

# Objects Detection (Rat)



Szu-Chi Huang  
1 3 5 8 6 0 9

Course : cloud computing  
Professor : Prof. Dr. Christian Baun







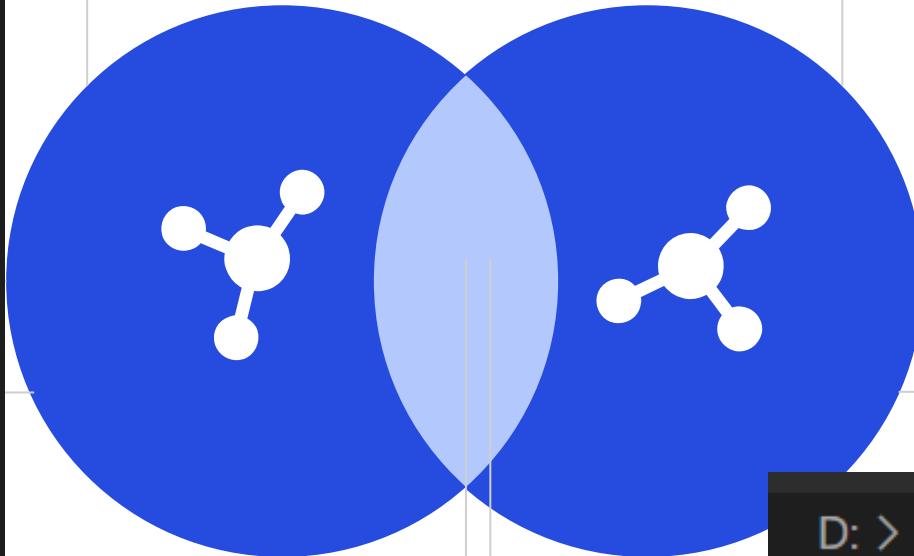
# Part one

● Data preparation ●

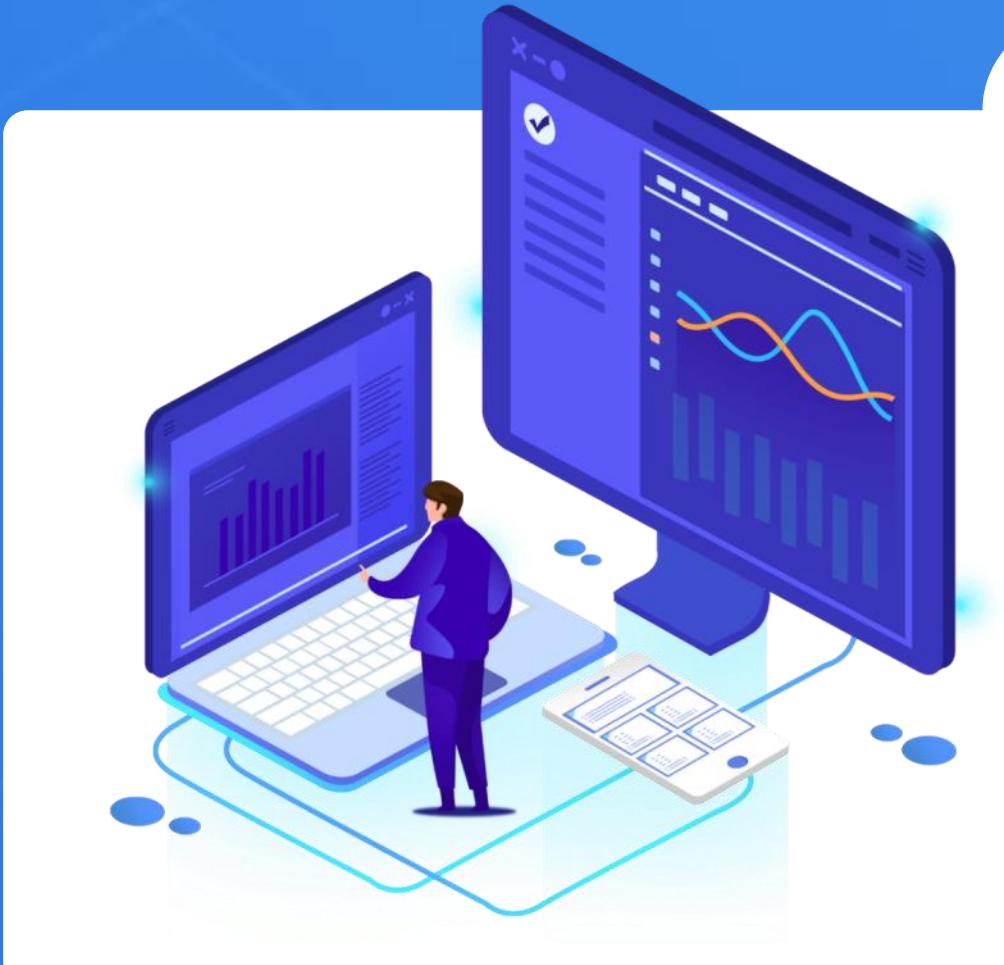


# Label

```
1 train: data_images/train  
2 val: data_images/test  
3 nc: 20  
4 names: ['person',  
5          'car',  
6          'chair',  
7          'bottle',  
8          'pottedplant',  
9          'bird',  
10         'dog',  
11         'sofa',  
12         'bicycle',  
13         'horse',  
14         'boat',  
15         'motorbike',  
16         'cat',  
17         'tvmonitor',  
