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# SUSPICIOUS ACTIVITY DETECTION

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**Abstract**

With the increasing in the number of anti-social activities that have been taking place, security has been given utmost importance lately. Many Organizations have installed CCTVs for constant monitoring of people and their interactions. For a developed Country with a population of 64 million, every person is captured by a camera 30 times a day. A lot of video data generated and stored for certain time duration. A 704x576 resolution image recorded at 25fps will generate roughly 20GB per day. Constant Monitoring of data by humans to judge if the events are abnormal is impossible task as requires a workforce and their constant attention. This creates a need to automate the same. Also , there is need to show in which frame and which part of it contain the unusual activity which aid the faster judgment of the unusual activity being abnormal. This is done by converting video into frames and analyzing the persons and their activities from the processed frame. Machine learning and Deep Learning Algorithms and techniques support us in a wide accept to make possible

## I.INTRODUCTION

Human face and human behavioural pattern play an important role in person identification. Visual information is a key source for such identifications. Surveillance videos provide such visual information which can be viewed as live videos, or it can be played back for future references. 3 The recent trend of „automation" has its impact even in the field of video analytics. Video analytics can be used for a wide variety of applications like motion detection, human activity prediction, person identification, abnormal activity recognition, vehicle counting, people counting at crowded places, etc. In this domain, the two factors which are used for person identification are technically termed as face recognition and gait recognition respectively. Among these two techniques, face recognition is more versatile for automated person identification through surveillance videos. Face recognition can be used to predict the orientation of a person's head, which in turn will help to predict a person's behaviour. Motion recognition with face recognition is very useful in many applications such as verification of a person, identification of a person and detecting presence or absence of a person at a specific place and time. In addition, human interactions such as subtle contact among two individuals, head motion detection, hand

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gesture recognition and estimation are used to devise a system that can identify and recognize suspicious behaviour among pupil in an examination hall successfully. This paper provides a methodology for suspicious human activity detection through face recognition. Video processing is used in two main domains such as security and research. Such a technology uses intelligent algorithms to monitor live videos. Computational complexities and time complexities are some of the key factors while designing a real-time system. The system which uses an algorithm with a relatively lower time complexity, using less hardware resources and which produces good results will be more useful for timecritical applications like bank robbery detection, patient monitoring system, detecting and reporting suspicious activities at the railway station, etc. Manual monitoring of exam hall through invigilators and manual monitoring of exam hall through surveillance videos is performed throughout the world. Monitoring an examination hall is a very challenging task in terms of man power. Manual monitoring of examination halls may be prone to error during human supervision. Such a system when implemented as an „automatic suspicious activity detection system" will not only help in detecting suspicious activities but also helps in minimizing such activities. 4 Moreover, the probability of error will be much lesser. This system will serve as a useful surveillance system for educational institutions. This describes a technology in which real time videos are analysed and are used for human activity analysis in an examination hall, thus helping to classify whether the particular person's activity is suspicious or not. The system developed identifies abnormal head motions, thereby prohibiting copying. It also identifies a student moving out of his place or swapping his position with another student. Finally the system detects contact between students and hence prevents passing incriminating material among students. In our research, we have contributed upon a system that will intellectually process live video of examination halls with students and classify their activities as suspicious or not. This research proposes an intelligent algorithm that can monitor and analyse the activities of students in an examination hall and can alert the educational institute's administration on account of any malpractices/suspicious activities. The Suspicious Human Activity Detection system aims to identify the students who indulge in malpractices/suspicious activities during the course of an examination. The system automatically detects suspicious activities and alerts administration.

## II.LITERATURE SURVEY

**Eralda Nishani [1]** developed "A real-time system meant to identify aggressive and violent behavior in real-time, thereby producing erratic and normal behavior patterns. Deep learning models was used to identify and quantify levels off in the video (CNN and RNN)".

**Wagon Wan and Naimat Ullah Khan [2]** states that "A system that uses PIR sensors to detect human presence. They used Raspberry Pi to control motion detecting sensors and video cameras as well as to run remote sensing and surveillance equipment and also stream live video. The recordings from these systems are stored on the Pi, allowing for future playback. The surveillance system

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would be activated upon the detection of any movement".

