INTELLIGENT VIDEO MONITORINIG AND ANALYSIS

N HarshaVardhan Reddy*[1], MVS Thrivedh[2], N Anil Kumar[3], V Nagaraj[4] and Krishnamurthy H[*5]

[1,2,3,4,5]Atria Institute of Technology, Dept. of CSE, Bangalore

vharsha064@gmail.com*[1], saithrivedh@gmail.com[2], anilkumarnambula5@gmail.com[3],

rohithvodapalli143@gmail.com[4], Krishnamurthy.h@atria.edu[*5]

Abstract: In recent years, many cameras have been installed in public spaces and everywhere where security is more important. Every surveillance should be monitored by knowledgeable persons. It is not an easy task to track each object and find Abnormalities.

Here we are introducing Intelligent video monitoring systems. Such systems are constantly being developed, observed, and understanding keeps track of objects and classifies the data. find out Abnormalities in real-time systems able to warn against, alarming situations and information to first responders. Simply It observes, Inspects the data, and makes conclusions Finally inform to appropriate people.

In this paper, we are providing a detailed view of implementation. With respective requirements. The following categories were considered: Accident Detection by applying the approach DenseNet-161, Crowd Detection by using following techniques like, Object detection, tracking, and movement analysis systems, and also systems are capable of alerting against, detecting, and identifying anomalous and alarming circumstances. Each category is described in great detail in the paper.

Key Words: *Accident Detection, Crowd Detection, CNN, DenseNet-161, YOLO, AI, ML, Python*

Introduction:

In our daily lives, we have been noticed many Abnormal activities which are happening around us, they are accidents, crimes, thefts, and some dangerous incidents like bomb blasts which are probably happens more in crowded places. Detecting of this Activities is not that simple, it takes time to detect and respond accordingly.

In recent years, an Artificial Intelligence (AI) technology has made a human perform more consistently and effectively by streamlining their work with more accuracy and precision [1].
AI is emerging in many industries for providing better results to develop their productivity and performance, The technology of CCTV (Closed Circuit Television) cameras are also raised, where surveillance cameras are detecting automatically without Human interruption using Deep Learning

techniques like DenseNet-161 especially conventional neural networks. It will detect the incidents and activates the alarm systems, by using this Advanced technology we can detect the incidents quickly, It helps in reducing Human power, In the event of accidents, it assists in saving several lives and saves times while detecting any incident. By using this advanced technology, we can achieve high accuracy in detecting such cases. So the technologies which are widely used are deep learning i.e., Back subtraction, Convolutional Neural networks it will detect the pixels in image and collects the object pixels, mainly used for detecting and tracking objects. Intelligent video monitoring system makes a CCTV camera more than just video recorder.

Related Works:

1) Real-time Traffic Accident Detection System using Deep Learning: This study proposed a real-time accident detection system based on a deep learning model that can detect accidents from video footage captured by surveillance cameras on highways.[4]

2) Automated Accident Detection System using Machine Learning:This study proposed an automatedaccident detection system that uses machine learning algorithms to detectaccidents based on data collected from sensors placed on vehicles.[5]

3) This study introduces a brand-new, practical framework for intersection accident detection for traffic surveillance applications. The suggested framework comprises three hierarchical steps: efficient and accurate object detection using the cutting-edge YOLOv4 method, object tracking using a Kalman filter in conjunction with the Hungarian algorithm for an association, and accident detection using trajectoryconflict analysis.[6]

4) Accident Detection and Notification System using IoT and Machine Learning: This study proposed an accident detection and notification system that uses IoT and machine learning technologies to detect accidents and notify emergency services automatically.

5) Vision-based Accident Detection System using Deep Learning: This study proposed a vision-based accident detection system that uses deep learning algorithms to detect accidents from video footage captured by dash cameras on vehicles.[7]

6) This study Evaluates With the help of AI, our technology automates this process by training a model to identify possible mishaps using deep learning. The binary image categorization-based CV approach was employed, with images devoid of accidents being categorized as standard and images with accidents being classified as an alarm.

7) Crowd Density Estimation using Machine Learning: This study proposed a machine learning-based approach for crowd density estimation, which uses a regression model to predict the crowddensity in an image.

8) Crowd Counting using Deep Learning: This study proposed a deep learning-based approach for crowd counting, which uses a convolutional neural network (CNN) to learn features from images of crowded scenes.