18         'cow',  
19         'sheep',  
20         'aeroplane',  
21         'train',  
22         'diningtable',  
23         'bus'  
24 ]
```



```
D: > ratDetection > ! data.yml  
1 train: pics/train  
2 val: pics/test  
3 nc: 1  
4 names: ['rat']
```

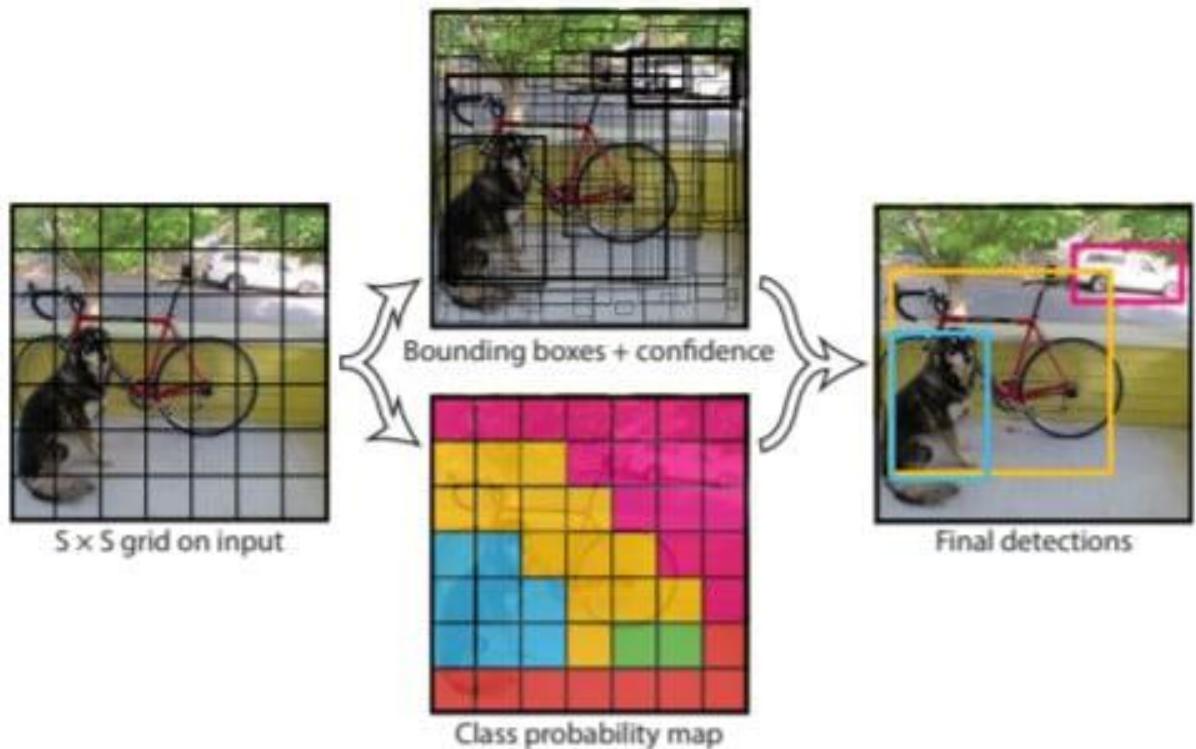


# Part two

● Training YOLO model ●



## YOLO model



- **Speed:** This algorithm improves the speed of detection
- **High accuracy:** That provides accurate results with minimal background errors.
- **Learning capabilities:** learning capabilities enable it to learn the representations of objects and apply them in object detection.

