

# **NEURAL- A SMART SURVEILLANCE SOFTWARE**

**PROJECT SYNOPSIS  
OF MAJOR PROJECT**

**BACHELOR OF TECHNOLOGY  
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## **ABSTRACT**

CCTV cameras hold substantial importance in India, serving as a pivotal tool for crime prevention and security enhancement. With an exponential rise in urbanization and the accompanying challenges, these surveillance systems have become crucial for monitoring public spaces, ensuring the safety of individuals, and deterring criminal activities. They play a significant role in traffic management, aiding authorities in regulating. This project will be able to detect suspicious activity and send alerts to the different police stations under 1 km area. Image processing and machine learning models will be used for the detection of different suspicious criminal activities like robbery, snatching, etc. We train our model using a machine-learning algorithm that is able to detect criminal activities in large crowds.

## **1. INTRODUCTION :**

CCTV cameras hold substantial importance in India, serving as a pivotal tool for crime prevention and security enhancement. With an exponential rise in urbanization and the accompanying challenges, these surveillance systems have become crucial for monitoring public spaces, ensuring the safety of individuals, and deterring criminal activities. They play a significant role in traffic management, aiding authorities in regulating vehicular flow and enforcing traffic rules. Moreover, in the context of counterterrorism efforts, CCTV cameras offer a valuable means of intelligence gathering and preemptive security measures. Notably, these cameras serve as vital sources of evidence in legal proceedings, providing visual documentation of events and aiding in the identification of suspects. Furthermore, they play a key role in the monitoring and maintenance of public services, contributing to the efficient functioning of utilities and infrastructure. Overall, the increasing reliance on CCTV cameras underscores their indispensable role in bolstering public safety, ensuring efficient governance, and fortifying security measures across various sectors in India.

## **2. LITERATURE SURVEY:**

[4]This paper presents a comprehensive survey of various techniques explored for face detection in digital images. This software aims to detect and respond to crimes in real time, ensuring timely alerts to relevant authorities and minimizing potential threats to public security. [2]The "Real-time Crime Detection and Alert System" addresses the increasing need for advanced surveillance systems to bolster public safety and security. By harnessing the power of AI and real-time data analysis.[3] It serves as a proactive tool to mitigate criminal activities, reduce response times, and enhance the overall safety of communities. This project represents an innovative and socially significant application of artificial intelligence and contributes to the broader field of smart city technology.

## **3. OBJECTIVE:**

We need to design a solution that can detect any illegal activity or unusual activity from camera surveillance in real-time and sends the information to Police(an interface for government organization) with the nature of the crime, i.e., low-risk, medium-risk, or high risk.

## FUNCTIONAL REQUIREMENTS :

- It supports video recording
- Video Playback
- Real-time Display
- Predict failures in the system and send an alarm.
- Support 24x7 operation
- Offers Face Recognition, Motion, Gestures Reading, GPS and Networking.
- Establish a network connection with nearby cameras