9) The research presented here provides a methodology to identify automobile collisions that combine YOLOv3 with DenseNet-161. The technology completes the task of detecting vehicle collisions with 98.9% accuracy.[8]

10) The present research suggests a DenseNet-161 and decision tree classifier-based accident identification and reporting system. On the assignment of identification of accidents, the algorithm achieves a 99.2% accuracy percentage.[9]

11) This research conveys a real-time crowd-counting system utilizing a hybrid network that combines the YOLOv3 algorithm with a fully convolutional network (FCN). The system achieves outstanding precision across multiple datasets.[10]

Methodology

Accident Detection:

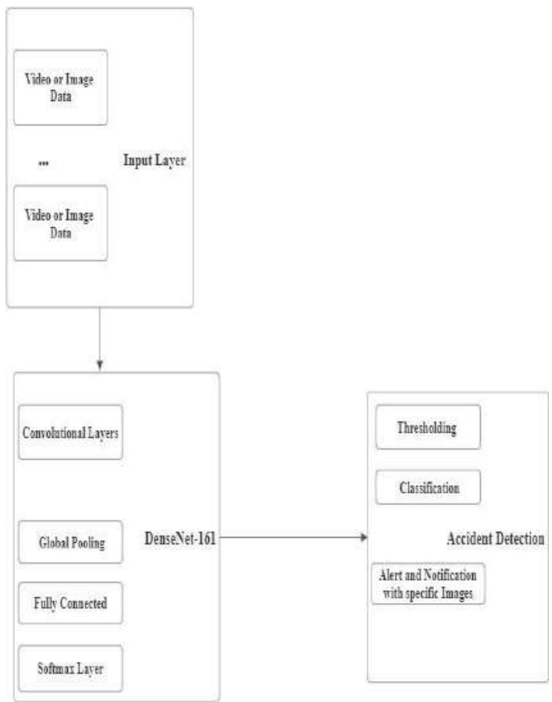
DenseNet-161

For image classification, DenseNet-161 is employed. If convolutional neural networks have shorter connections between layers near the input and those near the result, they can be trained to be significantly deeper, more accurate, and more effective.

Dense Convolutional Network (Dense Net), which uses a feed-forward connection between each layer & every other layer. Our network features L(L+1)/2 direct connections as versus standard convolutional networks with L layers having L connections, one between each layer and its succeeding layer.

Dense Net was created primarily to enhance the declining accuracy brought on by high-level neural networks' vanishing gradient. In plainer terms, the information vanishes before getting there because of the lengthier journey between the input layer and the output layer. By putting on the composite function's operation, an output from the first layer acts as an input for the second. The convolution layer, pooling layer, batch normalization, and non-linear activation layer make up this composite procedure.

The numerical values represent the neural network's layer count. Your Dense Net model has a 98% accuracy rate. Dense Net uses fewer parameters to train the model and reduces the vanishing gradient problem. The smooth flow of information is handled via dynamic feature propagation



The DenseNet-161 architecture is used by the accident detection system to extract features from video or image data. A thresholding and classification approach is then applied to the elements to decide whether an accident has happened. The system alerts and alerts the appropriate persons when it detects an accident [2].

The unique features of the system, such as the kinds of accidents being detected and the sensitivity of the system, would determine how the thresholding and classification algorithm would be implemented. The alarm and notification system could include sending emails or SMS to emergency services, members of the family, or other necessary parties.

Crowd Detection:

Yolov3

The YOLOv3 algorithm is frequently utilized for object detection tasks because of several important characteristics. One of its key benefits is speed: YOLOv3 can process video streams and recognize things as they move around the frame since it can detect objects in real time.

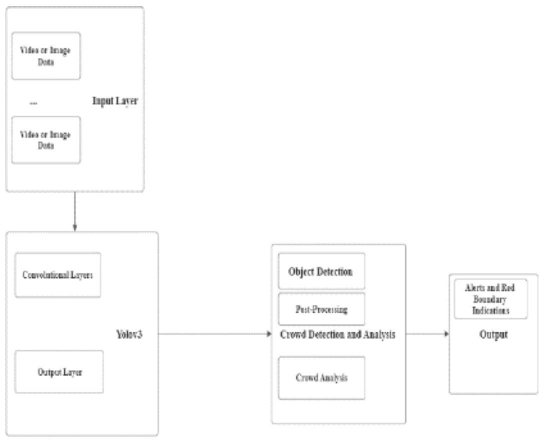
The precision of YOLOv3 is another benefit. The approach performs at the cutting edge on several object detection benchmarks, particularly the COCO dataset. This is because it makes use of an architecture for deep neural networks that can recognize intricate elements in pictures.

A backbone network, a feature pyramid network, and a detection network constitute a few of the parts of the YOLOv3 algorithm. The feature pyramid network creates a variety of feature maps at various scales to enhance object detection performance while the backbone network oversees extracting features from the input image [3].

