

1. INTRODUCTION

Here talked about the various aspects and uses of computer vision, basic meaning and keywords like detection, enumeration, and discussed the roadmap to the report.

1.1 PROBLEM STATEMENT:

In this python project, we are going to build the Human Detection and Counting System through Webcam or you can give your own video or images. This is an intermediate level deep learning project on computer vision, which will help you to master the concepts and make you an expert in the field of Data Science. Let's build an exciting project

1.2 PROJECT OBJECTIVES:

It proposes an effective and efficient real-time human detection and counting solution specifically for real time camera by producing a system with graphical user interface and management functionalities.

Besides, it comprehensively reviews and compares the existing techniques and similar systems to select the ideal solution for this scenario.

Some of the major objectives of this project are-

- i. Real Time Surveillance
- ii. Crowd Detection
- iii. Report and Analysis

1.3 PROJECT OVERVIEW

We will implement our use case using the Haar Cascade classifier. Haar Cascade classifier is an effective object detection approach which was proposed by Paul Viola and Michael Jones in their paper, "**Rapid Object Detection using a Boosted Cascade of Simple Features**" in 2001.

So, let's try to understand what these Haar Cascade Classifiers are. This is basically a machine learning based approach where a cascade function is trained from a lot of images both positive and negative. Based on the training it is then used to detect the objects in the other images.

So how this works is they are huge individual .xml files with a lot of feature sets and each xml corresponds to a very specific type of use case.

1.4 PROJECT SCOPE:

The future scope of this project or application, since in this we are taking any image, video or with camera we are detecting humans and getting count of it, along with accuracy. So some of the future scope can be :

- This can be used in various malls and other areas, to analyse the maximum people count, and then providing some restrictions on number of people to have at a time at that place.
- This can replace various manual jobs, and this can be done more efficiently with machines.
- This will ultimately lead to some kind of crowd-ness control in some places or areas when implemented in that area.

2. RELATED WORK

2.1 EXISTING SYSTEM/ Papers:

For this project we need some resources/files to train the model and it also help in minimize the work and time. for all the necessary files we are going to save in project named folder.

We are using the google collab platform that enables us to escape the hardware problem but still we have to upload and download the input and output videos. Also, we are using the command prompt to run our project and see the output.

Some of the research papers are attached below:

[1].A number of surveillance scenarios require the detection and tracking of people. Although person detection and counting systems are commercially available today, there is need for further research to address the challenges of real world scenarios. The focus of this work is the segmentation of groups of people into individuals and tracking them over time. The relevant applications of this algorithm are people counting and event detection. Experiments document that the presented approach leads to robust people counts

[2].Targeting the current Covid 19 pandemic situation, this paper identifies the need of crowd management. Thus, it proposes an effective and efficient real-time human detection and counting solution specifically for shopping malls by producing a system with graphical user interface and management functionalities. Besides, it comprehensively reviews and compares the existing techniques and similar systems to select the ideal solution for this scenario.

3. SYSTEM DESIGN

System analysis is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvements on the system. System analysis is a problem solving activity that requires intensive communication between the system users and system developers.

System analysis or study is an important phase of any system development process. The system is viewed as a whole, the inputs are identified and the system is subjected to close study to identify the problem areas. The solutions are given as a proposal. The proposal is reviewed on user request and suitable changes are made. This loop ends as soon as the user is satisfied with the proposal.

3.1 PROPOSED SYSTEM

The proposed system is used for Human Counting.

The Human counting is used in three ways:

- 3.1.1 Human Counting Using Existing Images
- 3.1.2 Human Counting Using Existing Videos
- 3.1.3 Human Counting Using Real Time Camera(Laptop's Camera)

3.2 SYSTEM DESIGN

➤ GUI Using Tkinter

After running our project ,The main UI appears showing the main functions of the the Project i.e. as following:

➤ Human count using existing Images

A user can enter existing(taken early) images and can select or upload manually using Our '**DETECT THROUGH IMAGE**' feature.It can show the human count in the selected images and also generate crowd report (i.e. The image is crowded or not)

➤ Human count using existing Videos

A user can enter existing(taken early) videos and can select or upload manually using Our '**DETECT THROUGH VIDEOS**' feature. It can show the human count in the selected video and also generate crowd report (i.e. The video is crowded or not)

➤ **Real-time human counting using camera**

User can use their laptop's or system camera for human counting and it is also applicable for the surveillance purpose.

