IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 5, May 2022
Impact Factor: 6.252

Design and Implementation of the Suspicious Activity Detection System using Machine Learning

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Abstract: *We intend to develop a real-time programme for detecting suspicious behaviour of persons in public settings. Our tool may be used to monitor areas where there is a risk of robbery or a gun assault, such as malls, airports, and train stations. To train our system, we will use deep learning and neural networks. This model will then be implemented as a mobile and desktop app, taking real-time CCTV footage as input and sending an alarm to the administrator's smartphone if a suspicious stance is detected. Human suspicious behaviour is associated with the identification of human bodily parts and perhaps tracking their travels. Its real-world applications range from gaming to AR/VR, healthcare, and gesture detection. In comparison to the image data domain, there has been very limited research into using CNNs to video categorization. This is due to the fact that videos are more complicated than photos since they have another dimension - temporal. Unsupervised learning, which takes use of temporal connections between frames, has proven effective for video analysis. Some techniques to suspicious behaviour employ CPU rather than GPU, allowing suspicious activity to execute on low-cost hardware such as embedded systems and mobile phones.*

Keywords: *Suspicious behaviour, Machine Learning, CNN, Random Forest (RF) and KNN, CCTV.*

I. INTRODUCTION

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 which can benefit from suspicious activity. For example, human suspicious activity is used in applications including video surveillance, animal tracking and behavior understanding, sign language detection, advanced human-computer interaction, and marker less motion capturing. Low-cost depth sensors have limitations like 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 the visual surveillance, human activities can be monitored in sensitive and public areas such as bus stations, railway stations, airports, banks, shopping malls, school 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 an intelligent video surveillance is required that can monitor the human activities in real-time and categorize them as usual and unusual activities; and can generate an alert. Mostly, of 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.

II. RELATED WORK

Mohammad Sabokrou ET AL. [1] suggested a system for real-time suspicious identification and localisation in congested settings in this work. Each movie is specified as a series of non-overlapping cubic patches, with two local and global descriptors. These descriptions capture video qualities from various angles. We can discriminate between normal and abnormal activity in films by adding simple and low-cost Gaussian classifiers. Mahmudul Hasan et al. [2] proposed the unclear notion of'meaningfulness,' as well as clutter in the environment, perceiving meaningful actions in a long video sequence is a difficult task. We tackle this challenge by creating a generative model for regular motion patterns (also

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known as regularity) from many sources with very little supervision. Jefferson Ryan Medel et al. [3] proposed that because of the vagueness in how such events are classified, automating the identification of anomalous occurrences within extended video sequences is difficult. We address the challenge by training generative models to detect abnormalities in films with little supervision. End-to-end trainable composite Convolutional Long Short-Term Memory (Conv-LSTM) networks that can anticipate the evolution of a video sequence from a limited number of input frames are proposed. Yong Shean Chong et al. [4] said We offer a fast approach for identifying video abnormalities. Recent convolutional neural network applications have demonstrated the promise of convolutional layers for object identification and recognition, particularly in photos. Convolutional neural networks, on the other hand, are supervised and require labels as learning signals. S. L. Bangare et al. [5-11] have worked in the brain tumor detection. N. Shelke et al [12] given LRA-DNN method. Suneet Gupta et al [13] worked for end user system. Gururaj Awate et al. [14] worked on Alzheimers Disease. P. S. Bangare et al [15-17] worked on the object detection. Kalpana Thakare et al [18-23] have worked on various machine learning algorithms. M. L. Bangare et al. [24-25] worked on the cloud platform. Rajesaheb R. Kadam et al [26] and Sachindra K. Chavan et al. [27] have discussed security issues with cloud.

