

6'APART – A STEP TO PREVENT COVID-19

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Abstract- The era of mobile technology opens the windows to android app development. The websites are getting overshadowed by the advancements in Native APP development. Thus, it is convenient to change from conventional websites to apps, which has become a major part of our daily routine. Considering the easy use and more preference to Android Apps, we are introducing 6' APART APP, an android application that helps in analyzing if people are maintaining Social Distance among themselves while being in a crowded area. Due to the outbreak of Coronavirus, a lot has changed in the world. The new normal will be impossible if citizens do not take necessary precautions like wearing a face mask and maintaining a distance of 6 feet at all times but there will come times when individuals will have to go out for work, use public transport. Police personnel will be able to make sure if citizens are following the rules of Social Distancing, just with the help of this app. During these situations, 6' APART APP would be a great tool in helping people also by letting them decide whether or not they should enter a crowded place.

Keywords - Object Detection, CNN, YOLO v3, XML, UI

1. INTRODUCTION

Stopping the spread of pandemics, such as the present COVID-19 pandemic and those that may strike in the future, requires the practice of social distance. Social distancing is defined by the US Centers for Disease Control and Prevention (CDC) as keeping at least 6 feet between yourself and other people outside of your home, refraining from gathering in groups, staying out of crowded places, and avoiding mass gatherings.

The CDC currently recommends social separation and wearing masks as the best ways to prevent COVID-19 from spreading, and experts believe that some type of social distancing will be required in the near future. Despite the necessity of social distancing and rules to enforce compliance, adoption has been delayed and at times insufficient in some locations. Not only for the current context of COVID-19, but also to respond to future pandemics, it is critical to understand what drives social-distancing uptake and adherence, and how these drivers vary for various individuals. Social distancing and

protective actions in general are linked to a multitude of demographic and attitudinal characteristics, perceptions of community standards, and structural elements including the ability to work from home, according to research from previous epidemics. For many of us, living inside our home, having all of the essential conveniences, and still being able to work from home is a blessing, but this is not the situation for our doctors, police officers, and other Corona front lines and fighters. This is the motivation for the app.

By using the 6'APART app, Police personnel can record a video of a crowded place and understand who all are taking the respective measures to avoid the spread of the novel Coronavirus. With the advancement in finding the vaccine for covid-19, various governments of the world are ensuring certain relaxations in the rules and regulations about staying at home. With the ongoing unlock in India, people have started going out for their jobs, attending other important matters and for a change of mind too, since people have stayed at home for a long time. This leads to the risk of breaking the Social Distancing rules in public places like Railway stations, restaurants and other rejuvenation centers. This led to the thinking that there has to be one app that allows users to understand whether or not they should visit that place.

2. RELATED WORK

Object Detection Apps - There are just a few object detection applications for social distance, but we identified one named "1point5"^[1] that helps maintain track of social distance. When a device enters your 1.5 parameter radius, the app looks for nearby mobile devices and alerts you. The phone vibrates and a notification is sent to you. It's a friendly nudge in the right direction to diffuse the issue. Family members' devices, for example, can be excluded. This program can also calculate the hazard rate. This software has the constraint that if the user switches off Bluetooth on his phone, the required output will not be received. We are well aware that keeping Bluetooth on our phones is not viable because it consumes a significant amount of battery power. This has the disadvantage that what if another device in the user's vicinity does not have Bluetooth connectivity? 1point5^[1] also allows you to

customize the notification's nature. For proximity notifications, you can toggle on or off sound and vibrations. When the app is turned on, it sends notifications about nearby objects, but not when it is closed. You can also use the app to restrict devices that belong to family members or others with whom you share a home.

Object Detection Models - ImageAI^[2], TensorFlow, OpenCV, and TinyYOLOv3 were used to detect objects. One of the methods for deep learning object detection is ImageAI. ImageAI is a Python-based object detection library. With the help of ImageAI, developers may create self-contained deep learning and computer vision apps and systems with a few lines of straightforward code. Almost all state-of-the-art deep learning algorithms, such as YOLOv3 and TinyYOLOv3, may be implemented using the ImageAI package. ImageAI employs a number of offline APIs, including object detection, object location, video detection, and object tracking APIs that may be used without an internet connection. ImageAI primarily uses pre-trained models and is easily customizable. With ImageAI, you can identify and recognize more than 80 distinct types of common items.

Numerous countries have been exploring for technological solutions since the emergence of the COVID-19 pandemic. COVID-19 has been combated by Asian countries using a variety of technology. The most widely utilized technology is phone location tracking, which saves COVID-19 positive people's data and allows them to be tracked depending on their proximity to healthy people. Germany and Italy are utilizing anonymized location data to monitor the lockdown. The C9 corona symptom tracker^[3] is a new software program from the United Kingdom that allows users to record their symptoms. Similarly, South Korea developed Corona 100m, an app that tracks infected individual's locations and informs healthy people when they get within 100 meters of them.