3.3 SYSTEM FUNCTIONAL REQUIRMENTS-

FUNCTIONAL REQUIRMENTS-

Images including Humans :

We need a images including Human for the counting purpose.This is used for DETECT FROM IMAGE feature in the project.

Videos including Humans :

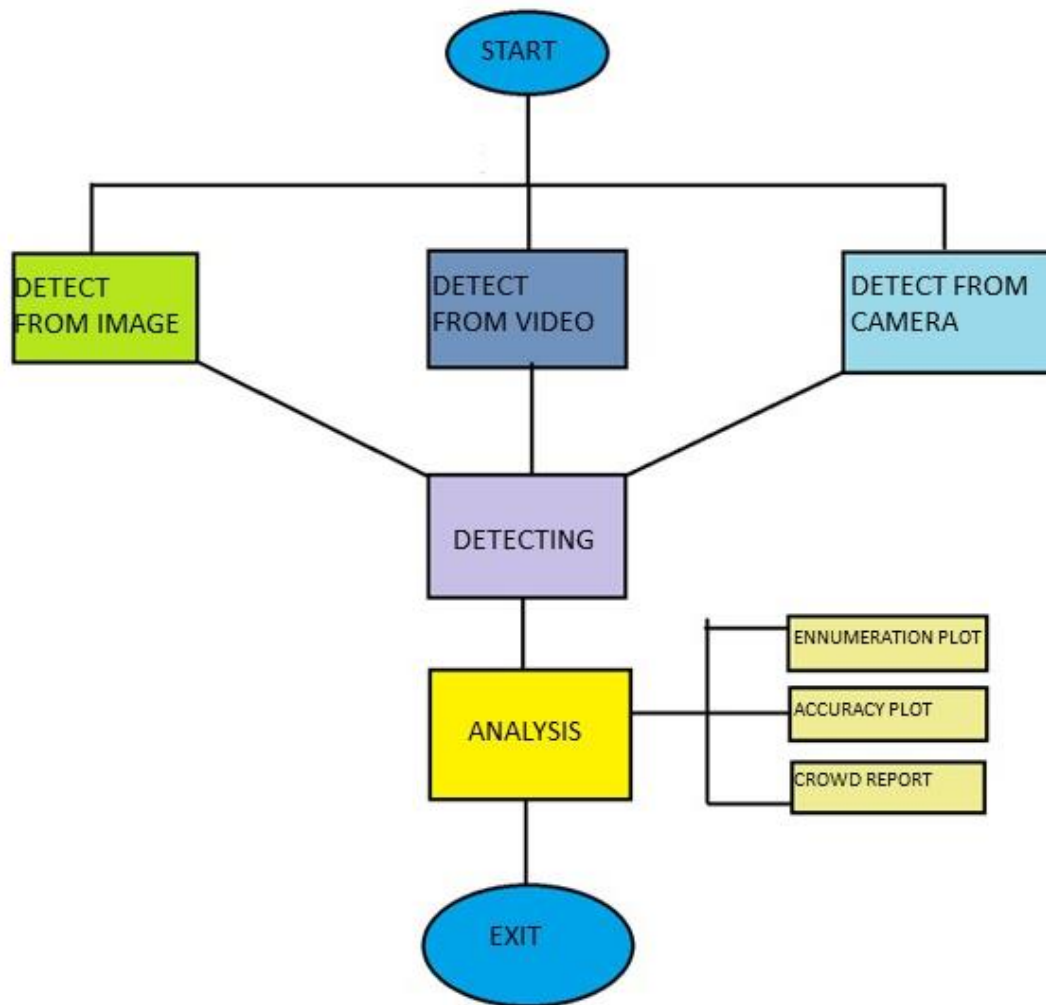
We need a videos including Human for the counting purpose.This is used for DETECT FROM VIDEO feature in the project.

Camera

We need a active camera on a System for a real time human detection and counting pupose.

3.4 BLOCK DIAGRAM

3.4.1 Flow Chart



4. METHODOLOGY

Using Haar Cascade Classifier

- Here we make use of .xml file for human detection, and using that we detect the humans in real time videos and images

Haar Cascade Classifier:

Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001.

It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

OpenCV provides a training method or pretrained models, that can be read using the `cv::CascadeClassifier::load` method. It is an Object Detection Algorithm used to identify faces in an image or a real time video.

The repository has the models stored in XML files, and can be read with the OpenCV methods. These include models for face detection, eye detection, upper body and lower body detection, license plate detection etc.

Object Detection in Real-time:

The haar-cascade algorithm is light and works in real-time with a perfect frame per second.