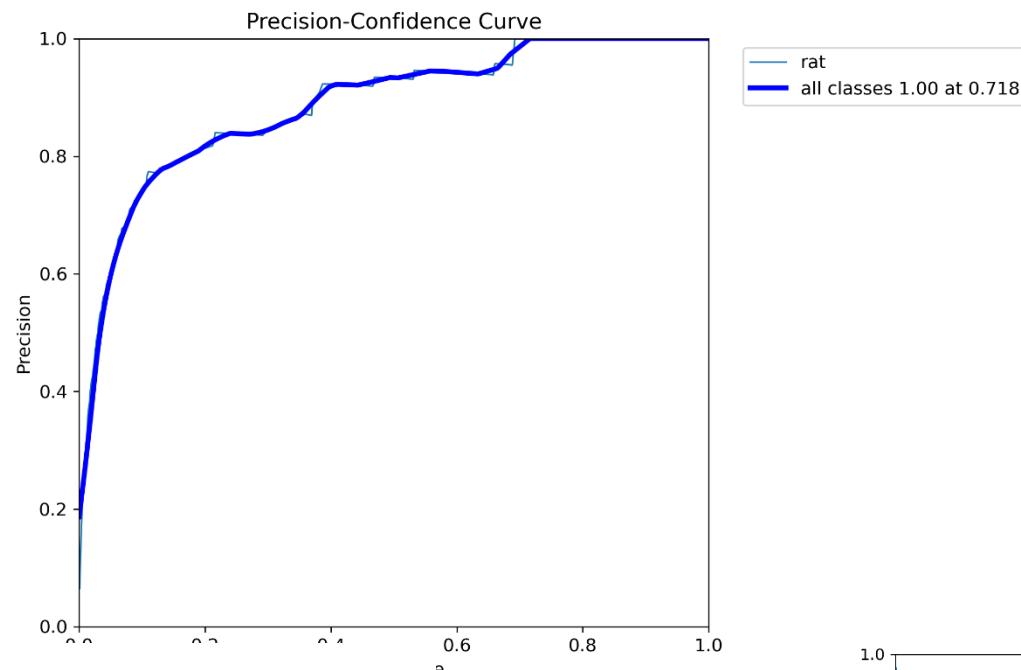


# Part three

**Results & validation**



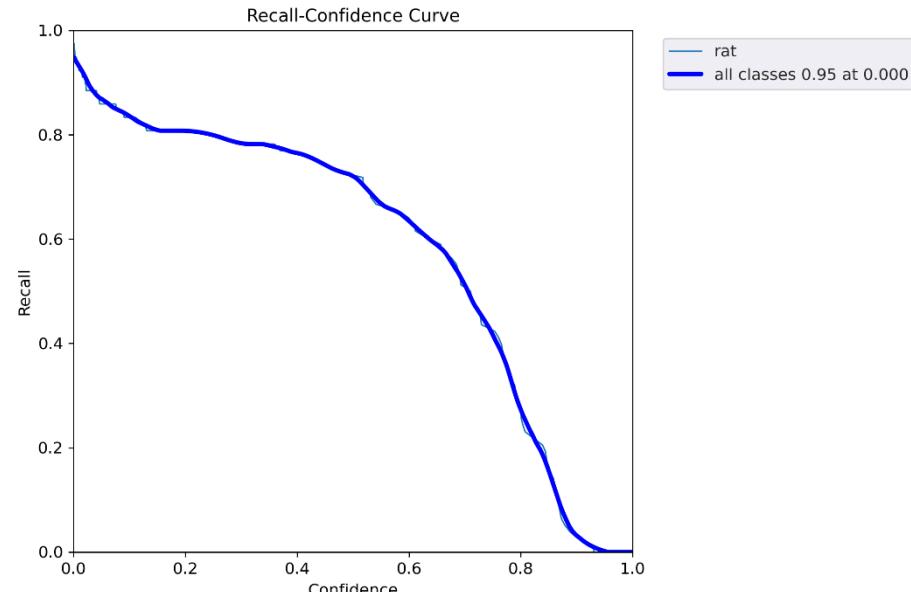