**Chen, Zhang, and Liu [3]** states that "A system that uses AMD algorithm to detect a suspicious person in a video and, once the user indicates one, will begin tracking the person. Complete detection of moving objects is accomplished with Advanced Motion Detection (AMD). To meet the rising demand for specialized monitoring equipment, a camera was also used in the monitoring room, where it was linked to the security monitoring equipment to emit alert messages if unusual activity was detected".

**Baole Ai, Yu Zhou, and Yao Yu [4]** used a hierarchical approach to "identify suspicious activities by analyzing the differences in the motion characteristics between objects. The first step was to use a semantic approach to identify suspicious activities. After that, they used background subtraction to do object detection. After discovering evidence of human life, they further categorized the detected entities as living (human) or non-living (bag). The device was able to identify events as either normal or suspicious using motion features or temporal information".

**Zhe Cao [5]** states that "learns anomalies by combining videos of both normal and anomalous occurrences. In order to avoid having to annotate every video, they suggested using the Deep Multi-Instance Learning 6 approach, which utilizes unlabeled training videos, in order to discover anomalies". A deep neural network (CNN) for the new study's project, researchers

**Dongsung Lee, Hanguen Kim, and Sangwon Lee [6]** stated that "it may be effective to teach a computer how various object appearances (background, tree, etc.) are connected to motion. A design that combines the two technologies was built using the same encoder. On 6real-world datasets, the experimental analysis demonstrated that the proposed approach was better than the most competitive methods currently available".

**Tripathi, Rajesh, Jalal, Anand, and Agarwal [7]** states that "A system for detecting suspicious activities in images and videos using Convolutional Neural Networks (CNN). They investigated various CNN architectures and compared their accuracy. Their system architecture allowed them to process video footage from cameras in real time and detect suspicious activity. They also proposed potential future developments in this area".

**Eksioglu, E. [8]** states that "Decoupled MRI reconstruction technique based on a nonlocal block matching model, a new strategy for obtaining deep features, in particular, is proposed. The "Siamese Convolutional Neural Network" (S-CNN) was used to create the S-CNN technique discussed in this article, which delivers better results when identifying hyper spectral images. The goal of this strategy is to create a five-layered CNN that extracts deep characteristics first. The CNN's purpose is to resemble a nonlinear change function. The Siamese convolutional neural network is made up of two CNNs that were taught to look for features with low and high interclass variability. The S-CNN is a supervised technique that generates more discriminant features using the margin ranking loss function. For several hyper spectral datasets, the performance of a support vector machine (SVM) classifier was employed to compare our method to existing methods. It has been

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demonstrated that the method produces superior classification performance than conventional methods for feature extraction". 7

**S. Wang, Z. Su, L. Ying, X. Peng, S. Zhu, F. Liang, D. Feng, and D. Liang [9]** states that "Deep learning has the potential to improve magnetic resonance imaging (MRI). In the IEEE international conference International Symposium on Medical Science, a real-time violence detection system was developed that used deep learning to anticipate aggressive behavior in crowds or athletes. In a spark environment, frames were retrieved from realtime videos. If football violence is spotted, security personnel should be notified. To reduce the likelihood of violence occurring, the system detects the in -progress videos, notifies the security forces, and initiates counter measure. Was achieved using the VID dataset to identify violence in stadiums, which returned an accuracy of 94.5percent".

**L. Xu, J. Ren, C. Liu, and J. Jia [10]** stated that "Studied daily human activities, such as activities at home, work, caring, and helping, captured from videos. In the world of sports, training and practice rely on deep learning. RNN is utilized for the purpose of classification, and CNN is used for retrieving input features. They used the Inception v3 modelUCF101, as well as Activity-net and datasets, in this project".

**Yang [11]** states that "Intelligent video surveillance for crowd analysis. This research looked at existing and advanced video surveillance methods and approaches, as well as several state-of-the-art deep learning algorithms and datasets".

**Longman Publishers [12]** states that "It will be easy to trace down the individuals responsible if suspicious incidents captured on video footage are found. Humans can be seen in the videos using backdrop subtraction. The features were extracted by CNN and supplied to a DDBN (Discriminative Deep Belief Network). The suspicious footage is given to the DDBN, and its features are extracted as well".