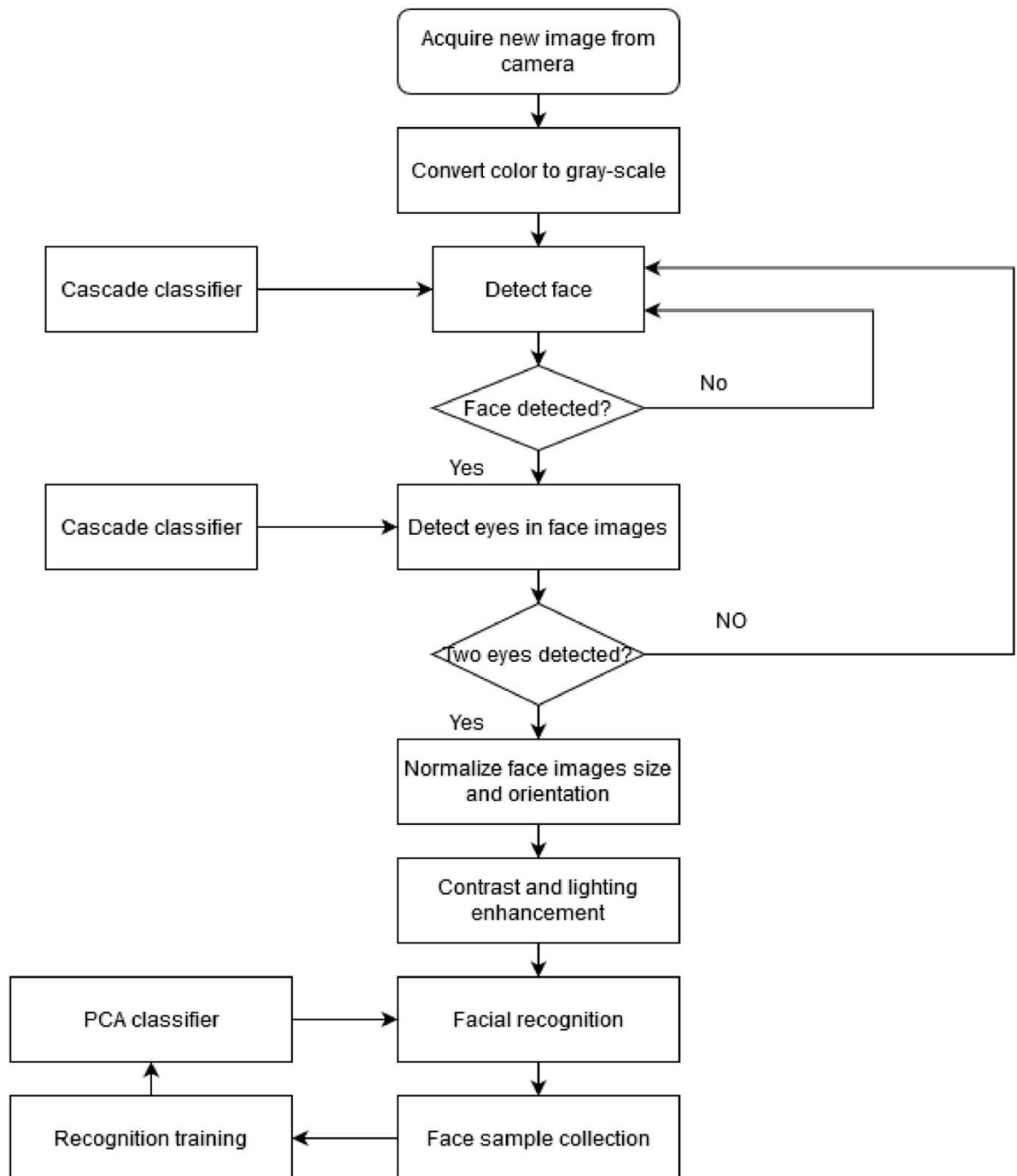
It classifies positive data points → that are part of our detected object and negative data points → that don't contain our object.

Why to use HaarCascade Classifier:

- Haar cascades are fast and can work well in real-time.

- Haar cascade is not as accurate as modern object detection techniques are.
- Haar cascade has a downside. It predicts many false positives.
- Simple to implement, less computing power required.

