Human Abnormal Activities Detection System Using Deep Learning Models for Security and surveillance

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ABSTRACT

Video Surveillance plays a pivotal role in today's world. The technologies have been advanced too much when artificial intelligence, machine learning and deep learning pitched into the system. Using above combinations, different systems are in place which helps to differentiate various suspicious behaviours from the live tracking of footages. The most unpredictable one is human behaviour and it is very difficult to find whether it is suspicious or normal. Deep learning approach is used to detect suspicious or normal activity in an academic environment, and which sends an alert message to the corresponding authority, in case of predicting a suspicious activity. Monitoring is often performed through consecutive frames which are extracted from the video. The entire framework is divided into two parts. In the first part, the features are computed from video frames and in second part, based on the obtained features classifier predict the class as suspicious or normal.

Keywords: Human Abnormal Activity Detection, Deep Learning, Convolutional Neural Network (CNN), Video Surveillance, Computer Vision, Feature Extraction, Activity Classification

INTRODUCTION

With increasing crime rates, it becomes a problem if they are not identified in time and necessary precautionary actions taken. Most urban and metropolitan areas have surveillance systems installed which constantly accumulates data. With the vast accumulation of surveillance data there are higher chances of suspicious activities to occur. But these tasks require human supervision to detect such activities as they are too complicated for artificial intelligence to handle and require high resources. Breaking down complicated tasks and detecting sub tasks which lead to

potential crimes are one way to simplify an activity to be automated.

LITERATURE REVIEW

Human abnormal activity detection using deep learning has become an important research area in intelligent video surveillance systems. Roberto Olmos, Siham Tabik, and Francisco Herrera (2017) proposed a CNN-based deep learning framework to detect violent and abnormal activities in surveillance videos by learning discriminative spatial features from video frames. Their approach achieved better accuracy than traditional machine learning methods but required high computational resources. Claire-Hélène Demarty et al. (2012) presented a violent scene detection system under the Media Eval initiative using visual and motion-based features extracted from videos, which showed acceptable performance but faced challenges with complex scenes and lighting variations. Rohit Kumar Tiwari and Gyanendra K. Verma (2015) developed a computer vision–based method for detecting suspicious activities and weapons using interest point detection and machine learning classifiers; however, the reliance on handcrafted features limited adaptability.

RELATED REVIEW

Recent research in human abnormal activity detection mainly focuses on developing intelligent video surveillance systems that can automatically identify suspicious human behaviours. Most existing works use computer vision and deep learning techniques to analyse video streams by converting them into consecutive frames for effective processing. Convolutional Neural Networks (CNNs) are widely used for feature extraction due to their strong capability in learning spatial patterns from images, while some studies integrate machine learning classifiers for activity classification. Advanced models also employ motion analysis and temporal modelling to distinguish between normal and abnormal activities. From the abstracts of published works, it is evident that deep learning–based systems achieve higher accuracy compared to traditional methods by reducing manual feature engineering.

EXISTING METHOD

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane. SVM chooses the extreme points/vectors that help in creating the hyperplane.

PROPOSED METHOD

The proposed system is an intelligent video surveillance solution that uses Deep

Learning to automatically detect abnormal human activities. It processes live or recorded video by extracting frames, learning spatial and temporal features, and classifying activities as normal or abnormal. When suspicious activity is detected, the system generates real-time alerts for security personnel, enhancing safety, reducing reliance on manual monitoring, and enabling timely intervention in public or private spaces.