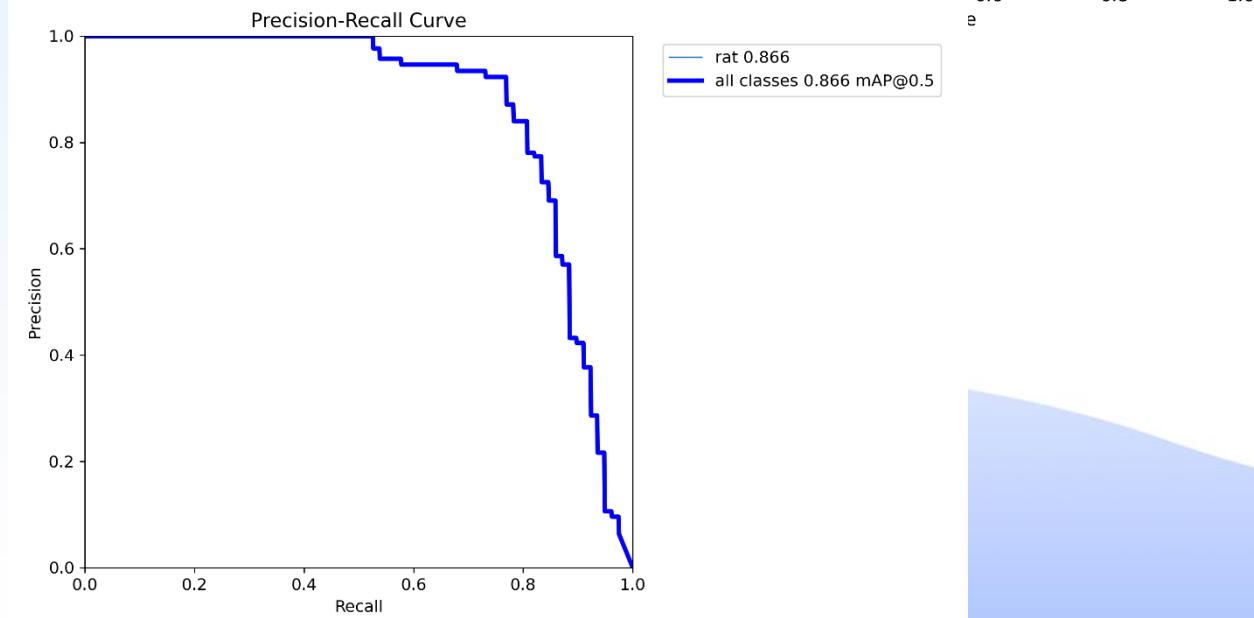
## Precision recall



Precision represents the proportion of positive predictions that are actually correct.