Working of HaarCascade Classifier

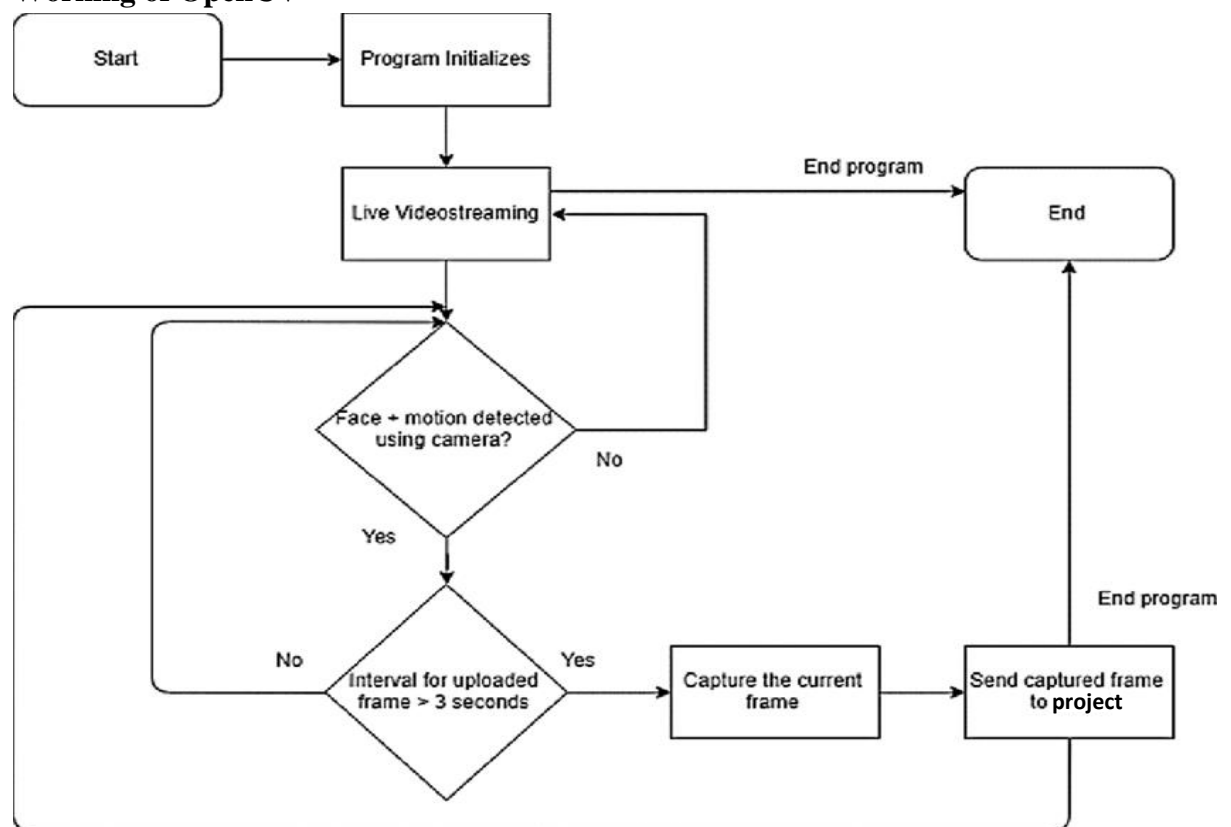


Open CV

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human.

When it integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify image pattern and its various features we use vector space and perform mathematical operations on these features.

Working of OpenCV



AdaBoost

There's a set of features which would capture certain facial structures like eyebrows or the bridge between both the eyes, or the lips etc. But originally the feature set was not limited to this. The feature set had an approx. of 180,000 of them, which got reduced to 6000.

They used a *Boosting Technique* called AdaBoost, in which each of these 180,000 features were applied to the images separately to create *Weak Learners*.