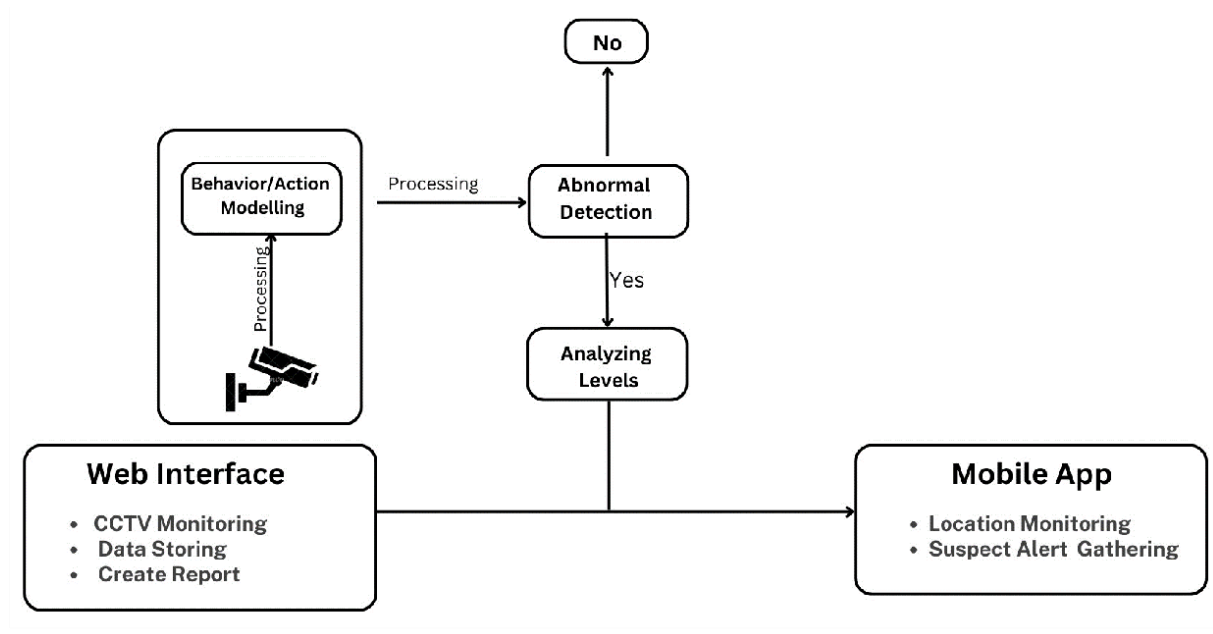


FIG 1

## **4, METHODOLOGY :**

### **1. HARDWARE:**

- Camera
- Switch
- Router
- Storage
- Monitor
- Power Supply
- GPS Sensor

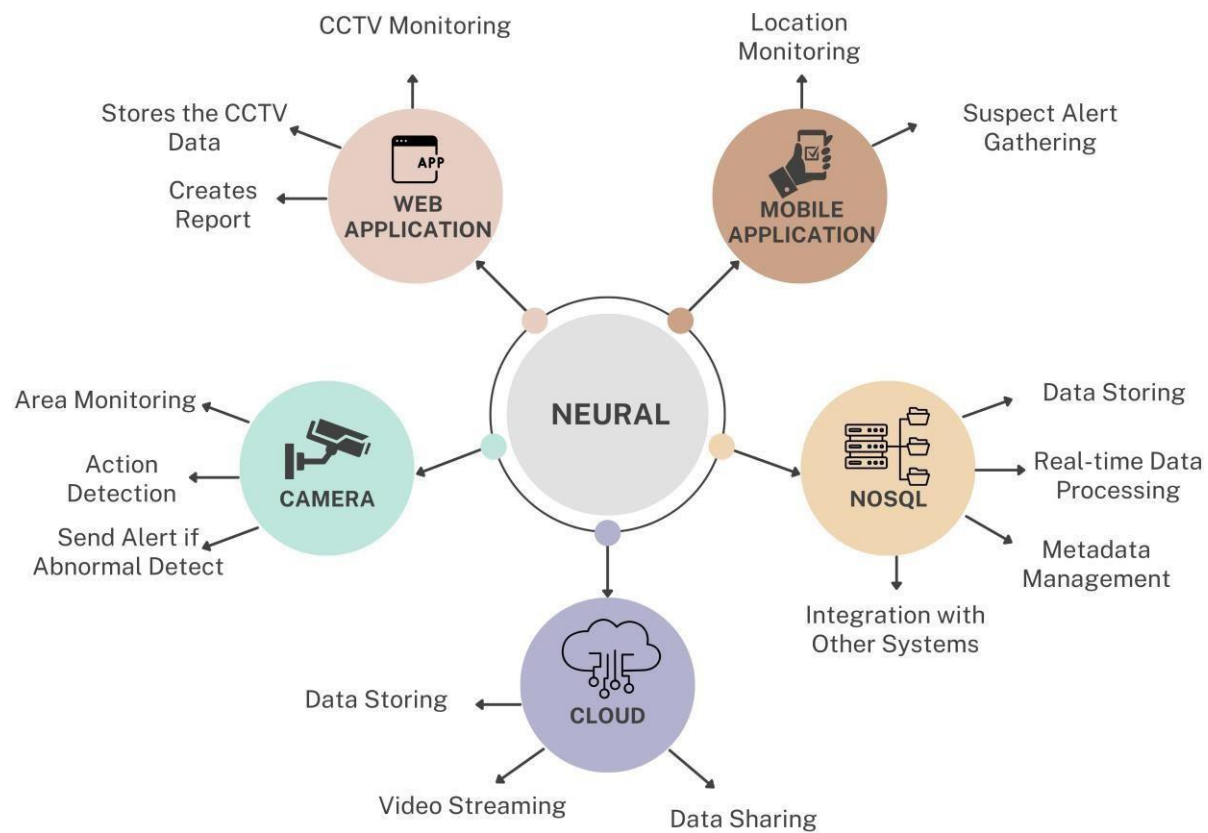
### **2. SOFTWARE:**

- Operating System
- Networking
- Load Balancer
- Web Server
- Socket Programming
- API
- UI Interface

### **3. DATABASE:**

- RDBMS
- S3 Storage
- Load Balancer
- Web Server
- Cloud Server
- Log

**TECH STACK NEEDS:**



**FIG 2**

## **SOFTWARE TECH STACK NEEDS:**

### **1. WEB DEVELOPMENT –**

To Design the interface for clients, customers, and admin.

**ADMIN:** It can manage the entire CCTV feeds on the server. These primarily consist of admins and senior officials of government department.

**CLIENT:** The client can view and manage the CCTV feeds—these contains police officers, police stations etc.

**CCTV:** To do video surveillance.

### **2. OPERATING SYSTEM –**

A System Software that manages CCTV feeds, detects issues (Criminal or technical) and helps in establishing the connection between at nearby GPS Locations.

#### ***IO OPERATION:***

The IO Operation in surveillance refers to the stage when a camera catches some kind of unusual and illegal activity such as any crime, assault, robbery, pickpocketing, etc., and looking at the nature of the crime, it sends an alert to the nearby cameras so that they can also monitor it and also transfers data to the Police Authority.

#### ***DATA:***

Data consists of any kind of criminal activity. The data will be sent to the nearby cameras of the same software which will provide more details and live updates to stop any criminal activity and gives a report to the authorities in less time.

#### ***BODY:***

Body refers to the government authorities who control the project (camera) and take necessary action.

### **API's –**

They are used to provide or share the data to others without accessing the database.

### **LOAD BALANCER –**

It handles the traffic to the server and manages the data transfer rate on the cloud.

