INTELLIGENT VIDEO SURVEILLANCE SYSTEM USING EDGE COMPUTING

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Abstract- Nowadays, Surveillance cameras serve a crucial function in security systems and have become an indispensable component. Surveillance feeds are usually only utilized as evidence, With the development of edge computing, real-time surveillance systems focused at crime prevention have a great future. You Only Look Once is indeed the acronym of a proposed model for recognizing and tracking objects. When a suspicious action occurs, the proposed technique sends out an alerts like sending mails and sounding the alarm. This algorithm was found accurate on images,videos and live webcam.

Keywords*: Surveillance, Crime Prevention, Object Detection,Localization.*

I. INTRODUCTION

Top-notch security alert systems are essential to detect anomaly activities in the real world. In public places like Malls, schools, buses, railways, and airports, where the probability of being robbed or shot is more, our app is used for surveillance. Many reports are filed against chain snatching, carrying bags in malls, knives, Guns, animals entering human living zones, and motorcycles entering indoor places. It is critical to detect these suspicious behaviours in order to keep a safe and secure environment. For better workplace safety, prevention of crimes, monitoring of crowded places, and security purposes surveillance cameras are used.

In the past, Deep learning Neural networks like Fast RCNN, Faster RCNN, RCNN, SSD, and CNN object detection algorithms are used to detect various objects like a person vs nonperson, cars, motorcycles, helmet detection, and pills identification. In real-time activity recognition, these algorithms take much time to recognize because of their complexity and require GPUs to run but our laptops and drones are not integrated with GPUs, this is considered a drawback.

It's tough to assess photos captured by surveillance cameras with lower resolution.So it may lead to less accuracy. As a result, extremely accurate techniques are capable of autonomously analyzing suspicious activities and preventing them from happening. As a result, there is a growing demand and necessity for algorithms that can process data automatically.

Edge computing is a kind of computing that occurs near a data source or onsite source, minimising the need for data to be processed in a remote data centre..Edge computing, when compared to traditional types of computing, allows businesses and other organisations to handle data more quickly and efficiently utilising enterprise-grade apps. Edge points used to generate large volumes of data that would often go unused. Decentralised IT architecture provided by mobile computing and the Internet of Things (IoT) allows businesses to gain near real-time insights with less latency and lower cloud server bandwidth demands **.**

Scope of the Project

There is no accurate system that alerts the security system when suspicious activity is detected in real-time. The rate at which individuals report criminal activities, animals wandering on roads, and colonies are increasing. Surveillance camera feed is used to spot the suspicious activity. This information is crucial in the detection and localisation of suspicious activities.

Let's list a few suspicious activities that occur in real-time are:

- Animals wandering on roads, entering into human habitat,
- Carrying bags, knives, and Sharp objects,
- Parking motorcycles at "No Parking" zones,
- Entering indoor places with vehicles without permission,
- Wearing helmets at malls, theaters, and temples, hide their faces from CCTV.

- People fall to the ground.

II. LITERATURE SURVEY

Aishwarya D, Minu R.I (1) proposed the detection of various actions like pulling, pushing, running, and falling using Fast RCNN on Raspberry pi 3. The proposed approach uses two steps for activity recognition: foreground extraction for reducing the load on neural networks and an object detection network i.e, Fast RCNN. The Feature map generated from CNN is sent to RPN, generating region proposal data. This feature map is forward to ROI pooling to resize to the same size. Softmax classifiers predict human activity. However, this model has a higher false-positive rate.

Bouguettaya Abdelmalek, Kechida Ahmed, and Taberkit Mohammed Amine (3) have conducted surveys on various object detection algorithms for finding out the best algorithm that can be deployed on small digital application with limited computational resources like laptops, and phones. Fast YOLO, YOLO, and SSD are object detection algorithms in real-time with high precision, speed, and accuracy.

Shaoqing Ren, Kaiming He, Ross Girshick, and Jian Sun (8) proposed faster R-CNN for object detection and localization. They have used RPN for generating region proposal feature maps. This is integrated with Fast R-CNN. This method is evaluated on PASCAL VOC, with an accuracy of 73.2% mAP, and the system runs at 5-17 fps.

Jeff Donahue, Trevor Darrell, Jitendra Malik, and Ross Girshick (7) have used Regionbased Convolutional Networks for Object detection and localizing. This approach was applied on PASCAL VOC, achieving more than 50% mAP compared to methods on low-level image features. They carried out an overall performance in two steps: one is applying high-capacity CNN to bottom-up region proposals and for instance “supervised pre-training/ domain-specific fine-tuning” would be highly effective for data scarcity problems.

Tianming Yu, Jianhua Yang, and Wei Lu(2019) (9) used the SubSENSE algorithm for background subtraction and a pretrained fine-tuned CNN i,e, GoogleNet is used for object recognition. This proposed method was compared to the SVM multi classifier with the HOG features descriptor. The accuracy of the proposed method was 0.9988, while 0.9500 for SVM. Overall performance of the pretrained method was much better than SVM with HOG features.