5.SYSTEM REQUIRMENTS

5.1 HARDWARE REQUIRMENTS

- Windows / linux / macOS device
- Minimum of 4gb RAM

5.2 SOFTWARE REQUIRMENTS

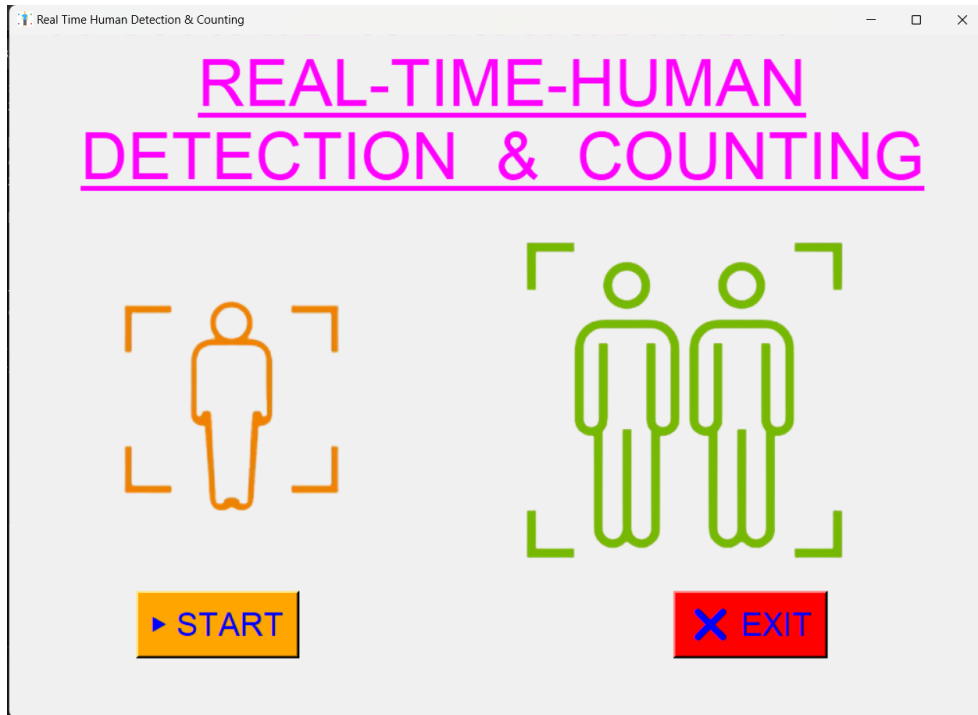
- Frontend -Python

5.3 LIBRARIES USED:

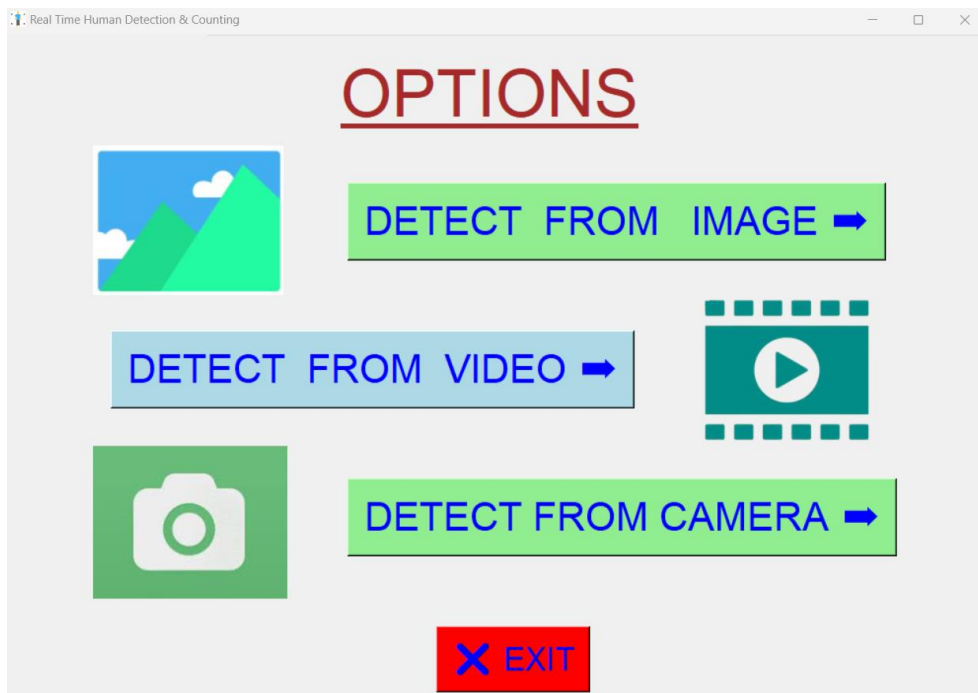
- Tkinter
- Messagebox
- PIL
- Cv2
- Argparse
- Matplotlib.pyplot
- Numpy
- Time
- Os