III. SYSTEM ANALYSIS

3.1 System Architecture

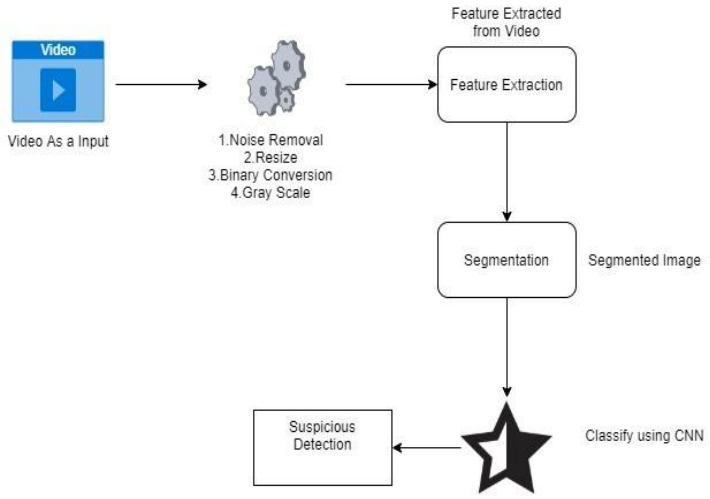

Fig.1 System Architecture

3.2 Proposed Work of Model

Data collection begins with the extraction of information for various Websites and Social Media apps depending on certain factors.

1. Preprocessing: To prepare our dataset, we will do different pre-processing techniques such as noise removal, resizing, binary conversion, and grey scaling.
2. Noise removal: Noise from the input video is eliminated. Filtering is the main step in image processing for denoising; commonly, average filters, median filters, Wiener filters, and Kalman filters are used to minimise noise.
3. Picture scaling is required when we need to increase or reduce the total number of pixels, whereas remapping is used when we need to compensate for lens distortion or rotate an image.
4. Binary conversion: A binary picture is one that has pixels that can only have one of two colours, black and white. Binary pictures are sometimes known as bi-level or two-level images. This means that each and every pixel is stored as a single bit, with values ranging from 0 to 1.
5. Gray scaling is the process of converting a continuous-tone image into an image that a computer can easily alter.
6. Picture segmentation is an important technique that involves isolating a digital image into several parts, i.e. (sets of pixels, also recognised as image objects).

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7. Data Training: We collect artificial as well as real-time web news data and train any machine learning classifier.
8. Feature extraction: Feature extraction is a step in the dimensionality reduction technique that involves separating and compacting an initial collection of raw data into more manageable categories.
9. Classification is the technique of classifying and identifying groupings of pixels or vectors inside a picture using certain rules and instructions.
10. Data Training: We collected simulated as well as real-time social media data and trained any machine learning classifier.
11. Machine learning testing: We provide a testing dataset to the system and use a machine learning algorithm to detect activity.