For each recognized object in the input image, the detection network oversees predicting bounding boxes and class probabilities. Anchor boxes, which are pre-determined forms and sizes that the system learns to recognize, are used by the YOLOv3 algorithm to anticipate the locations of objects.

After the detection network has predicted the bounding boxes for each object, redundant detections are eliminated using a minimal suppression approach. To do this, overlapping bounding boxes with lower confidence values are discarded.

The YOLOv3 technique produces a list of bounding boxes and class probabilities for each object that was recognized in the input image as its result. Numerous applications, including object tracking, surveillance, and autonomous vehicles, might make use of its output.



The YOLOv3 architecture has been utilized by the crowd detection system to extract characteristics of objects from video or image data. Bounding boxes and class probabilities are output using YOLOv3 for each object that is spotted in the video or image input data.

The findings of the object detection are subsequently improved by post-processing the bounding boxes and class probabilities generated through YOLOv3. This can entail eliminating detections that are too little or distant to be included in a massive crowd.

The crowd present in the input data is subsequently identified and measured using the post-processed object detection findings. This could entail counting the people inside each bounding box, monitoring the crowd's movement over time, and spotting any unusual or perilous behaviour. The results of this research could be utilized to send authorities or security personnel alerts or notifications.

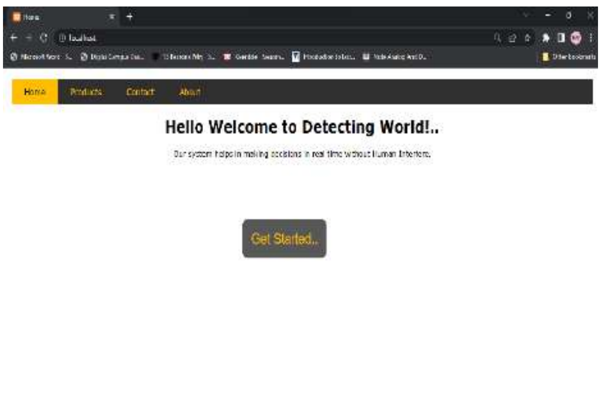
The characteristics of the system and application would determine how the crowd analysis techniques were implemented. The warning and notification system may also involve sending important people emails or text messages.

Proposed Solution:

For detecting actual conditions, we can make use of a variety of distinct sub modules

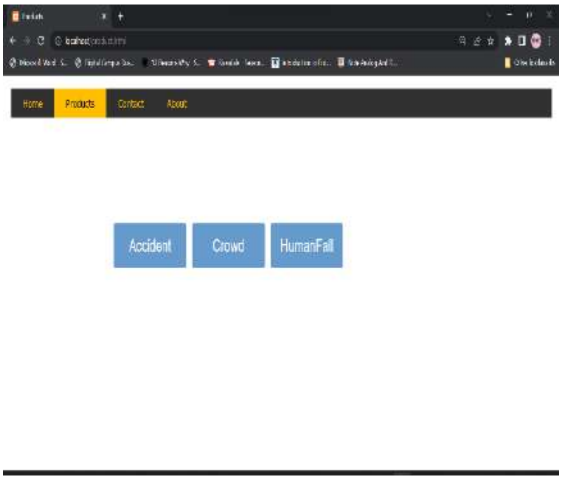
1. The Homepage:

The user can start detecting just selecting on the get started button on this page's main interface.



2. The Products:

When the user clicks the "Get Started" button, they are taken to a new page where they can view the "Products," "Contact," and "About" sections. The user can select what he wants to detect by clicking on the products to view the accident and crowd alternatives.

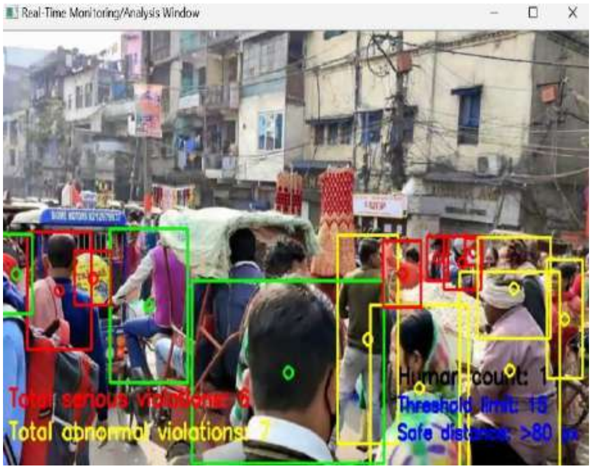


3. Accident Detection:

The user can locate the roads here by selecting the accident option, and the user will receive a notification when an accident occurs. The surveillance camera continuously monitors the roads; it will identify accidents when none occur and will also store the data of accident detected images in the backend.