6. RESULTS

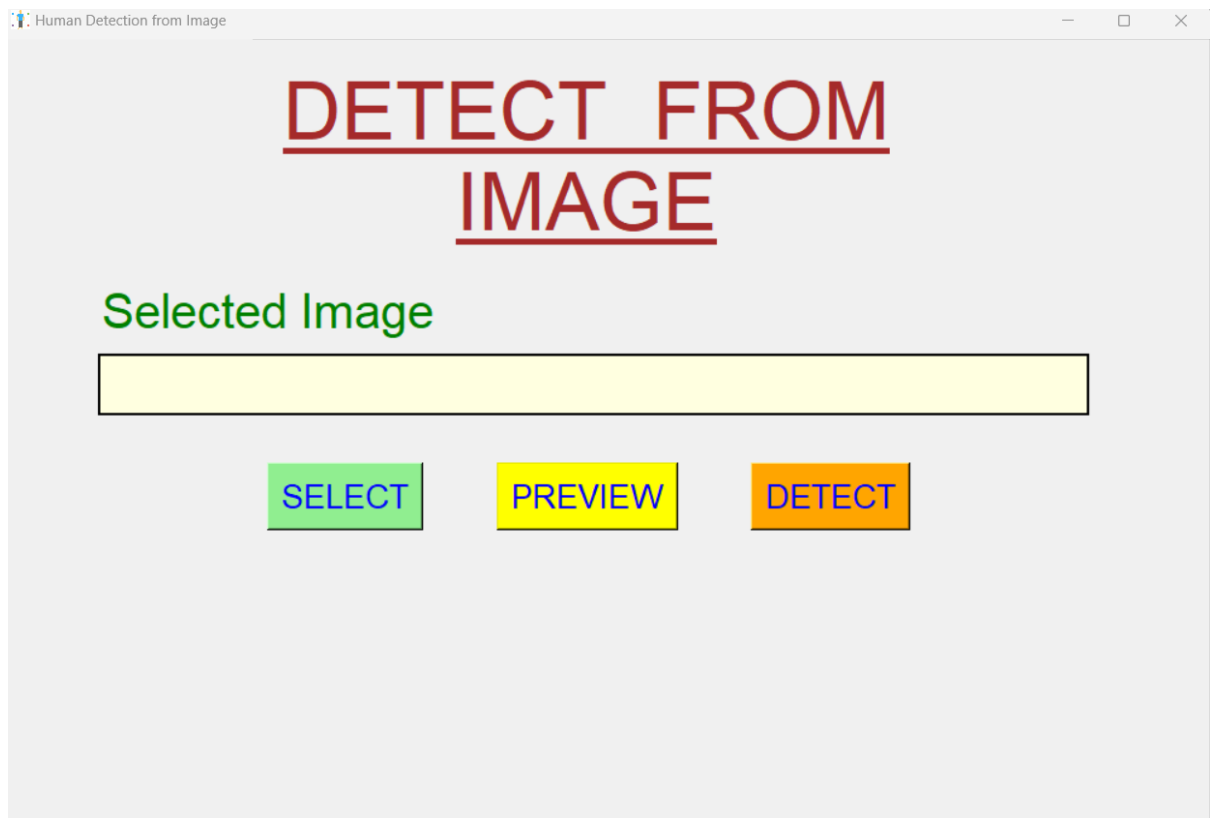
1. Main Interface



2.Options for Input



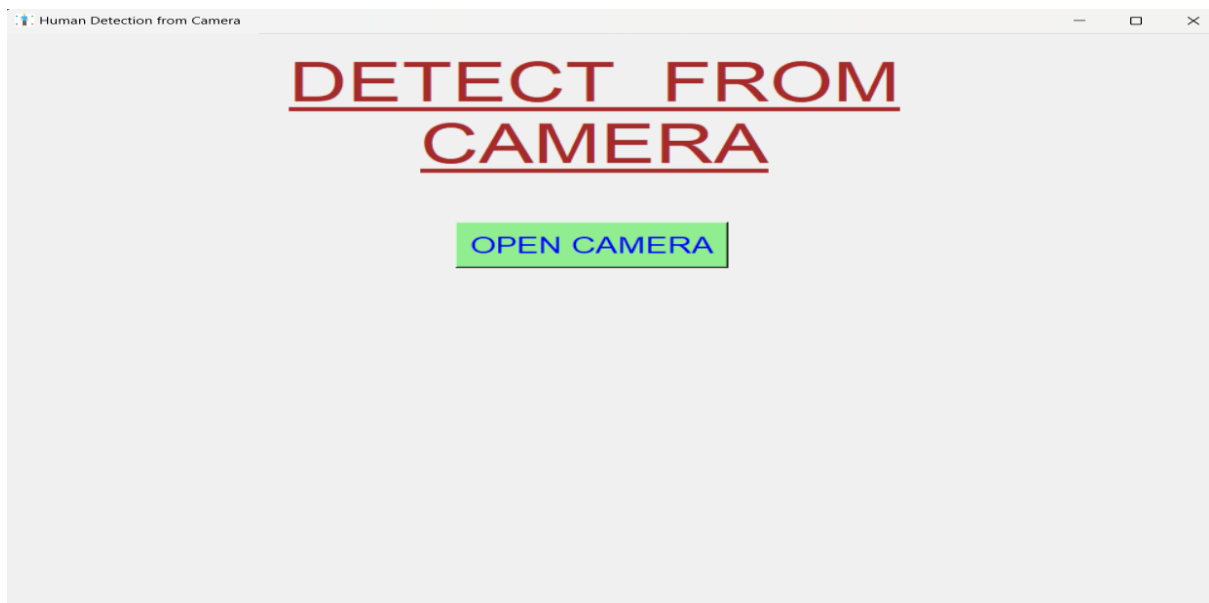
3. Part 1: Detect From Image



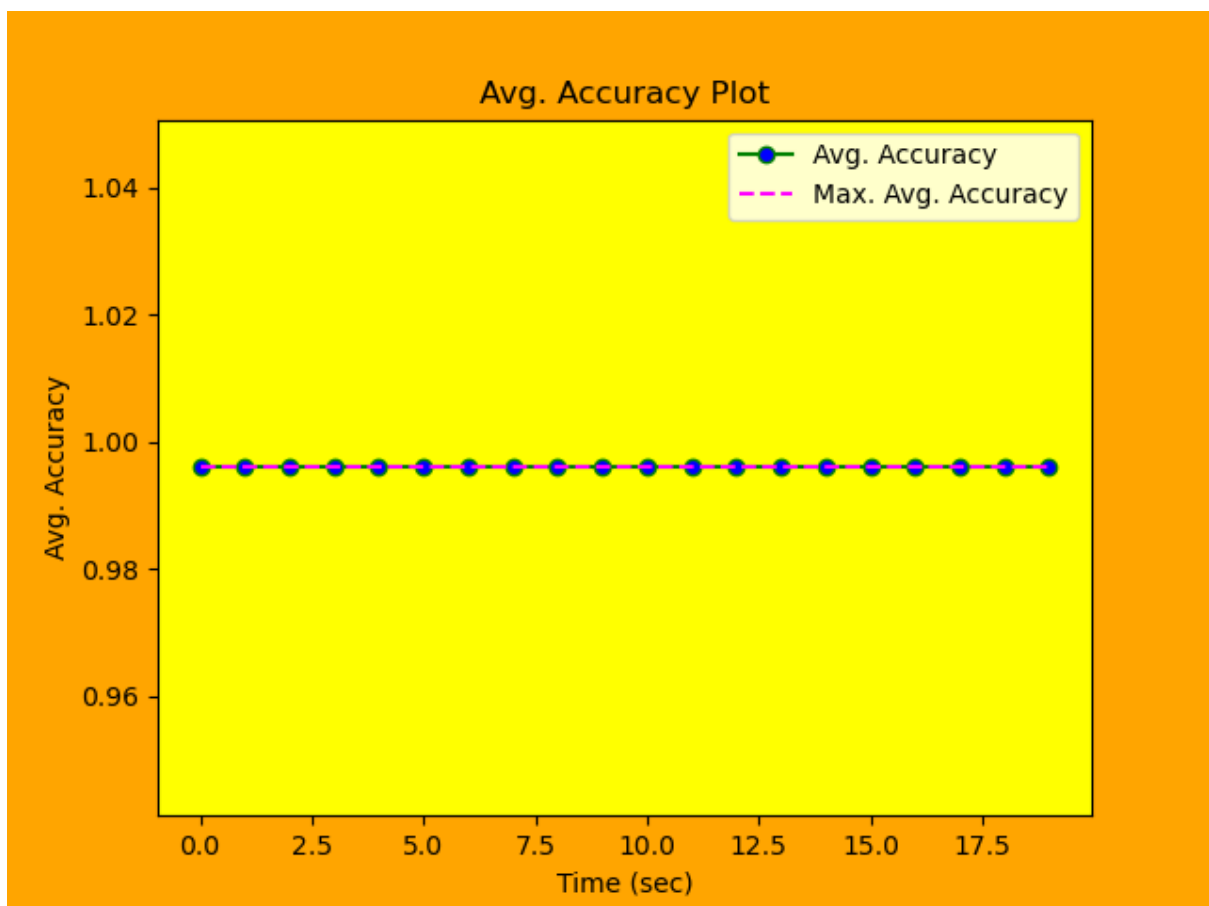
4. Part 2: Detect From Video



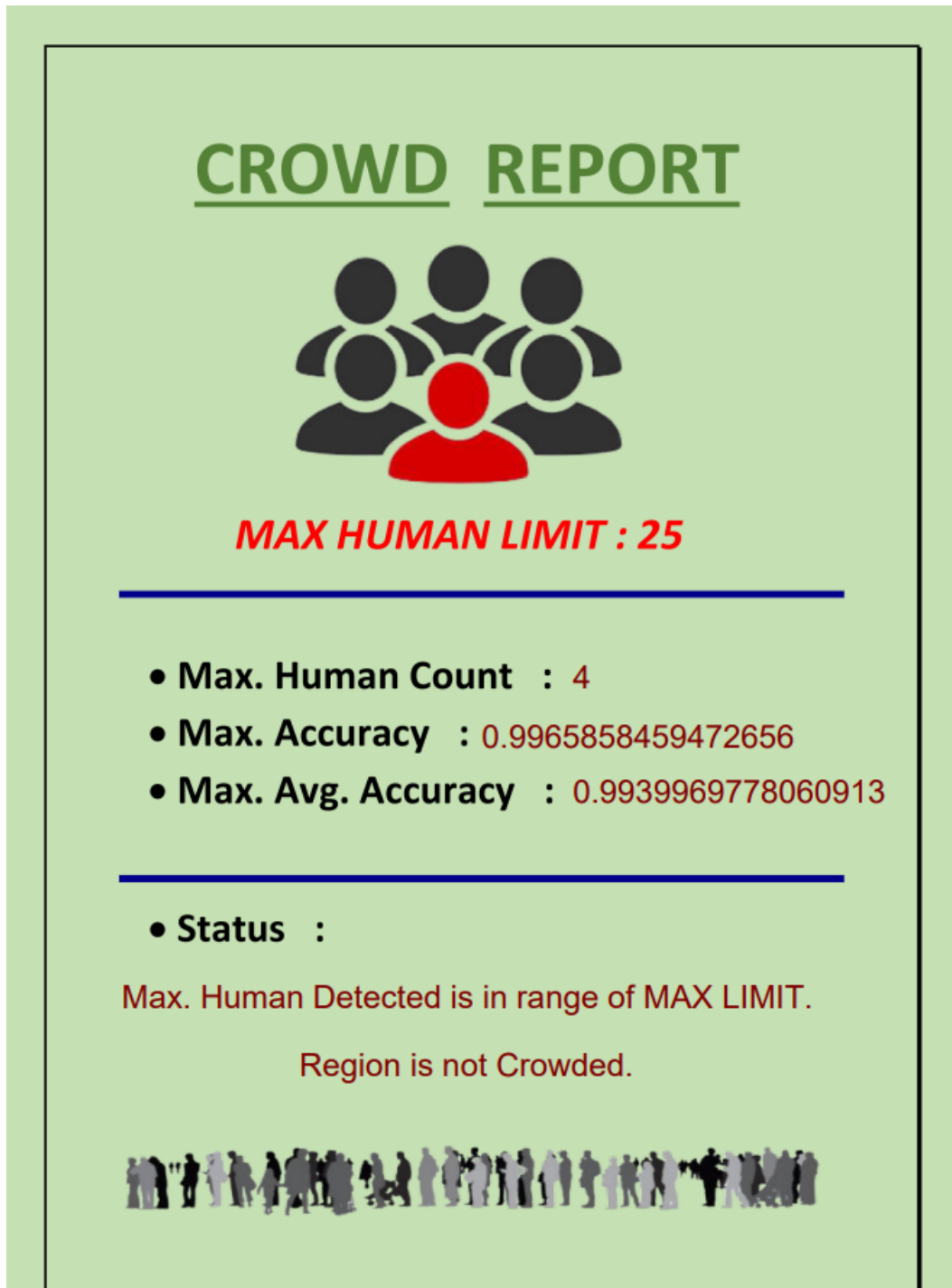
5. Part 3: Detect From Image



6. Accuracy Plot



7.Crowd Report



7.CONCLUSION

In the last section of the project, we generate Crowd Report[5], which will give some message on the basis of the results we got from the detection process. For this we took some threshold human count and we gave different message for different results of human count we got from detection process.

Now coming to the future scope of this project or application, since in this we are taking any image, video or with camera we are detecting humans and getting count of it, along with accuracy. So some of the future scope can be :

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