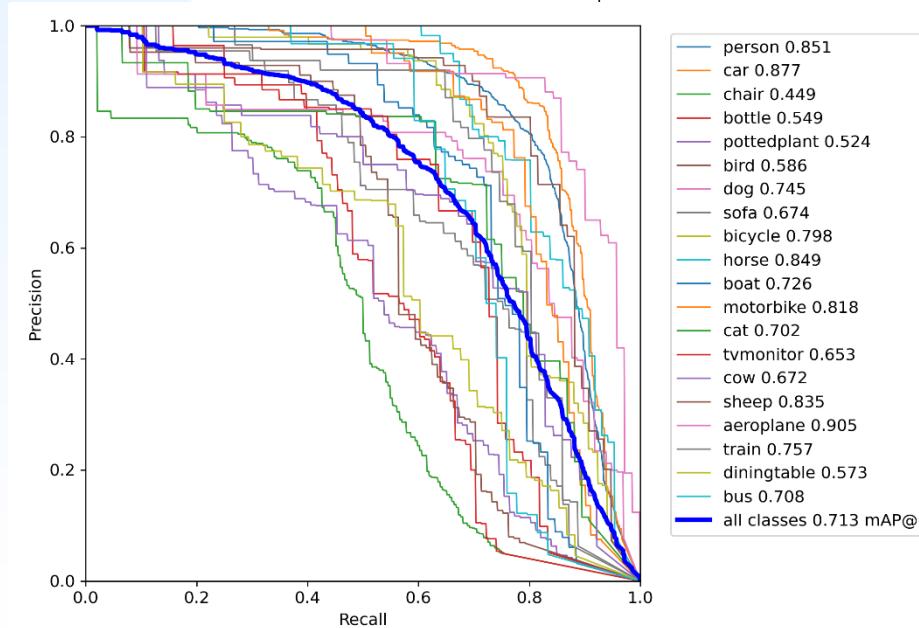
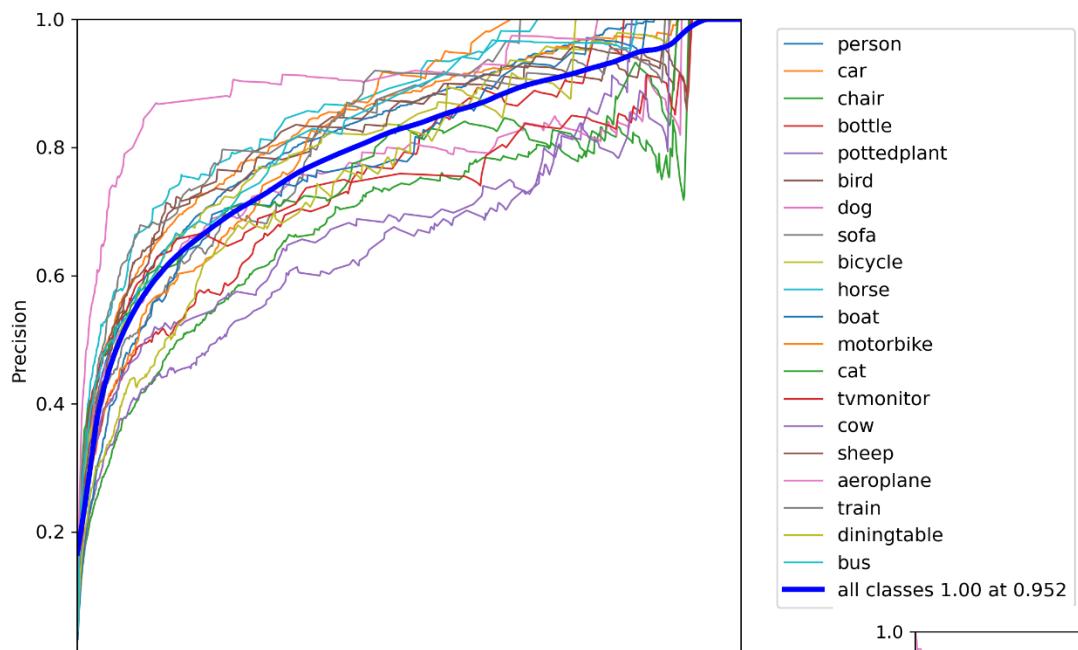


Recall is an indicator of the completeness of the classifier's positive predictions.





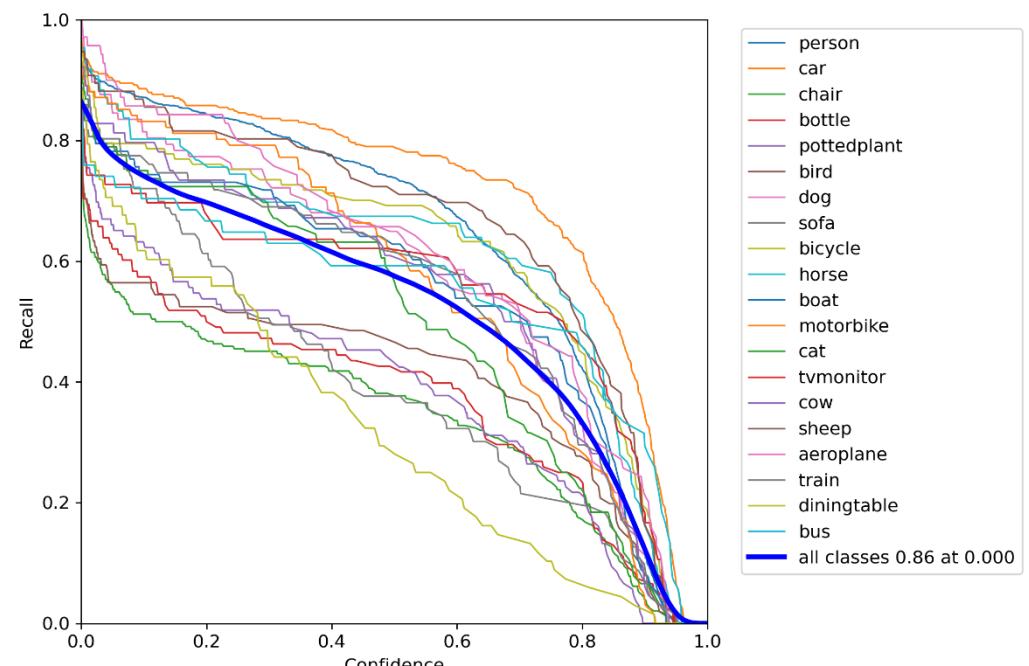
## Precision recall



Precision represents the proportion of positive predictions that are actually correct.