### **DEEP LEARNING–**

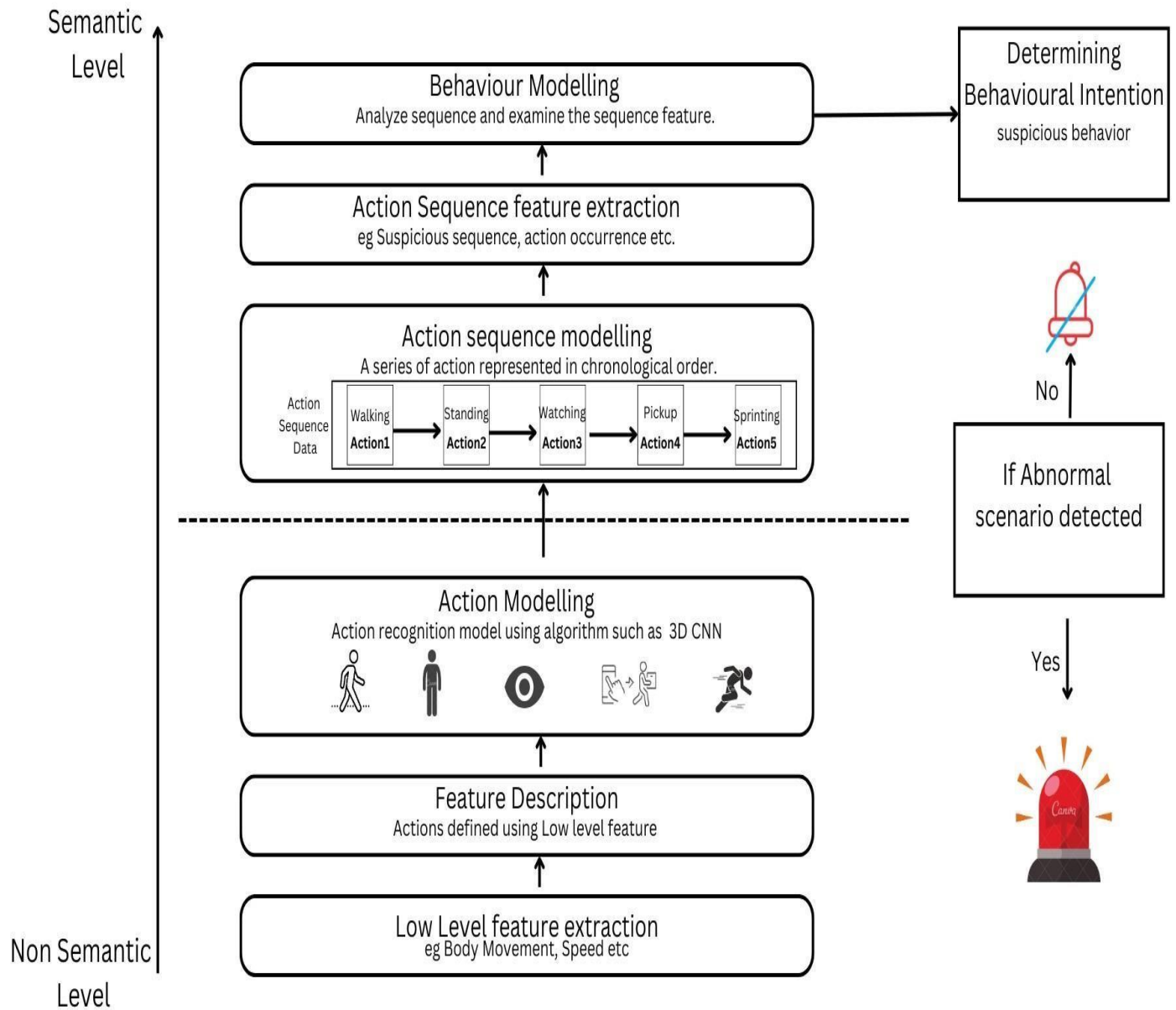
This is the most important part of the development cycle.

The motion reading, gesture, and face recognition part of the software can be done with the help of deep learning.

The convolutional neural network with GAN helps in performing the task. OpenCV, PYTORCH, and TENSERFLOW libraries are used in their process.

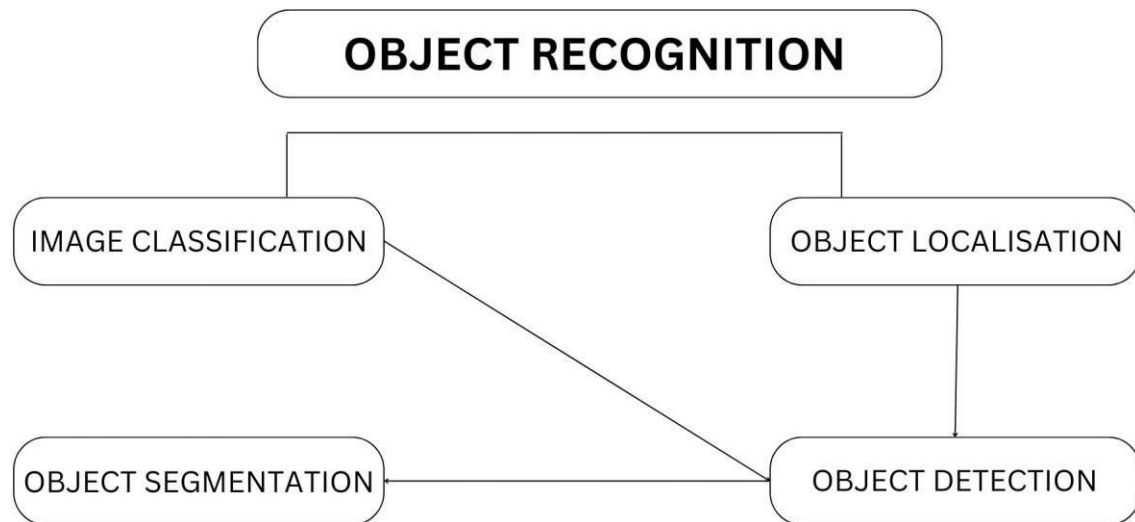


## THE DEVELOPMENT PROCESS CAN BE DONE IN STEPS :



## IMAGE CLASSIFICATION OR OBJECT CLASSIFICATION –

### YONO Model with RCNN:



### IMAGE CLASSIFICATION:

Predict the type of an object in an image.

