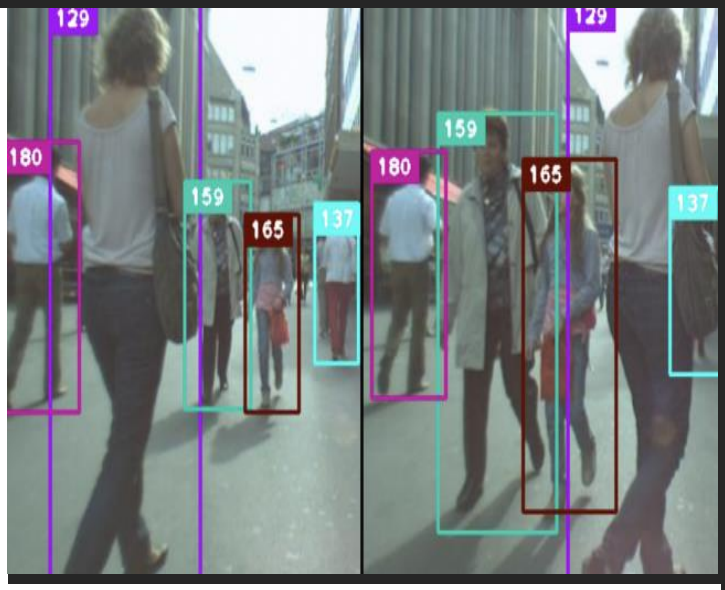
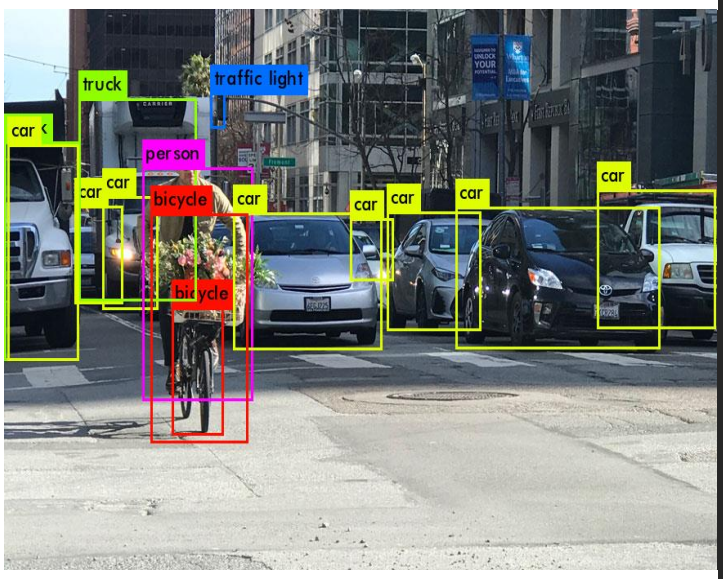
Megathon 2021





Team Irani Chai

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Objective

The objective of the solution that we are building is to identify a human face, identify if a mask is worn or not and classify faces accordingly. This is largely a binary classification problem where we train the neural network with images containing faces covered with masks and faces not covered. In addition to identifying masks on faces we are asked to give a unique ID to each face that comes up on the input.

Architecture

We use 2 different object detection algorithms here:

a) Tiny YOLO v4
b) Deep Sort

Tiny YOLO v4

YOLO v4 Tiny, a version of YOLOv4 developed for edge and lower-power devices, is a real-time object detection algorithm capable of detecting and providing bounding boxes for many different objects in a single image. The model achieves this by dividing an image into regions and then predicting bounding boxes + probabilities for each region.

YOLO stands for “You only look once.” This name is shared between multiple separate projects.