Recall is an indicator of the completeness of the classifier's positive predictions.





## Validation results

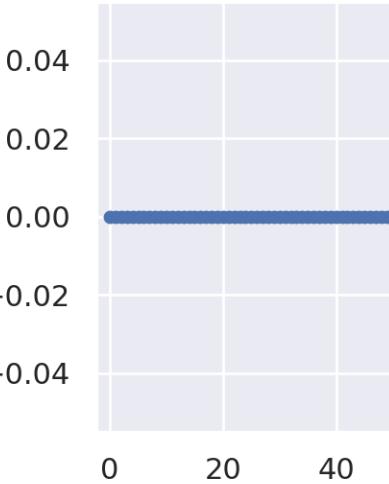
train/box\_loss



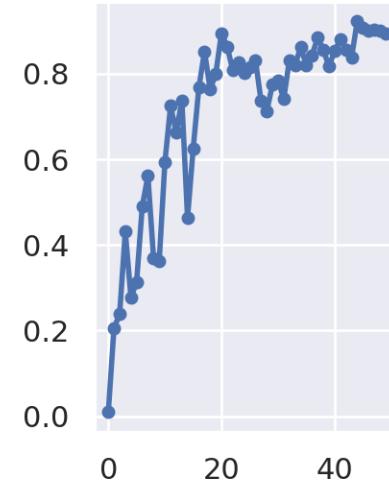
train/obj\_loss