In India, an application is developed that allows users to keep a safe distance from someone who has tested positive for corona. In addition, India, South Korea, and Singapore are utilizing CCTV video to track down sick patients who have recently visited COVID-19-affected areas. China is detecting people with high temperatures in crowds using AI-powered thermal cameras. In this critical situation, such inventions may help to flatten the curve, but they also put personal information at risk.

3. METHODOLOGY

We concluded from the problem statement that we need to build an android app and in order to do that, we understood that we required a good UI design that attracts

the User, a Machine Learning model and a script, frontend of the app which implements the design and backend which will handle the queries from the frontend and connectivity of the machine learning model with the app.

The tools and technology used in these proposed models are a version control system so we chose to use GIT, a place to host our source code for collaboration so we used GitHub, Visual Studio Code and Android Studio to create the app.

The features included in the proposed model are a main screen where there will be the animated logo of the proposed model and a button which asks the user to capture a video, the video button will direct the user to the camera screen. An output screen where the video will be shown after it has been processed by the ML model.

Transfer learning^[4] is a machine learning technique in which a model developed for one task is seen as the foundation for the next task's model. Given the huge compute and time resources required to develop neural network models for these problems, as well as the huge jumps in skill that they provide on related problems, pre-trained models are a popular approach in deep learning for computer vision and natural language processing tasks.

Working of the app:

The user installs the app. The app will then ask the user to grant permission to access storage and camera. The user can then record a video. If the user does not give permission to access storage and camera then the user will not be able to record a video. After recording the video, the user will get the review of the video, if the user is satisfied with the video recorded then it gets stored in the gallery and the same video will be sent to the server or else the user can record another video. Machine learning model which is deployed on the server, will then receive the recorded video as input. All the objects in the video are detected first using a pre-trained YOLOv3 model, then people are filtered out from the rest of the objects. Their centroids are calculated and then the midpoint between two centroids is checked. Dispensing on whether the midpoints are among the given range, red and green bounding boxes are assigned to each frame. All frames are then grouped to form a video (mp4) format. The video is then sent to the app in a binary format as response from the server which is decoded using base64 decoder in java. The output video with red and green boxes will then be shown on the output screen using Java and XML.

We have used the **YOLOv3** model for detecting the distance between two people. Other YOLO models are YOLOv2, YOLOv4, YOLOv5, PP-YOLO

1) **YOLOv3** - You Only Look Once, Version-3 (YOLOv3) is a real-time object detection system that detects specific objects in movies, live feeds, and images [5]. YOLO employs features learned by a deep convolutional neural network to detect an item.

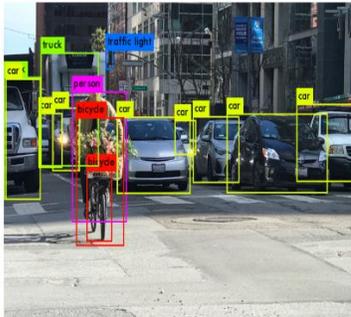


Fig 1 - YOLOv3 computer vision example

A real-time object detection system is the YOLO Convolutional Neural Network (CNN). CNNs are classifier-based systems that can recognize patterns in incoming images and interpret them as organized arrays of data (view image below). YOLO has the advantage of being much faster than other networks without sacrificing accuracy. It allows the model to assess the complete image at test time and generate predictions based on the overall context of the image. Regions are "rated" by YOLO and other convolutional neural network algorithms depending on how closely they resemble specified categories.

Positive detections of the class with which they most closely identify are highlighted in wide areas. For instance, YOLO may be used to detect different types of cars in a live traffic feed relying on whether parts of the video score well in comparison to specified vehicle classes.

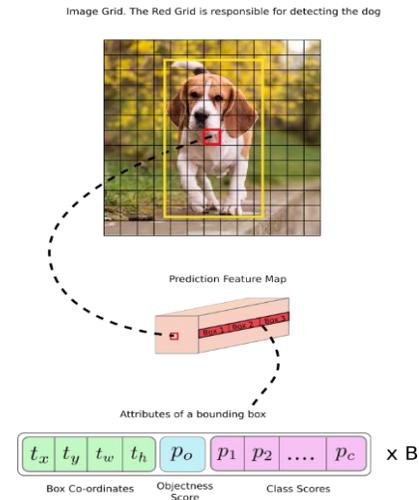


Fig 2 - How YOLOv3 works

Other versions of YOLO are as follows:

YOLOv2 - In 2016, Redmon proposed YOLOv2 model. The primary objective is to increase recall and localization while retaining classification accuracy. Darknet-19, a new fully convolutional feature extraction network with 19 convolutional layers and 5 maximum pooling layers, is used in YOLOv2 [6]. The recall and accuracy are greatly improved by adding a batch normalization layer to the convolutional layer and reducing dropout, introducing anchor box mechanism, utilizing k-means clustering [7] on the training set bounding box, and multi-scale training. However, there is still room for improvement in the detection of targets with a lot of overlap and small targets.