3.3 UML diagrams

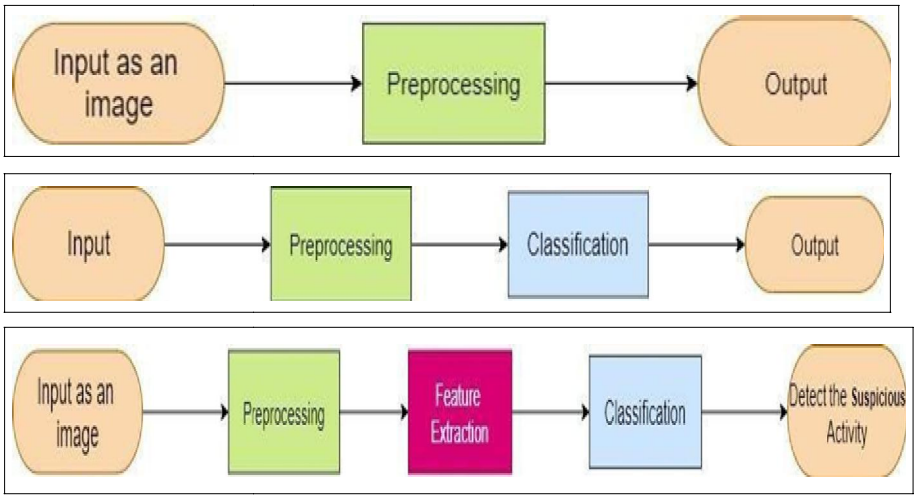

Fig.2 Data Flow diagram

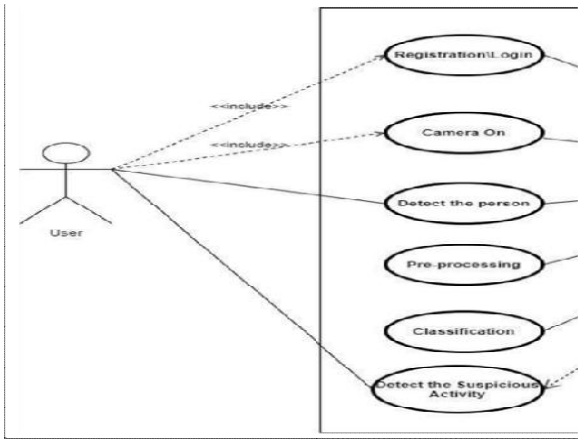

Fig.3 Use case Diagram

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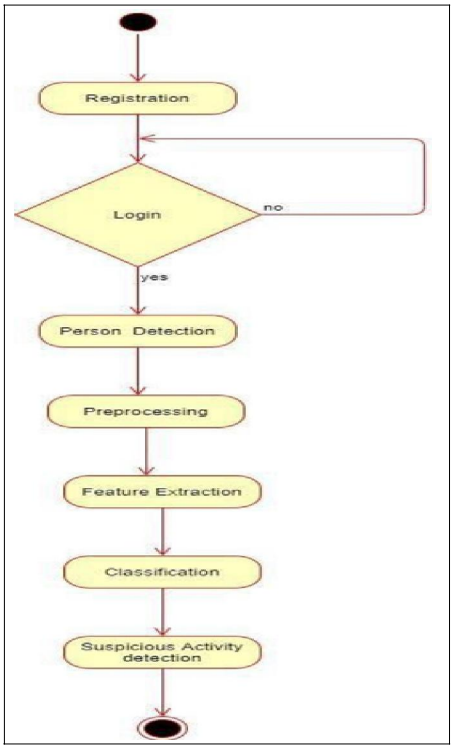

Fig.4 Activity Diagram

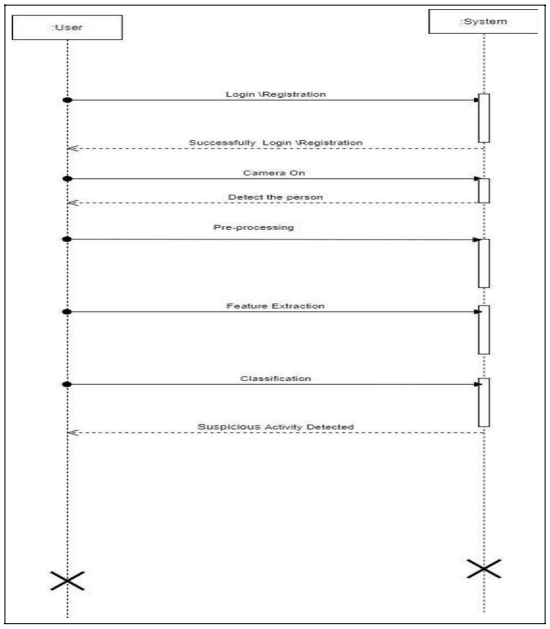

Fig. 5 Sequence Diagram

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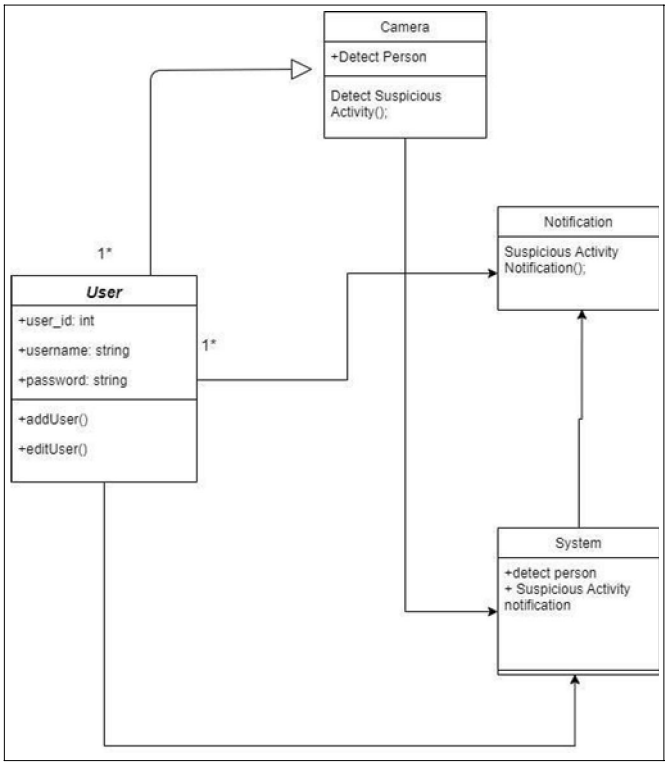