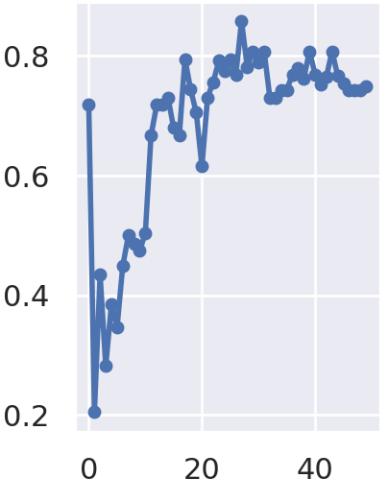
train/cls\_loss



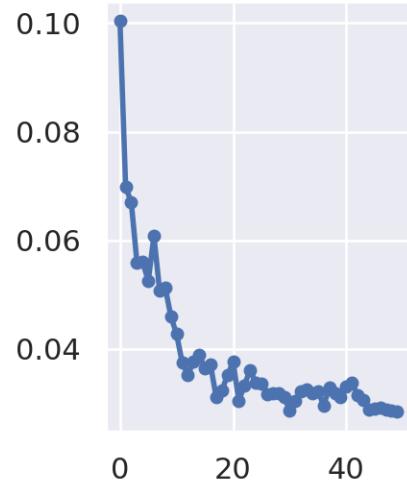
metrics/precision



metrics/recall



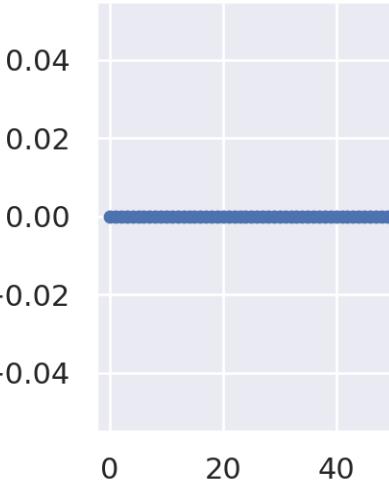
val/box\_loss



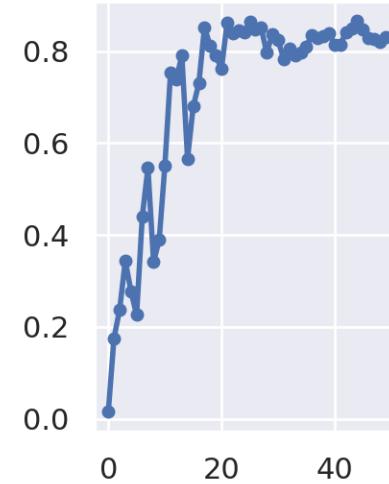