**T. Xiao, C. Zhang, H. Zha, and F. Wei[13**] states that "Anomaly detection, which aims to discover anomalous events, defined as having a low likelihood of occurrence, from surveillance videos, has attracted increasing interest and is still a challenge in computer vision community. In this project, we 8 propose an efficient anomaly detection approach which can perform both real-time and multi-scale detection. Our approach can handle the change of background. Specifically, Local Coordinate Factorization is utilized to tell whether a spatio-temporal video volume (STV) belongs to an anomaly, which can effectively detect spatial, temporal and spatio-temporal anomalies. And we employ Spatio-temporal Pyramid (STP) to capture the spatial and temporal continuity of an anomalous event, enabling our approach to handle multi-scale and complicated events. We also propose an online method to update the local coordinates, which makes our approach self-adaptive to background change which typically occurs in real-world setting. We conduct extensive experiments on several publicly available datasets for anomaly detection, and the results show that our approach can outperform state-of-the-art approaches, which verifies the effectiveness of our approach".

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**Kaul Eshwar Prasad, Richa Sharmaand, Deepika Wadhwani [14]** states that "This project initially proposes a technique for identifying a moving object in a video clip of stationary background for real time content based multimedia communication systems. It deals with identifying an object of interest. Dynamic objects are identified using both background elimination and background registration techniques. Post processing techniques are applied to reduce the noise. The background elimination method uses concept of least squares to compare the accuracies of the current algorithm with the already existing algorithms. The background registration method uses background subtraction which improves the adaptive background mixture model and makes the system learn faster and more accurately, as well as adapt effectively to changing environments".

**H. Mousavi, M. Nabi, H. K. Galoogahi, A. Perina, and V. Murino [15]** states that "Recently the histogram of oriented tracklets (HOT) was shown to be an efficient video representation for abnormality detection and achieved state-of-the-arts on the available datasets. Unlike standard video descriptors that mainly employ low level motion features, e.g. optical flow, the HOT 9 descriptor simultaneously encodes magnitude and orientation of tracklets as a mid-level representation over crowd motions. However, extracting tracklets in HOT suffers from poor salient point initialization and tracking drift in the presence of occlusion. Moreover, count-based HOT histogramming does not properly take into account the motion characteristics of abnormal motions. This project extends the HOT by addressing these drawbacks introducing an enhanced version of HOT, named Improved HOT. First, we propose to initialize salient points in each frame instead of the first frame, as the HOT does. Second, we replace the naive count-based histogramming by the richer statistics of crowd movement (i.e., motion distribution)".

**Ahmad Salihu Ben-Musa, Sanjay Kumar Singh, Prateek Agrawal [16]** states that "In this research work Suspicious Human Activity Recognition for Video Surveillance System, we detected cheating activities in examination hall. We used SURF (Speed up Robust Features) to extract interest points, and use SURF method to match and find the corresponding features. We used some algorithms to classify the suspicious activities. We also use Viola Jones object detectors for finding the faces and labeling the activities. We also use tracking algorithms to track detectors in the input video. The proposed techniques use fast detectors and they are robust. In addition to the detectors and tracking algorithms, we used text labeling to avoid false classification, if detectors and tracking algorithms fail to track the faces".

**Gowsikhaa D, Manjunath, Abirami S [17]** states that "Video analytics is the method of processing a video, gathering data and analyzing the data for getting domain specific information. In the current trend, besides analyzing any video for information retrieval, analyzing live surveillance videos for detecting activities that take place in its coverage area has become more important. Such systems will be implemented real time. Automated face recognition from surveillance videos becomes easier while using a training model such as Artificial Neural Network. Hand detection is assisted by skin color estimation.

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This research work aims to detect suspicious activities 10 such as object exchange, entry of a new person, peeping into other's answer sheet and person exchange from the video captured by a surveillance camera during examinations. This requires the process of face recognition, hand recognition and detecting the contact between the face and hands of the same person and that among different persons. Automation of 'suspicious activity detection' will help decrease error rate due to manual monitoring".

**M. Fahad Khan, Hafiz Adnan Habib [18]** states that "This report presents a survey of evaluation datasets, metrics and practices used by the scientific community pertaining to the evaluation of video analytics in the video surveillance context. The focus of the survey is on the task of visually tracking people in video, and its application to loitering and tailgating detection. The related key results from the TRECVID video analytic evaluation conducted by the National Institute of Standards and Technology (NIST) are presented. A scene represents a dynamic environment which includes individuals and cameras. Each camera can observe one part of the scene. Even when there is only one camera, the scene will usually be larger than what the camera can capture. For example, in a loitering experiment an individual might leave the field of view of the camera, but will not leave the scene. Every experiment is associated with one scene".

