Department of INFORMATION TECHNOLOGY

**ROBUST SECURITY CAMERA**

Proposal

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Group members

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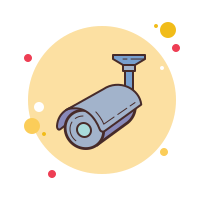
**INTRODUCTION:**

Life is what matters a lot for each and every individual. People in every consequence want to live a secure life so, they always prefer using all those software, devices, autonomous systems or others that provide security among which CCTV (Closed Circuit Television) camera plays an important role.

CCTV is one of the feasible functioning/operating requirements that is to be considered in vast safety and security aspects. CCTV cameras are almost installed in every private and public sectors such as educational institutes malls, hotels, firms, cinema etc. in order to provide security and measures such as alarms, site design and systems etc. which are not enough for fulfilling today’s need as the increase in number of surveillance camera footages is challenge for CCTV operator to monitor, analyze and make a decision about whether a dangerous situation is about to happen or not. Monitoring multiple screens continuously is quite risky for the single CCTV operator for prolonged time.

So, to overcome this the automated surveillance algorithm is being developed. The main objectives of this is to train CCTV camera for detection of the weapon (the most common way to harm/ rob anyone) in the image, counting people along-with proper mask detection (most important regarding current situation i.e. Covid-19, as calculated number of people with proper mask application will enter the mall/firm/hotel etc. helping in proper application of SOPs) and alerting the CCTV operator about it through web application while security guard through android application(automated alert message will be send from web app to android app)which were not being provided by primitive/general CCTV cameras but we will assure you regarding proper provision of above mentioned additional features in our project by integrating algorithm of object detection from field of the computer vision and processing of image through automated surveillance.

Selecting such a project will save cost regarding time, money and labor work as all you need is to integrate all the features in CCTV camera and not to deploy each and every individual system. So, will not only satisfy customer regarding security but will shape business satisfaction too.



**FIGURE 1 CCTV**

**LITERATURE REVIEW:**

Detection of weapon, face mask and counting people is an important issue. Modern technology is in need of the appropriate system that can detect weapons [1], face mask detection and counting people (most important regarding current situation i.e. Covid-19, as calculated number of people with proper mask application will enter the educational institute/mall/firm/hotel etc. helping in proper application of SOPs) .The project is concerned with the real time detection of weapon, face mask and counting of the people thus, the classification speed is an important issue [8], secondly it is concerned with the accuracy [8], as false alarm can result in unfavorable responses [5]. Thus, it is necessary to choose right approach to make accurate tradeoff between speed and accuracy [10].

Basically, there are two approaches for detection of weapons, first is Concealed weapon detection system; focuses on detection of hidden weapons through X-rays. The most representative application in this context is luggage control in airports [8]. In existential method high accuracy is achieved by using various combinations of the features detectors and extractors, either by using density descriptors, pattern matching or border detection. [10] Accuracy can also be achieved through cascade classifiers with the boosting [17]. Second one is real time weapon detection that is based on Object detection, consisting of recognition of weapons and its location in image or video [4]. It uses two approaches the sliding window approach or region proposals approach.

Sliding approach is an exhaustive method that considers a large number of candidate windows, in the order of 104, from the input image. It scans the input image, at all locations and multiple scales, with a window and runs the classifier at each one of the windows. The Histogram of Oriented Gradients (HOG) based model [4] uses HOG descriptor for feature extraction to predict the object class in each window. The Deformable Parts Models (DPM) [5], which is an extension of HOG based model, uses [1] HOG descriptor to calculate low-level features, [10] a matching algorithm for deformable part-based models that uses the pictorial structures [6] and [17] a discriminative learning with latent variables (latent SVM).

Unlike sliding window, the region proposal approach selects only actual candidate region by using the detection proposal method [7]. CNNs introduced the first detection model was R-CNN (region based CNNs) [8,19]. 2000 potential bounding boxes are generated by this by selecting the search method [9]. Subsequently faster R-CNN with speed of 140 ms/image and around 7f/s [11] and Fast R-CNN with speed of 2s/image and 0.5 f/s [2] further improve data access, disk use and computation of the R-CNN [19].

Covid-19 has become the headline of news since 2019 and people from every platform wants to contribute from scientists to tech specialists. Based upon the measures to be taken for its prevention, face mask is the important one as per sources it reduces the spread of virus thus disease. In order to accomplish this task Vinita and Velantina proposed a model that not only detects the faces but masks too. [5]

The pre-labelled images as “mask” and “no mask” had been used in order to feed ML models correctly and two OpenCV models i.e. (Floating point 16 version of the original Cafee implementation and 8-bit quantised version using TensorFlow for face detection) while Pytorch library for MobileNetV2 model implementation for image classification as “mask” or “no mask” had been implemented.