Phalguni Kadam, Akshita Thorat, Rohini Mule, and Shweta Gawande (6) the proposed study uses Deep Learning and Image Processing to reduce the amount of time and effort spent monitoring video surveillance cameras. It’s nearly impossible to predict human behavior. Deep Learning is used to detect suspicious and non-suspect behavior, as well as to alert the user when suspicious activity is found. The suggested method aims to detect real-world suspicious activities in surveillance footage, such as burglary, assaults, and so on. For the first ten epochs, the training phase’s accuracy is 85.85%.

1.2 Problem definition

Suspicious activity detection, classification, and localization is the most troublesome task in real-time activity recognition. To avoid criminal activities, and animal attacks, we need keen observation but for some reasons, human mistakes may happen due to being unable to concentrate on two or more surveillance cameras. Preventing of these activities helps us to attain a secure and safe environment. For these problems, machine learning is to be implemented which will minimize the risk of human errors.

A method should be taken that either takes images or videos as input feed and predicts the presence of suspicious activity in the provided image or video. The method should be accurate, efficient, and easy to use with minimal human interference.

1.3 Limitations of existing system

A falling activity is confined to only one person. As this proposed system can only detect one person falling onto ground and gives alert but couldn’t detect when there are many humans.

Rules often collect tens to hundreds of events because they are focused on encoding known patterns of attack or suspicious actions. Every day, many businesses create billions of occurrences. And if it takes an analyst half a day to create and implement a smart rule, it’s evident that rules alone aren’t enough to model billions of occurrences. Thus,we concentrate only on a few listed activities.

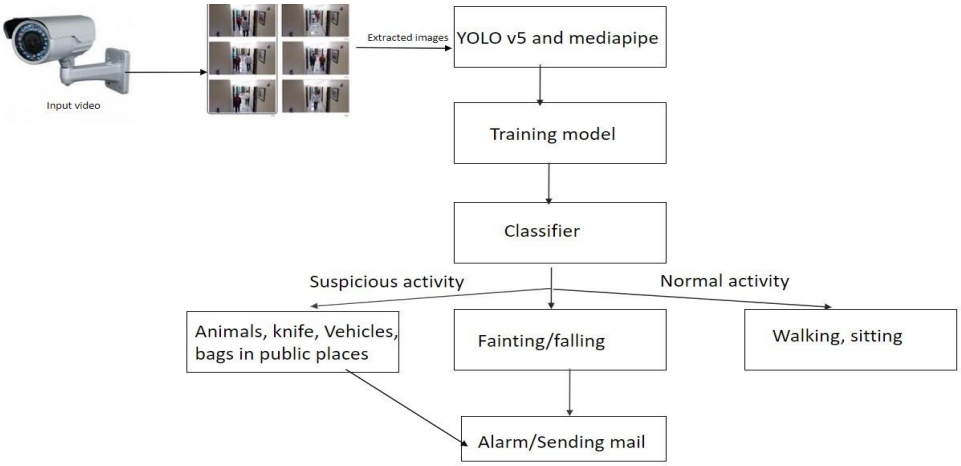
Rules can only recognise what is a ”known bad” because they can’t model millions of events. They can’t model a ”known good,” which accounts for 99.99 percent of all business events. As a result, millions of ”known good” occurrences bury fresh and unknown activity. Not all new activity is bad, but if we can’t tell the difference between ”new and unknown” and ”known,” we’ll definitely miss ”unknown evil,” which is a smaller subset of ”unknown.”

1.4 Proposed system

The most advanced object identification algorithm is used in this system. It’s a novel convolutional neural network (CNN) that identifies objects throughout the image, divides them into components, and forecasts bounding boxes and probabilities for each component. The probability is used to weight these bounding boxes. It generates predictions only after one forward propagation through the neural network, the approach is ”You Only Look Once” at the image.

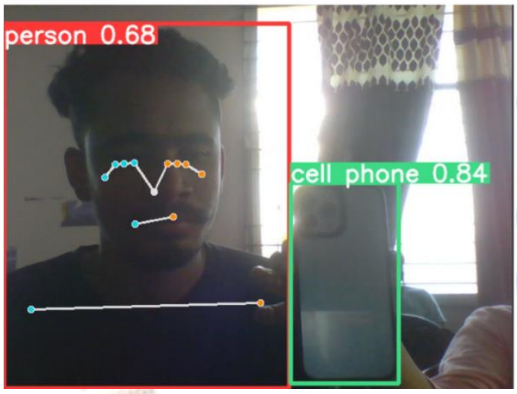
After making predictions, and localization, if the activity is determined to be suspicious then an alert is produced i.e, Making a buzzing sound, and sending an email to respective administration/administrator with the detected activity image. So we can prevent those activities.

Coco datasets contain 330k images that are labeled with respective class names. These images are collected from daily activities and regular scenes that contain common objects labeled like a cat, person, cow, knife, motorcycle, helmet, sheep, mobile phone, and many more.



