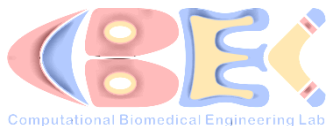


# Using ML to determine the distance between the car and the object

by : YOLO v5

**Result : make an noise or other message to alert the driver when safe distance between the car and an object become too close.**



# Why did we choose this topic?

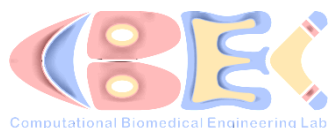
- To avoid accident: sleepy, divert





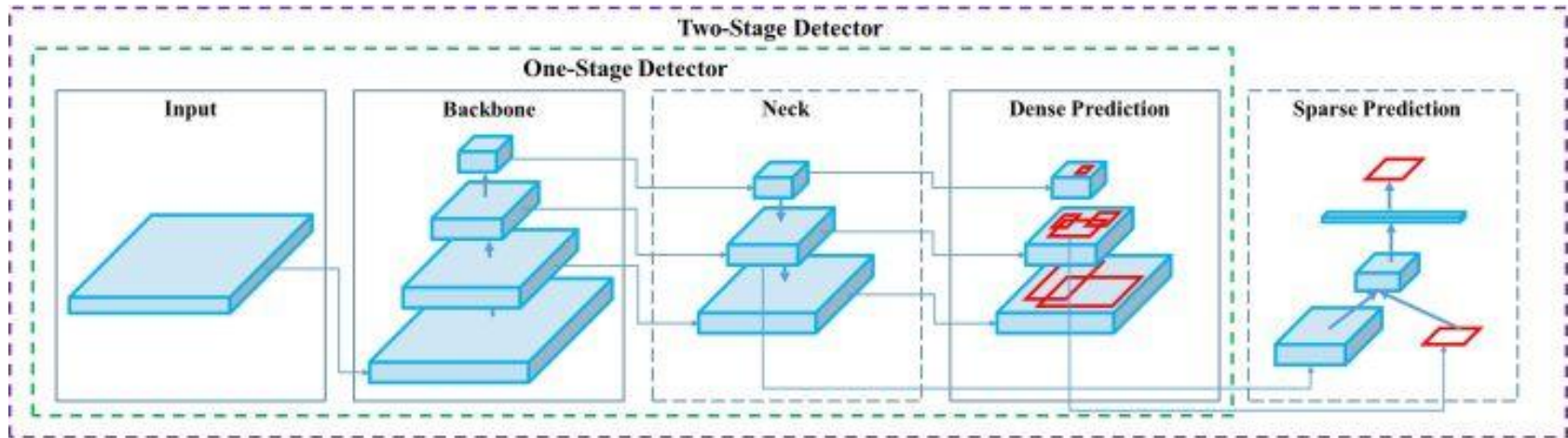
# Why need to use ML(YOLO v5)?

- To catch the target which you want to detect



# How to identify different objects?

- Model is built by three main parts : **Backbone** 、 **Neck** 、 **Head**



Input: { Image, Patches, Image Pyramid, ... }

Backbone: { VGG16 [68], ResNet-50 [26], ResNeXt-101 [86], Darknet53 [63], ... }

Neck: { FPN [44], PANet [49], Bi-FPN [77], ... }

Head:

Dense Prediction: { RPN [64], YOLO [61, 62, 63], SSD [50], RetinaNet [45], FCOS [78], ... }

Sparse Prediction: { Faster R-CNN [64], R-FCN [9], ... }

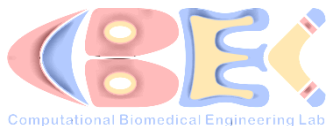




# How to detect distance?

- Distance formula : 
$$\frac{\text{focal length} * [\text{real}(\text{height or width})]}{\text{pixel}(\text{height or width})}$$
- By license plate – too small, angle
- By reference – no general target
- By average – only approximation

In the last, we choose to use the average



# What are the parameters?

- Danger distance : 5m
- Focal length : 760
- Average height: car(1.56 m), people(1.665m), bus(2.875m)
- Pixel height : YOLOv5 detect
- Deviation rate: car( $\pm 9.74\%$ ), people( $\pm 3.90\%$ ), bus( $\pm 4.34\%$ )

Average formula : 
$$\frac{\sum_{i=1}^n (L_i + H_i)}{2n}$$

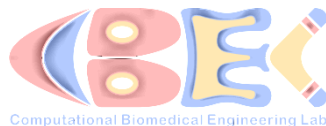
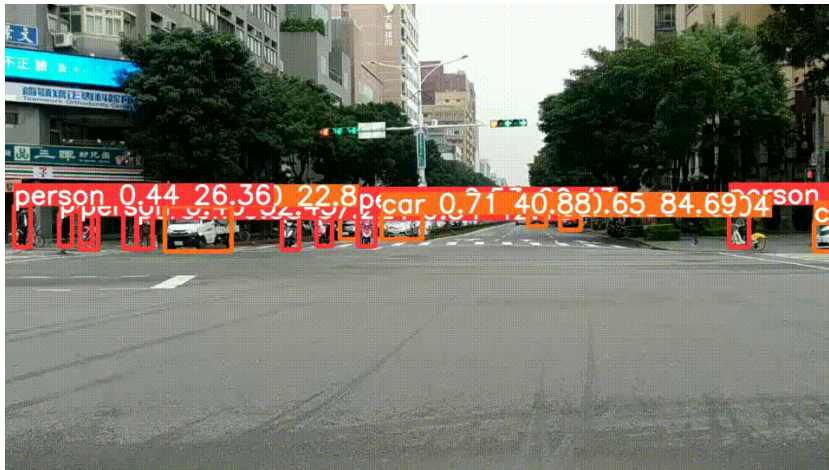
$L_i$  : lower bound of same type  
 $H_i$  : upper bound of same type  
 $n$  : sample number  
Avg : Average height

Deviation rate formula : 
$$\frac{\sum_{i=1}^n (|Avg - L_i| + |Avg - H_i|)}{2n * Avg}$$



# What is the implementation looks like?

Location :No. 79, Section 1, Heping E Rd, Da'an District, Taipei City, 106





# Discussions & Conclusion

## Difficulty

Only approximation

Limit-distance

Fog, car, rain...etc.

## NVIDIA

Less deviation

Close to no limit

Good than traditional

## Extended applications

COVID-19 safe distance

Car following system

Trolley Problem