INPUT – An image with a single object, such as a photograph. OUTPUT – A class label (e.g. – one or more integers that are mapped to class labels).

### OBJECT LOCALIZATION:

Locate the presence of objects in an image and indicate their location with an abounding box.

INPUT – An image with one or more objects such as a photograph. OUTPUT – One or more bounding boxes (e.g. – defined by a point, width, and height).

### OBJECT DETECTION:

INPUT – An image with one or more objects such as a photograph. OUTPUT –One or more bounding boxes (e.g. – defined by a point, width, and height), and a class label for each bounding box.

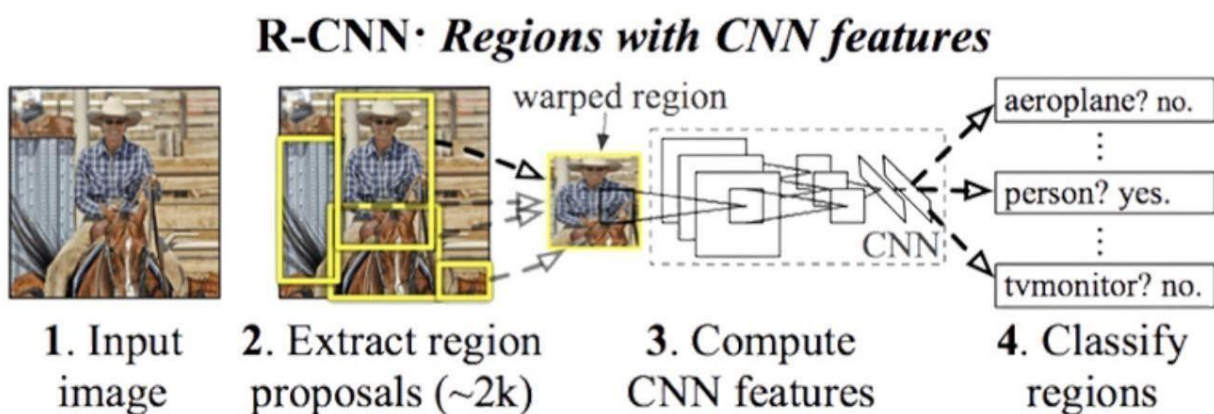
## OBJECT SEGMENTATION OR SEMANTIC SEGMENTATION:

Where instances of recognized objects are indicated by highlighting the specific pixels of the object instead of a bounding box.

### FAST R-CNN:

The region with a convolutional neural network.

- REGION PROPOSAL – Generate and extract category independent region proposals.
- FEATURE EXTRACTOR – Extract features from each candidate region by using a deep convolutional neural network.
- CLASSIFIER – Classify features as one of the known classes.  
e.g. – Linear SVM classifier model.



### FASTER RCNN:

#### *MODULE 1 – Region Proposal Network*

Convolutional neural network for proposing regions and the type of objects to consider in the region.

#### *MODULE 2 – Fast RCNN*

CNN network for extracting features from the proposed regions and outputting the bounding box and class label.

## **YOLO – You Only Look Once:**

The Model works by first splitting the input image into a grid of cells where each cell is responsible for predicting a bounding box if the center of a bounding box falls within the cells. Each grid cell predicts a bounding box involving the x, and y coordinates, width, height, and conference. A class prediction is also based on each cell.

## **SHOWSTOPPERS:**

- The surveillance system can handle large crowds easily.
- The program may be installed in any CCTV camera, making it very convenient for the user.
- Can be used in both Commercial and Public use.
- AI algorithms can be used to optimize camera operation.

## **REFERENCE**

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