2) **YOLOv4** - Object detection algorithm YOLOv4 [8] is an extension of the YOLOv3 model. It is twice as fast as EfficientDet with comparable performance. In addition, AP (Average Precision) and FPS (Frames Per Second) in YOLOv4 have increased by 10% and 12%, respectively, when compared to YOLOv3. CSPDarknet53, a spatial pyramid pooling extra module, a PANet path-aggregation neck, and a YOLOv3 head form the backbone of YOLOv4. YOLOv4 has a number of new features and combines them to achieve cutting-edge results: At a real-time rate of 65 frames per second, the Tesla V100 scored 43.5 percent AP (65.7 percent AP50) for the MS COCO dataset.

The following are the new features in YOLOv4

Weighted-Residual-Connections (WRC), Cross-Stage-Partial-Connections (CSP), Cross mini-Batch Normalization (CmBN), Self-adversarial-training (SAT), Mish activation, Mosaic data augmentation,

DropBlock regularisation, Complete Intersection over Union loss, Self-adversarial-training (SAT), Mish activation, Mosaic data augmentation, DropBlock regularisation, Complete Intersection over (CIoU loss)



Fig 3- Features of YOLOv3

- 3) **YOLO v5** [9] is now the most acceptable version, but YOLOv3 takes significantly less time to learn than v4 and v5. And, when all factors are considered, v4 has some good performance qualities and requires less training time than v5. We chose YOLOv3 since it requires very little training time.

4. RESULT & DISCUSSION

The transfer learning methodology is applied to improve the accuracy of the model (yolo v3). The model is now tested for the sample test video.



Fig 4



Fig 5

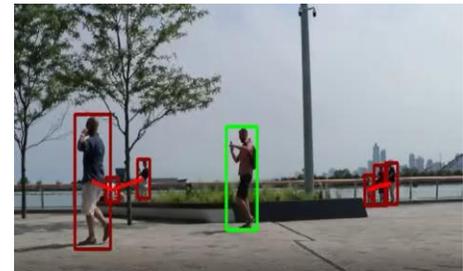


Fig 6

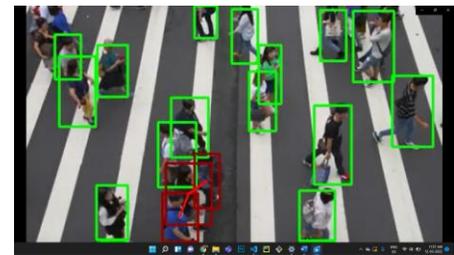


Fig 7

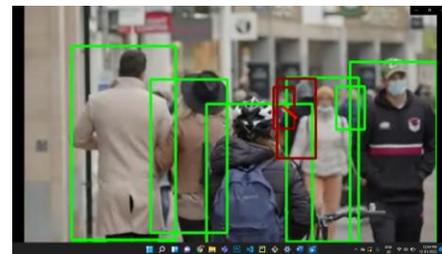


Fig 8

Multiple people walking and entering the site are detected and monitored in Fig. 5.0. If the persons are too close to each other, the framework efficiently detects the breach of social distance between them and marks the bounding box as a red rectangle. People are bounded by green box if there is no violation of social distance. In fig. 5.0, four people are bound in red, indicating that they have broken the regulations, whereas roughly eight people are bound in green, indicating that they have followed the rules. We can also see that there is only one person who is not detected. The cause for the miss detection could be that as the pre-trained model is used, an individual's appearance from an overhead view change, which could lead to the model being misled.

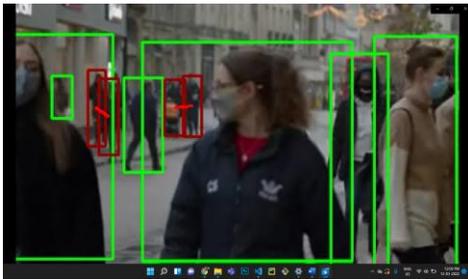


Fig 9

Output	People in red box	People in green box
Fig 4.0	4	14
Fig 5.0	0	7
Fig 6.0	5	1
Fig 7.0	3	15
Fig 8.0	3	6
Fig 9.0	4	6

Table 1

5. CONCLUSION

Java is an excellent choice for developing Android applications since it provides a large number of libraries and packages to aid development. Android is a completely free and open development platform based on Linux and open source. Without paying a royalty, handset makers can utilize and adapt the platform. Internet mash-ups inspired this component-based architecture. Parts of one software can be utilized in another in ways the creator never imagined, and they can even replace built-in components with their own enhanced versions. This will spark a new wave of innovation in the mobile realm.

- Android is available to everyone: businesses, developers, and users.
- Being a part of a number of successful open-source proposal models
- Aims to be as simple to program as the web.
- Google Android is taking the mobile internet to the next level.

Fields like Machine Learning can be a boon if used well and integration is well taken care of. Deployment of models and then using their endpoints for any frontend or

backend application can be done using a combination of framework for API conversion, and Java for the POST and GET methods.

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