# CROWD MONITORING SYSTEM

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#### **Abstract:**

The waiting time in the queues and the behavior of people moving over queues makes standing in the queues a hard process so we are going to create an application that will detect all the people in the area and track the people who are joining a queue. The data collected from this detection and tracking process is used to train a machine learning model. A queue is actually measured by its appearance, size, arrival rate, service speed, and waiting time. The data collected from the tracking and detection of people are used to calculate the average waiting time and the busiest time of the queues. This will help the owner of the place to analyze the situation and make a decision like add or remove queues from the system. This application will serve as a business analysis model for the owner. For example: If there are 2 queues A and B. Queue A has 10 people waiting and Queue B has 5 waiting. Normally people will choose Queue B. But, using our Machine Learning model we came to know that the waiting time for queue A is 1 minute per person but for queue B is 3 minutes per person that is queue A will move faster by making this change we can manage the queue in a faster and efficient way.

**Keywords: Machine Learning, Object Detection** 

## 1. INTRODUCTION AND OVERVIEW:

A queue is a specific kind of crowd organized in an arranged way, generally in public places such as railways and shopping malls. It is measured by its appearance, size, arrival rate, service speed, and waiting time. Successful queue management needs an active checking of these parameters, in order to identify whether further service desks should be opened or closed, and to make queues more manageable in the future. A queue can be defined by six attributes Arrival style, Service style, Queue

regulation, Capacity of the system, Number of service desk, Stages of service Estimating queue parameters is an important part of many business operations, including retail shops, public transport hubs, and airports. When these queues are particularly large, as, at airport check-in counters with multiple service stations, it is difficult for human operators to quantitatively assess queue parameters such as wait time, throughput rate and overall queue size.

In this project, we are going to use crowd counting and computer vision to monitor these queues and also suggest people take the queues that are best based on the queue parameters like, Queue length, Throughput rate, Wait time.

Successful queue management requires active monitoring of these properties in order to determine whether additional service stations should be opened or closed and to plan for future events.

## 2.OBJECTIVES:

The main objective of our proposed system is to monitor the crowd in public/private places. Based on the record gathered by monitoring the crowd we analyze people movements in selected areas. To develop a business model to make the management of the crowd easier. To reduce the problems caused by over congested queues.

#### **3.COMPONENTS:**

#### 3.1.Camera:

A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks traveling through systems such as the internet, and e-mailed as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. A webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

3.2.Open CV:

OpenCV (Open Source Computer Vision Library) is released under a BSD license and. It can be implemented in C++, Python and Java and also supports Windows, Linux, Mac OS, iOS and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. It is mainly used to support operations with computer Vision.

## 3.3 Keras:

Keras is a high-level neural networks API, written in Python and capable of running on top of TensorFlow,. It has a focus on enabling fast experimentation. Keras is an open-source neuralnetwork library written in Python.Designed to enable fast experimentation with deep neural networks, it is very user-friendly, modular, and extensible. Keras is compatible with: Python 2.7-3.6.

#### 4.ARCHITECTURE DIAGRAM:

The proposed system includes a Mobilenet Single Shot Detector(SSD) to detect objects in the Region Of Interest (ROI). The following diagram shows the working flow of the system.



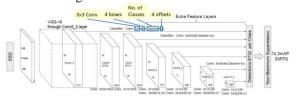
## 6. ANALYSIS OF EXISTING SYSTEM:

Trackometrix is a real-time video analytics cloudbased "Consumer Discovery" platform for Retail that is powered with an AI, Machine learning and Neural network for image processing like Face Recognition, Objection Detection, Motion Analytics, Emotion Detection, and OCR. The system is built to process petabytes of data on consumers behavior, action/motion and transaction analytics all in "Real Time".

## 7.LITERATURE SURVEY:

A method for detecting objects in images using a single deep neural network. Our approach, named SSD, discretizes the output space of bounding boxes into a set of default boxes over different aspect ratios and scales per feature map location. At prediction time, the network generates scores for the presence of each object category in each default box and produces adjustments to the box to better match the

The SSD is a deep neural network module used to detect persons in the given area of the field. The module uses 8732 boxes in a single frame.



## 5. Working:

The input is from the CCTV camera video feed the live/ recorded feed is passed to the system. The system divides the video into the frame by frame and each frame is sent to the detection module. The detection module uses the SSD to detect all the objects in the frame and then return the classes of predicted objects with the confidence of each object. The module only tracks the centroid of the object labeled as person and confidence above 40%. The main.py iterates with the object list to identify the movement of the object in the current and previous frames of the video until the object is undetectable ie., until its move off the range of the camera. If the tracking object moves above and the object centroid are above the Region Of Interest (ROI), then the up count is incremented. Else if the object moves down and the centroid is below the ROI, then the down count is incremented.

The up count represents the number of people moving into the ROI and the down count represent the number of people moving out the ROI. The counts are passed to the analysis module with the time of the object tacked and the total number of objects.

The Analysis module includes the statistics calculation. The statistics contain the number of people entering and leaving the ROI, the most crowded time of the day/month, average serving time in the queue and the fastest / slowest queue movement.

object shape. A comparative study of two state-ofthe-art object detection architectures - an end-to-end CNN-based framework called SSD and an LSTMbased framework which we refer to as LSTMdecoder. To this end, we study the two architectures in the context of people head detection on a few benchmark datasets having small to moderately large number of head instances appearing in varying scales and occlusion levels.

#### 8.ADVANTAGES:

Reduce Time save up to 80% of the time normally spent on video review and transform overwhelming amounts of video into actionable intelligence. Increase accuracy by human reviewers misses 50% of objects after 20 minutes of video review. The System doesn't rest until it finds the needle in the haystack.Flexible Integrations easily deploy the secure cloud solution in minutes; the on-premises solution integrates with your existing VMS or EMS. Intelligence Delivered security, safety and productivity analytics through delivered one

comprehensive solution that integrates with your existing camera network — and any that you may own in the future.

## 9.CONCLUSION:

The proposed solution has great Social related benefits as it aids the managing people in public/private places. And also people can enjoy this innovation at a very low cost as the camera sensors are available in good quality at a low price. The entrepreneurial constraints were also concentrated in the literature survey of our system. The results indicate the marginal effect due to the proposed system is positive as it can be applied in any platform as desired there will be positive growth in the entrepreneurial growth.

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