Fig.6 Class Diagram

IV. EXPERIMENTAL RESULTS

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Impact Factor: 6.252

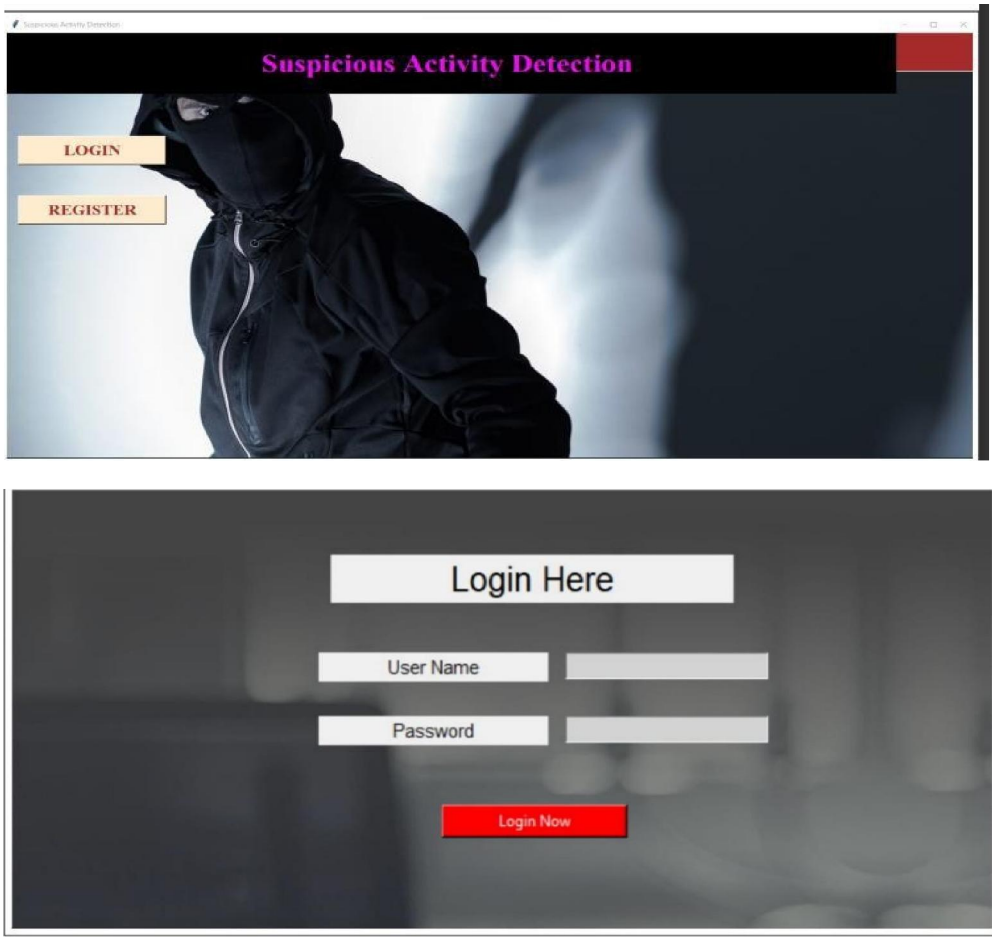

Fig.7 Screens shots

V. CONCLUSION

A system that processes real-time CCTV data to detect any suspicious behaviour would assist to improve security and reduce the need for human involvement. Great advancements have been achieved in the realm of human suspicious activity, allowing us to better serve the numerous applications that it is capable of using CNN. Furthermore, research in adjacent domains such as Activity Tracking can significantly improve its productive application in a variety of fields.

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