4. Crowd Detection

Here, if a user chooses the "crowd detection" option, he or she can watch overcrowded areas in real time while a surveillance camera continuously records. When people enter the scene, the camera will recognize them, vary them, and send analert if there are more people present. It willalso save each person's id number in the backend for later use when an investigationis necessary.



Future Enhancements:

Developing our system to provide maximum Accuracy in detecting activities/incidents, and adding new features/Systems.

The DenseNet-161 model can be optimized for real-time video analysis, making it possible to analyze and process video feeds in real-time. This would be beneficial in scenarios where real-time analysis is required, such as monitoring traffic or security cameras.

It can be made to improve intelligent video monitoring analysis through the DenseNet- 161 architecture. These enhancements can help to make the analysis more accurate, efficient, and useful in a variety of scenarios.

We are doing to get the accurate and exact detection through the DenseNet-161 Algorithm and Yolo for to detect the any Abnormal Activities.

In future we can detect the 99% of the The model can be trained on a dataset of normal activities and then used to detect any activities that deviate from the normal pattern. This is commonly referred to as anomaly detection.

To use DenseNet-161 for anomaly detection, the model is typically trained on a large dataset of normal activities, such as people walking, cars passing by, and other common activities. The model is then used to classify each frame of a video feed as either normal or abnormal. Any frames that are classified as abnormal can be flagged for further analysis by human operators or other automated systems.

There are several advantages to using DenseNet-161 for anomaly detection. The model is highly accurate and can found it exactly.

YOLOv3 can be enhanced to estimate crowd density in a given area. This would be useful in scenarios where it is necessary to understand crowd behavior, such as in public events or transportation hubs.

Human fall detection:

Huma Fall detection systems can be enhanced by fusing data from multiple sources, such as visual data from cameras, audio data from microphones, and inertial sensor data from wearable devices. This would improve the accuracy of fall detection by providing more contextual information about the fall.

Theft Detection:

Theft detection systems can be enhanced by using object detection algorithms to identify objects in the scene that may be at risk of being stolen, such as high-value items or items that are commonly stolen. This can be achieved using techniques such as YOLOv3 or Faster R-CNN.

Conclusion:

DenseNet-161 and YOLOv3 are powerful deep learning architectures that can be used for accident and crowd detection. DenseNet-161 is a densely connected convolutional neural network that can learn features at different scales, making it well-suited for detecting abnormalities in medical images and abnormal activities in surveillance footage. YOLOv3, on the other hand, is an object detection algorithm that can detect and track objects in real-time, making it well-suited for crowd detection and accident detection. By using the DenseNet-161, YOLOv3 algorithms to achieve maximum accuracy in detecting events, and developed a software platform which is web application, where it will show all the triggered events which came from CCTV cameras and it is connected to alarm systems.

References:

[1] A. Balasundaram, C. Chellappan, “An intelligent video analytics model for abnormal event detection in online surveillance video”, Springer, 2018.

[2] Gao Huang, Zhuang Liu, Laurens van der Maaten, Kilian Q. Weinberger “Densely Connected Convolutional Networks” Cornell University, 2018.

[3] Joseph Redmon, Ali Farhadi , “YOLOv3: An Incremental Improvement”, Cornell University, 2018.

[4] Hadi Ghahremannezhad, Hang Shi, Chengjun Liu, "Real-Time Accident Detection in Traffic Surveillance Using Deep Learning", Cornell University, 2022.

[5] Bharath Kumar M; Abdhul Basit; Kiruba MB; Giridharan R; Keerthana SM, "Road Accident Detection Using Machine Learning", IEEE, 2021.

[6] Bima Sahbani, Widyawardana Adiprawita, "Kalman Filter and Iterative-Hungarian Algorithm Implementation for Low Complexity Point Tracking as Part of Fast Multiple Object Tracking System", researchgate, 2016.

[7] Earnest Paul Ijjina, Dhananjai Chand, Savyasachi Gupta , Goutham K , "Computer Vision-based Accident Detection in Traffic Surveillance", arXiv, 2019.

[8] Yao-Liang Chung; Chuan-Kai Lin; "Application of a Model that Combines the YOLOv3 Object Detection Algorithm and Canny Edge Detection Algorithm to Detect Highway Accidents", MDPI, 2020.

[9] B Mitleshwar Rao; Shrijith Devdas Nair; Shivasharvesh; R Dhanalakshmi, "Accident Detection using DenseNet", IEEE International Conference, 2022.

[10] C He, Z Liu, S Gou, Q Zhang, J Zhang…"Detecting global urban expansion over the last three decades using a fully convolutional network" 2019.