**Benjamin Maurin, Osama Masoud and Nikos Apanikolopoulos [19]** states that "This project deals with real-time image processing of crowded outdoor scenes with the objective of creating an effective traffic management system that monitors urban settings (urban intersections, streets after athletic events, etc.). The proposed system can detect, track, and monitor both pedestrians (crowds) and vehicles. We describe the characteristics of the tracker that is based on a new detection method. Initially, we produce a motion estimation map. This map is then segmented and analyzed in order to remove inherent noise and focus on particular regions. Moreover, tracking of these regions is obtained in two steps: fusion and measurement of the current position and velocity, and then estimation of the next position based 11 on a simple model. The instability of tracking is addressed by a multiplelevel approach to the problem".

**Gwang Goo K Lee, Hwan Ka, Byeoung Su Kim, Whoi Yul Kim, Ja Young Yoon and Jae Jun Kim [20]** states that "This chapter presents a review and systematic comparison of the state of the art on crowd video analysis. The rationale of our review is justified by a recent increase in intelligent video surveillance algorithms capable of analyzing automatically visual streams of very crowded and cluttered scenes, such as those of airports concourses, railway stations, shopping malls and the like. Since the safety and security of potentially very crowded public spaces have become a priority, computer vision researchers have focused their research on intelligent solutions. The aim of this chapter is to propose a critical review of existing literature pertaining the automatic analysis of complex and crowded scenes. The literature is divided into two broad categories: macroscopic and microscopic modeling approach. The effort is meant to provide a reference point to all computer vision practitioners currently working on crowd analysis. We discuss the

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merits and weaknesses of various approaches for each topic and provide a recommendation on how existing methods can be improved".

**Paul Viola and Michael J. Jones [21]** states that "This project describes a face detection framework that is capable of processing images extremely rapidly while achieving high detection rates. There are three key contributions. The first is the introduction of a new image representation called the Integral Image which allows the features used by our detector to be computed very quickly. The second is a simple and efficient classifier which is built using the AdaBoost learning algorithm (Freund and Schapire, 1995) to select a small number of critical visual features from a very large set of potential features. The third contribution is a method for combining classifiers in a cascade which allows background regions of the image to be quickly discarded while spending more computation on promising face-like regions". 12

**Mohamed Elhoseiny, Amr Bakry, Ahmed Elgammal [22]** states that "There is a growing demand in automated public safety systems for detecting unauthorized vehicle parking, intrusions, unintended baggage, etc. Object detection and recognition significantly impact these applications. Object detection and recognition are challenging problems in this context, since the purpose of the surveillance videos is to capture a wide landscape of the scene, resulting in small, low-resolution and occluded images for objects. In this project, we present an experimental study on geometric and appearance features for outdoor video surveillance systems. We also studied the classification performance under two dimensionality reduction techniques (i.e. PCA and Entropy-Based feature Selection). As a result, we built an experimental framework for an object classification system for surveillance videos with different configurations".

## III.PROBLEM STATEMENT

Video Surveillance system is a collection of video, electronic and wireless components to ensure the continuous or periodic video recording for monitoring the various important public locations. Due to the increased crime rate and instable incidents happening around the world, many organizations are deploying video surveillance systems at their locations with CCTV cameras. Now a days, we can notice these cameras at various public locations. The captured video data is useful to prevent the threat before crime and becoming a good forensic evidence to identify criminals after crime. Unfortunately, most existing approaches are hugely depending on human observers and there is no unified framework to meet this requirement.

### DISADVANTAGES OF EXISTING SYSTEM

- Existing system stores the data in form of records only and needed continuous monitoring which is labor intensive task.
- Different detection techniques are implemented to find suspicious activity.
- Some researchers are carried where the features are typically learned from scratch without considering the well-established pre-train model.
- There are large numbers of computations which result in high computation cost.

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- Classification accuracy is low.

## IV.PROPOSED SYSTEM

Methodologies used in proposed system are:

- **Image Processing:** Image processing is the conversion of an image to a digital format and manipulation of that image in order to improve or extract relevant information from it. It's an information potential application in which the input is an image, like a video frame or a 2 photograph, and the output is an image or image-related features. Typically, an image processing system treats images.
- **Visualization:** Focus on things you can't see.
- **Sharpening and restoration of images:** To improve the appearance of the image.
- **Image retrieval:** Find the image you're looking for.
- **Pattern measurement**: Determines the distance between different objects in an image. Recognize the objects contained within an image using image recognition.
- **Deep learning:** It's a neural network-based artificial intelligence function that extracts higher-level features from data and creates patterns for decision-making.