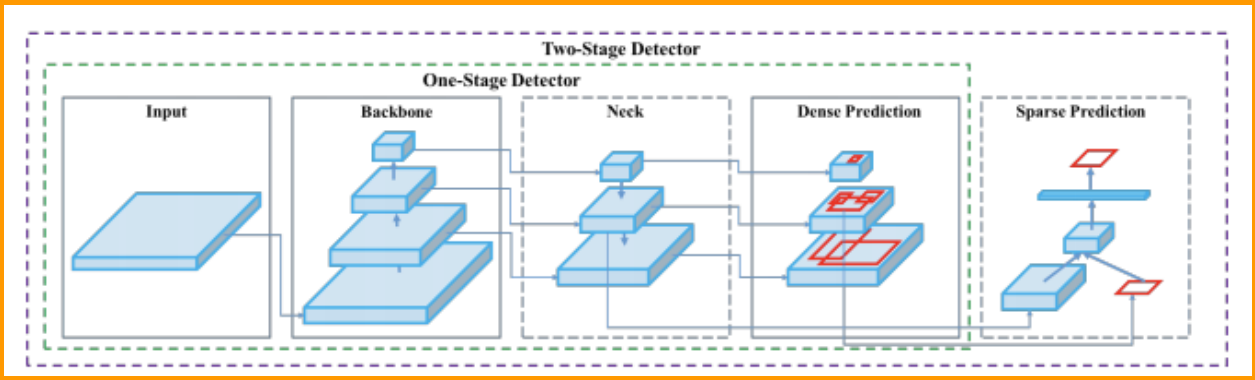

Fig 1: Breakdown of an object detector

Layer	Filters size	Repeat	Output size
Image			416 × 416
Conv	32 3 × 3/1	1	416 × 416
Conv	64 3 × 3/2	1	208 × 208
Conv Conv Residual	32 1 × 1/1 64 3 × 3/1	Conv Conv Residual × 1	208 × 208 208 × 208 208 × 208
Conv	128 3 × 3/2	1	104 × 104
Conv Conv Residual	64 1 × 1/1 128 3 × 3/1	Conv Conv Residual × 2	104 × 104 104 × 104 104 × 104
Conv	256 3 × 3/2	1	52 × 52
Conv Conv Residual	128 1 × 1/1 256 3 × 3/1	Conv Conv Residual × 8	52 × 52 52 × 52 52 × 52
Conv	512 3 × 3/2	1	26 × 26
Conv Conv Residual	256 1 × 1/1 512 3 × 3/1	Conv Conv Residual × 8	26 × 26 26 × 26 26 × 26
Conv	1024 3 × 3/2	1	13 × 13
Conv Conv Residual	512 1 × 1/1 1024 3 × 3/1	Conv Conv Residual × 4	13 × 13 13 × 13 13 × 13

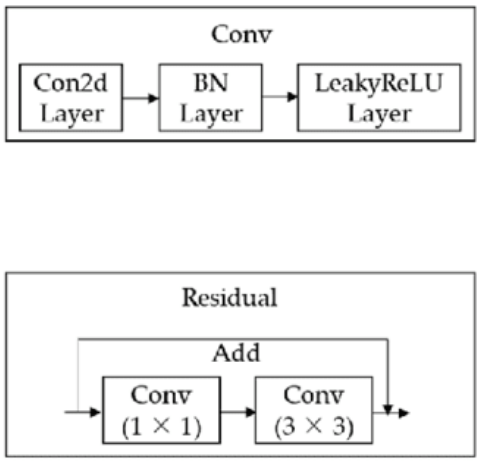

Fig 2: Architecture of YOLOv3 to show roughly how YOLO is designed

Deep SORT

Deep SORT is an extension of the popular framework SORT (Simple Real time Tracker) created with an aim of applying to problems that require objects to be tracked in moving images or videos.

Workflow

We have two tasks at hand,

1. Identify whether a person is wearing a mask or not
2. Track unique individuals

Tiny YOLOv4 identifies whether a given person is masked or not. Now the task 1 is as simple as that.

Coming to task 2, we first have to understand why it is important to do this. So in a moving video, there is a chance that a person who is not wearing a mask wears it some time between the video. The person would look completely different once they wear a mask. So we have to ensure that the model we have understands that it is the same person who wore the mask and do not report masked and unmasked individual as two people.

So Tiny YOLOv4 helps us by identifying individuals and returning to us a bounded box for each individual. The result is then passed to Deep Sort which keeps track of unique individuals.

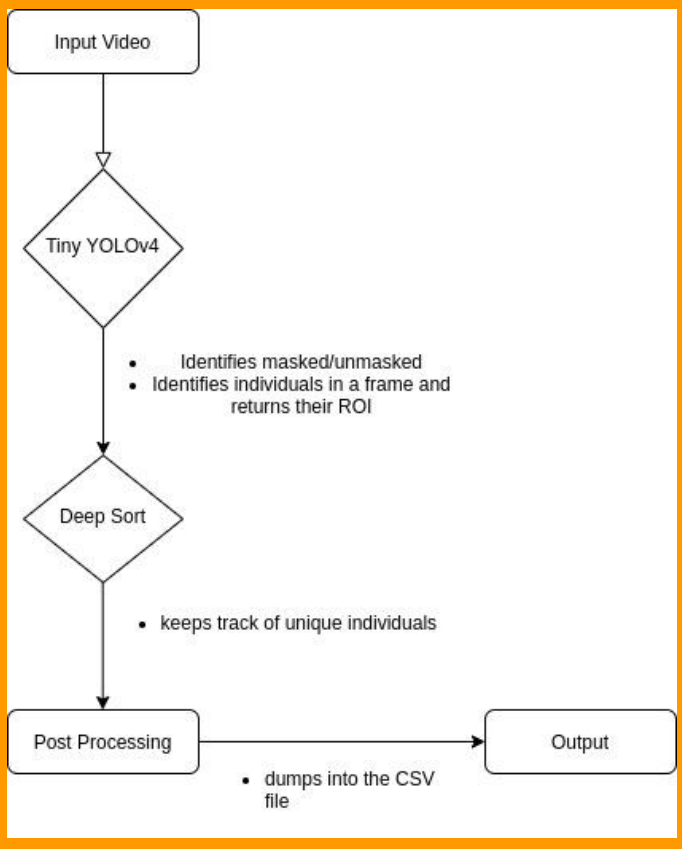

Fig 3: Workflow of the model

Working Screenshots


person-5
person-1
person-3


on-1