Let me talk about the validation for our project. So first validation for Yolo, our detection algo. There is actually this famous benchmark for object detection called COCO dataset with more than 300,000 images. This figure shows the performance of Yolov5 model series in this dataset. Compared with other models, the Yolov5 series is extremely competitive both in terms of detection accuracy and speed. So what we did was we have chosen five videos just for traffic from the internet, including different kinds of scenarios. We manually count all the vehicles in them and found out that the empirical accuracy is somewhere around 90%.

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\section{Tracking Stability}

For tracking, there is also this well-known benchmark called MOT16. Here among all the indices, we are interested in this ID switch index. Our chosen algo deepsort has a really low ID switch numbers compared with other models, indicating good tracking capabilities. Again, for the same five traffic videos we choose, we checked for their ID numbers and found out the observed accuracy is about 85%.

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In terms of data loss rate, we actually have this website for MQTT broker, allowing us to check the packet loss rate. After multiple runs, we found out it’s also zero. This is partly because the data size we are transmitting each time is very small and the scenario is quire simple.

\section{Computation Time}

The time cost of the entire framework matters as policemen want to check the road status in real-time. The ultimate goal is to perform all the detection, tracking, calculation, and data transmission of a frame before the next frame comes in. The computational time is also highly dependent on the computation power.

Here we check what we did against those specifications we set earlier. We can see we meet the most important criteria of being real time, the detection accuracy looks great, and also data loss rate is much lower than expected. However, tracking accuracy is somehow lower than expected possibly due to the ID switch problems.

Then to conclude our proj, I wil first give a summary of our proj, and then have some discussions about it.

So in this project, we have constructed this pipeline that takes video as input, and outputs traffic plots onto a GUI, which operates in real time. We have divided it into these stages, where the metric calculation part is the important part and serve as the purpose for our proj. Now this pipeline was done and is workable. But what are the potential problems or room for improvements?

First, detection and tracking has bad performance when the vehicle is small or is far away. They are quite often missed or have the ID switch problem.

We also expect more metrics to be calculated, for example, car accidents, real traffic speed not just in terms of pixels

Last but not least, for the web GUI, we are now simply displaying several plots. It looks more like a powerpoint than an interactive and use-to-easy webpage. It could be better designed to be more catered the traffic policemen’s needs.

In the end, we want to say…