Output Screen of Accident Activity

V. CONCLUSION

In conclusion, the combination of YOLO (You Only Look Once) and Convolutional Neural Networks (CNNs) such as Conv2DNet offers a powerful solution for human behavior analysis and abnormal detection. YOLO's real-time object detection capabilities and Conv2DNet's spatial feature recognition make them well-suited for detecting and analyzing human behavior in video data. By training YOLO on a dataset containing diverse examples of human behavior, the system can accurately detect and track individuals in real-time. This enables the system to identify the presence of humans and their actions within a video scene.

Conv2DNet, being a type of CNN architecture, is effective at capturing spatial features and patterns. It can be trained to recognize normal human behavior patterns, such as walking, sitting, or running. By combining YOLO's object detection with Conv2DNet's behavior recognition, the system becomes capable of detecting abnormal behavior. Abnormal actions like fighting, loitering, or unusual movement patterns can be identified and flagged for further investigation. The integrated YOLO and Conv2DNet system can be deployed in various surveillance applications, such as public spaces, airports, or critical infrastructure locations. It enhances security measures and enables more efficient human monitoring. The system assists human operators in detecting potential threats or abnormal situations, improving situational awareness.

However, it is essential to ensure the training data used for both YOLO and Conv2DNet is of high quality and diverse. Sufficient training data, including examples of abnormal behavior, is crucial for achieving accurate and reliable results. Regular monitoring, evaluation, and fine-tuning of the system are necessary to adapt to changing behaviors and minimize false positives or negatives. In summary, the integration of YOLO and Conv2DNet offers a promising approach for human behavior analysis and abnormal detection. This combination of real-time object detection and spatial feature recognition contributes to enhancing security systems and improving situational awareness in various surveillance applications.

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