### ADVANTAGES OF PROPOSED SYSTEM

- Better accuracy with our intelligent tracking algorithm, resulting in fewer false alarms.
- Auto notifications send live video and other alerts to your security team for fast, appropriate response.
- The proposed methodology offers the benefit of preventing crime from occurring in the first place.
- CCTV footage is being tracked and analysed in real time.
- A system that processes real-time CCTV footage to detect any suspicious activity will help to improve security and reduce the need for human intervention

## V.SYSTEM ARCHITECTURE


## VI IMPLEMENTATION

To automate that process first we need to build training model using huge amount of images (all possible images which describe features of suspicious activities) and „Convolution Neural Network" using TENSOR FLOW Python module.

Then we can upload any video and then application will extract frames from uploaded video and then that frame will be applied on train model to predict its class such as „suspicious or normal".

To implement above concept we need to install python 3.5 version in 64 bit laptop. I will send this software with code. While software installation u need to select checkbox saying add path to system variable. This option will show on first or second screen of installation. Once you install software

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execute below commands. Your system must connect to internet.

pip install tensorflow
pip install numpy
pip install scipy
pip install opencv-python
pip install pillow
pip install matplotlib
pip install h5py
pip install keras
pip install

ageai-2.0.2-py3-none-any.whl

## VII RESULTS

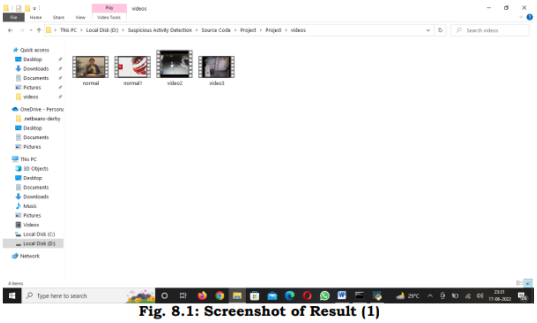
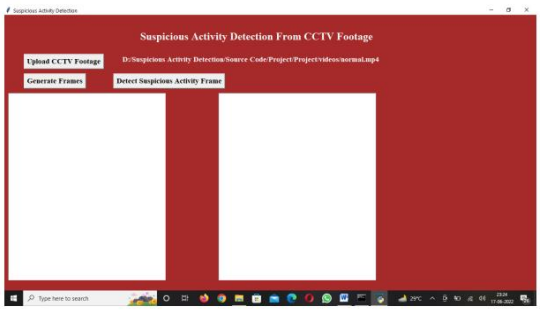
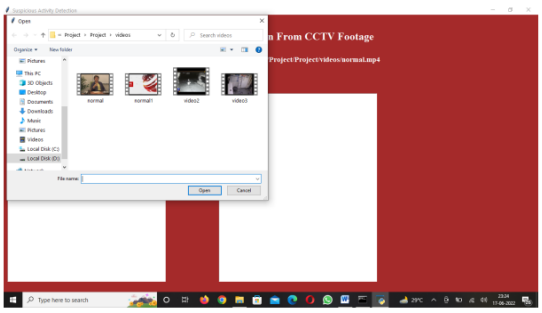
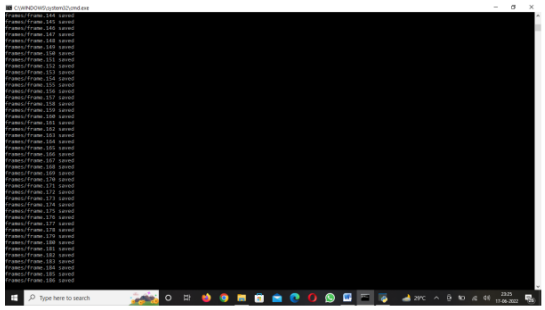


Fig. 8.1: Screenshot of Result (1)



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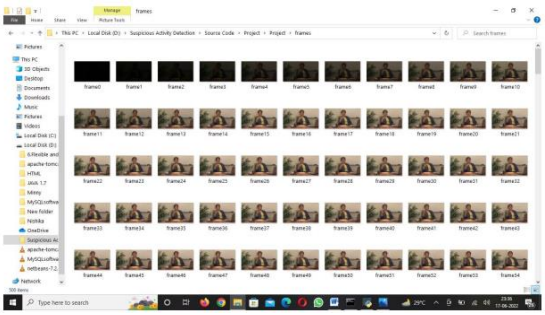