The system of people counting must fit with the Ethernet of the company [3]. Many systems use camera for detecting the people, these cameras are set up on the wall. As the system only gets images thus, another component is used for analyzing images and counting people [16]. Consider a camera that is capable to acquire video in PGB241 at the pixels of 320×240[15].

**SCOPE OF THE PROJECT:**

The aim of this project is not only security but business satisfaction too as from detection of weapon and proper application of SOP’S (counting people & entering them and face mask detection) till cost effective integration and deployment of CCTV cameras; with which they won’t need to change their cameras rather bringing changes through integration.

It will be based on reviewing and working on ML Models i.e., weapon detection, face mask detection and counting people) and will be consisting of two applications i.e., web-application (highlighting the screen for CCTV operator along-with generating an automated alert message) and android-application (for alerting the guards).

**BENEFITS/UTILITY OF THE PROJECT:**

CCTV cameras are helpful for all of us so, why not to improve them even more? As we know a lot of CCTV cameras are installed in both private and public sectors and videos of these CCTVs are monitored by a single operator. Thus, it is quite difficult and risky for that person to monitor multiple screens for prolonged time. But through artificial intelligence we can improve the features of CCTV cameras and make it easy for CCTV operator(s) for suspecting the screen with suspicious activity.

Combination of the automatic detection of the objects with risk-based screening can be particularly beneficial. The Weapon Detection Algorithm helps detect weapons such as gun, knife etc. at real time and automatically sends alarm message(s) to control room that makes it easier for screen operator to focus on the screen in which any suspicious activity is taking place and he/she gets opportunity to react quickly.

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Counting people is one of most important features regarding the current situation i.e., Covid-19 that spreads between the people through direct surfaces, objects or via close contact (even within 1m) with the infected person through nose or mouth secretions. Thus, it is really important to allow limited people in any area such as malls, hotels and firms etc. to keep everyone safe because health is what matters a lot. If limited people are allowed in malls, firms or hotels with proper implementations of SOPs then there are less chances for Covid-19 to spread.

**COMMERCIALIZATION/BUSINESS POTENTIAL OF THE PROJECT:**

Our project has the potential of both businesses to consumer and business to business provisions as through this we can not only serve the community by providing security but will help businesses to expand and get extended more and more because you won’t need to buy or install any new CCTV camera rather integrating our discussed features in a single CCTV camera and it would also be customized as per business need(s) i.e. whether they want to integrate a single feature or all.

As life matters a lot both public and private sectors are ready to invest in such a project. Like; educational institutes, malls, hotels, firms, aviation industries, banks and commercial spaces as these are not only threatened by terrorists, anti-social groups but humans (person to person virus transmission) too.

It will be launched in Pakistan but has the potential to get extended in other countries too as all and all everyone wants to live a secure life.



**FIGURE 2 BUSINESS POTENTIAL**

**PROJECT REQUIREMENTS:**

**HARDARE REQUIREMENTS**

CCTV

Google Cloud Server

Laptop

1. 8 GB RAM
2. 1 TB Hard-disk
3. NVidia GTX (1050) with 4 GB RAM GPU
4. Core i5 and 2nd generation Processor

**SOFTWARE REQUIREMENTS**

Dreamweaver

Android Studio

**OTHER REQUIREMENTS OR CONSTRAINTS**

Data sets

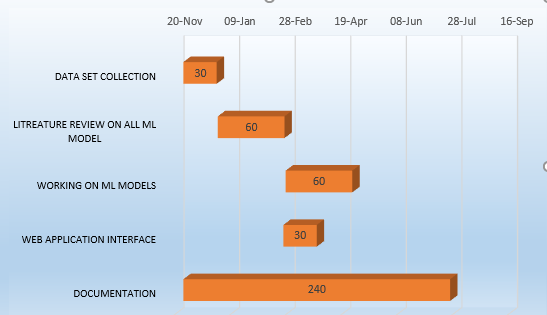
Testing tools

**ESTIMATED COST**

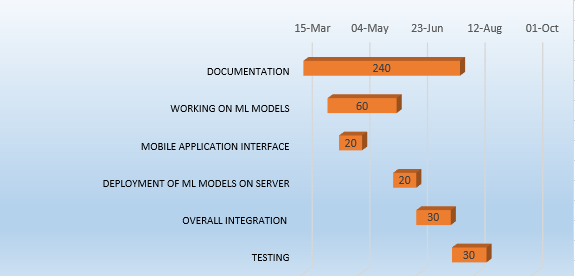
50,000

**PROJECT PLAN:**

**GANTT CHART**

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**FIGURE 3 PHASE-1**



**FIGURE 4 PHASE 2**

**LIST OF DELIVERABLES**

1. Literature Review on ML models.
2. Web Application Interface & Android Application Interface.
3. Deployment of ML Models on Server.
4. Integration.
5. Testing.

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