SYSTEM ARCHITECTURE

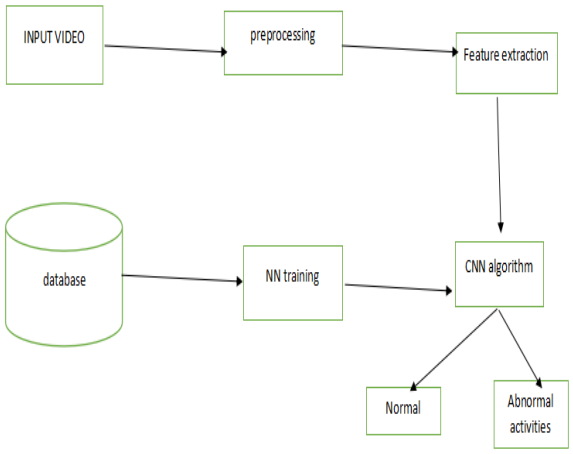

Fig1: System Architecture of Human Abnormal Activities Detection System

METHODOLOGY DESCRIPTION

The proposed methodology for human abnormal activity detection follows a systematic architecture designed to efficiently analyse surveillance video data. Initially, the input video is captured from CCTV cameras or selected from stored datasets. In the preprocessing stage, the video is converted into frames, resized, and normalized to reduce noise and computational complexity. Next, background subtraction and blob detection techniques are applied to identify and isolate moving human objects from the scene. The extracted regions of interest are then passed to the feature extraction module, where a Convolutional Neural Network (CNN) automatically learns spatial features such as edges, shapes, and motion patterns. These features are forwarded to the classification layer, which distinguishes between normal and abnormal human activities using trained deep learning models. During training, labelled video data is used to optimize the network parameters and improve accuracy. Finally, the output module displays the detected activity and generates alerts when abnormal behaviour is identified. This step-by-step approach ensures accurate, reliable, and real-time abnormal activity detection in surveillance environments.

RESULTS & DISCUSSIONS:

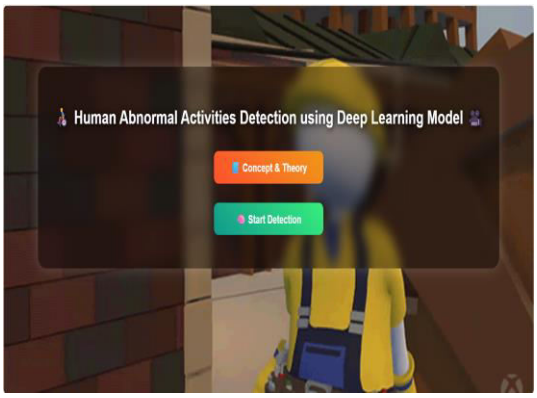

Fig 2: Home Page

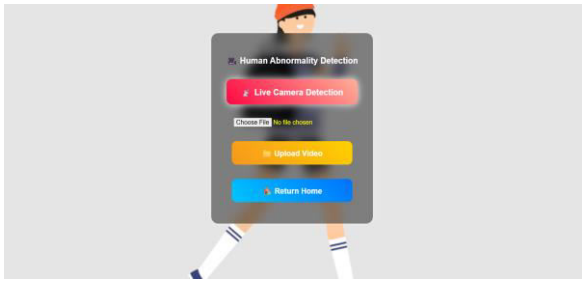

Fig 3: Live Detection Page

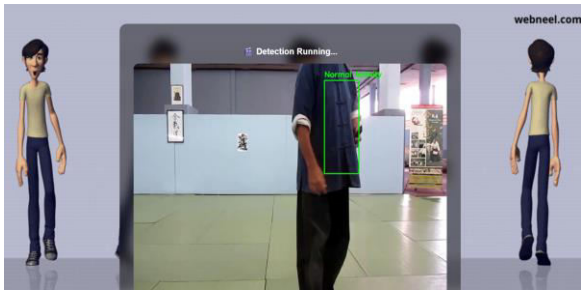

Fig 4: Normal Activity

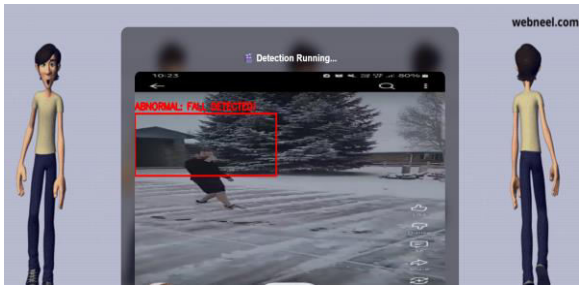

Fig 5: Fall Detected: Abnormal Activity

CONCLUSION&FUTURE ENHANCEMENT

We created an CNN model for detecting activity like fighting, walking, jumping & running from CCTV footage, the model was trained on **videos** and achieved a good **accuracy.** The proposed system can be further enhanced in several ways to improve its performance and usability. Real-time alert notifications can be integrated to immediately inform authorities when abnormal activities are detected. Cloud-based storage can be used to store and manage large volumes of surveillance data efficiently. The system can also be extended to support mobile applications for remote monitoring. Real - time alert notifications can be integrated to immediately inform authorities when abnormal activities are detected. Cloud-based storage can be used to store and manage large volumes of surveillance data efficiently. Additionally, expanding the dataset with diverse real-world scenarios and incorporating anomaly prediction techniques can make the system more robust and scalable for smart city and public security applications

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