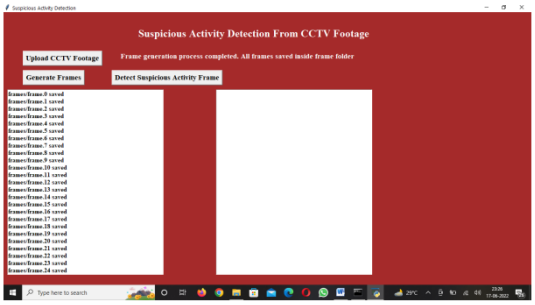


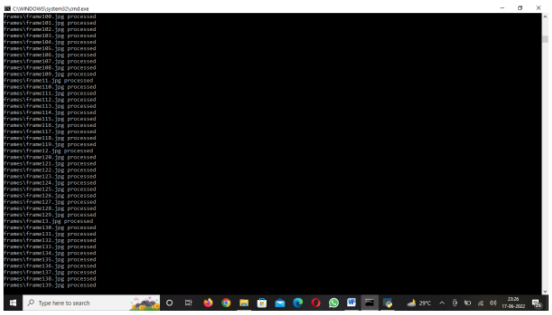

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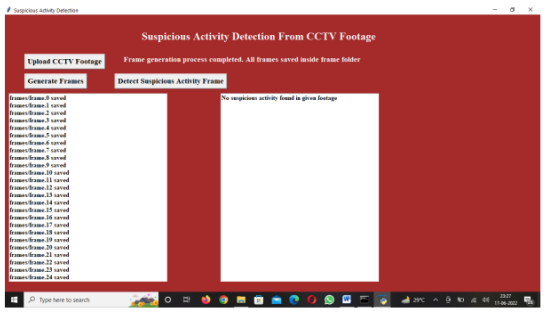


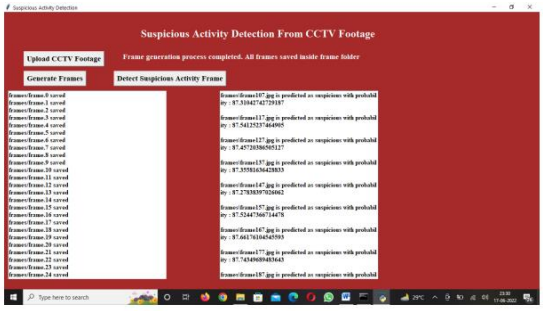


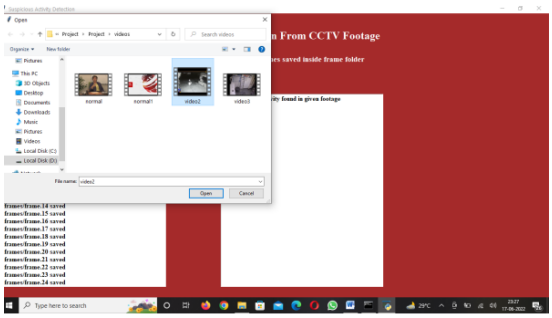

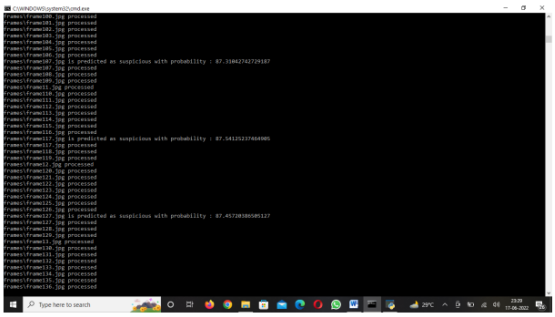

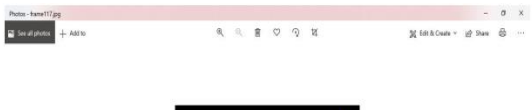

## VIII.CONCLUSION

The proposed system is a machine approach to detect real-world criminal Activity identification in surveillance videos. The necessity to develop such a security system is increasing with the increasing number of crimes that are happening every day. The result of the proposed system will be able to detect whether any anomaly action is taking place or not. And most of the previous researches had lower accuracy in determining the abnormal behaviour.

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