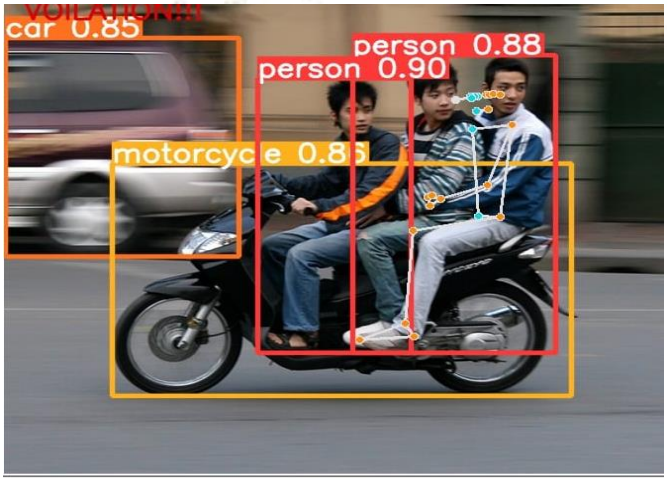
System Architecture

V RESULTS ANALYSIS

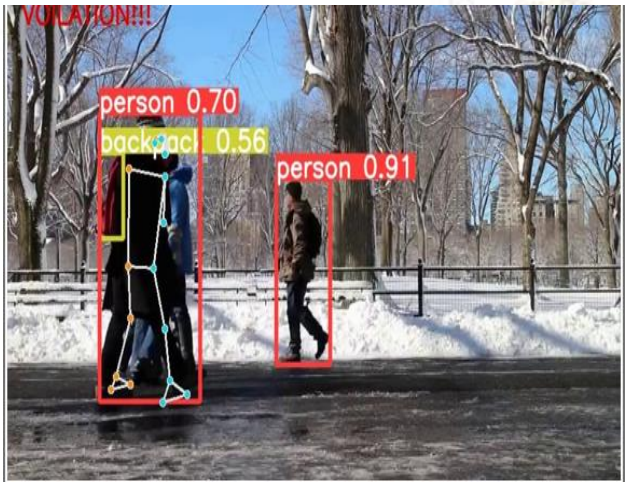


I. Violation detected for cell phone

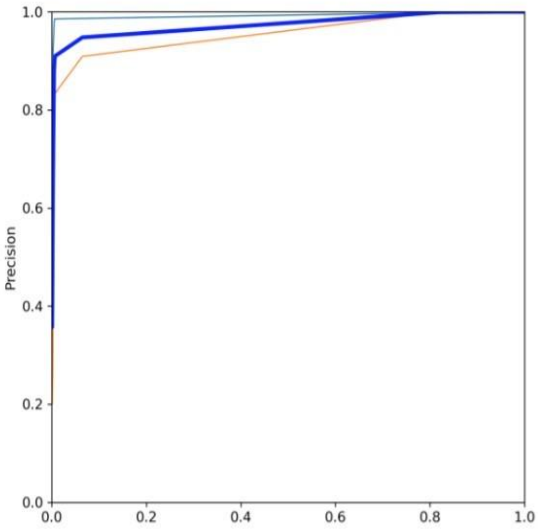
II .Violation detected for dog



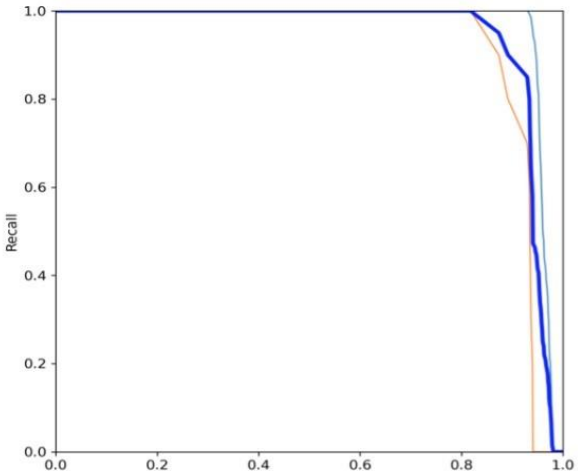
III. Violation detected for motorcycle for riding three members



IV.Violation detection for carrying backpack



V. Precision curve



VI. Recall curve

VII. Select input form

III. CONCLUSIONS

The main goal of this project is to prevent the happening of violent actions and maintain a safe and secure environment. The classification is performed using You only look once advanced version 5, novel convolution neural network. This proposed system used YOLOv5 and mediapipe for better accuracy and low complexity. We have trained this algorithm on the MS COCO dataset, this dataset contains more than 90 classes like a person, knife, clothes, shoes, etc.

This project is implemented using Python as the primary language, which can easily be upgraded for future enhancements and greater functionalities due to a large number of machine learning libraries available and its efficiency in executing computations. Tkinter was used to create the user interface for this program.

This project promotes portability by requiring the installation of relevant libraries in the environment prior to completing operations and is also reliable. The accuracy of this project is 90% and effectively detected objects and suspicious activities in real-time. For future enhancement we can work on detecting fall action for multiple people.

IV. REFERENCES

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