val/obj\_loss



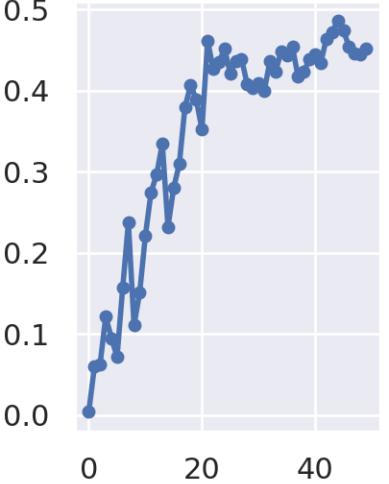
val/cls\_loss



metrics/mAP\_0.5



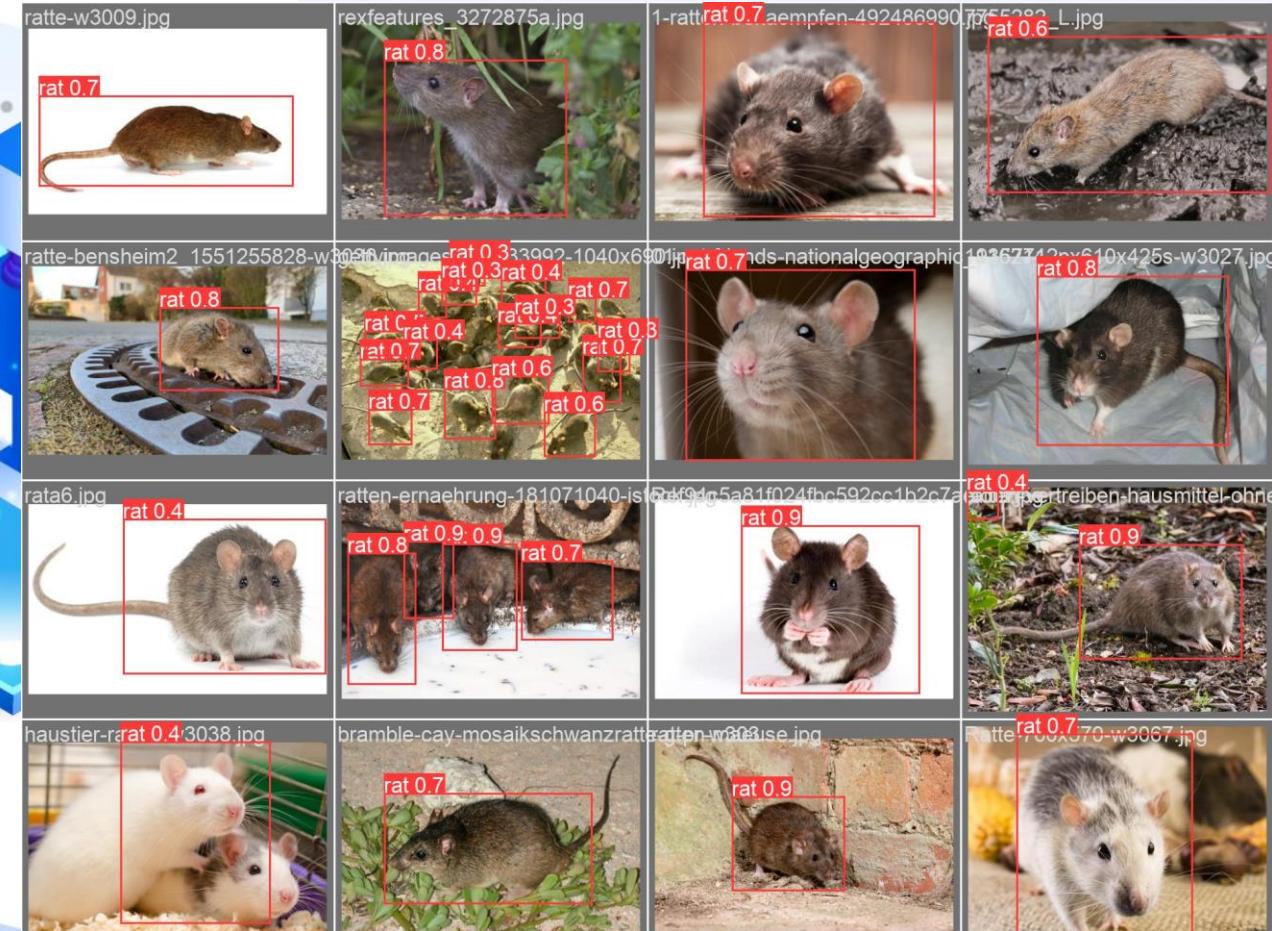
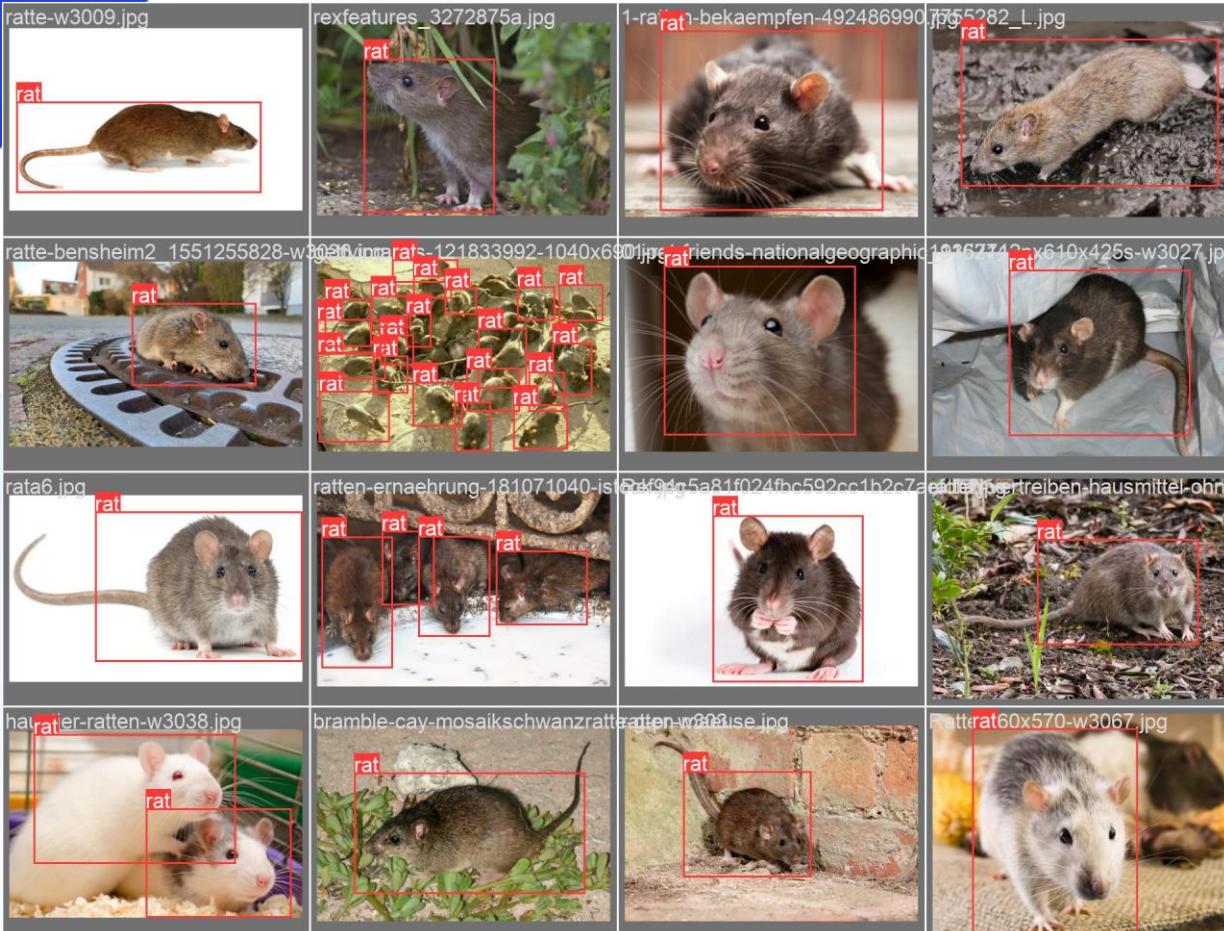
metrics/mAP\_0.5:0.95





## Validation results

### Actual

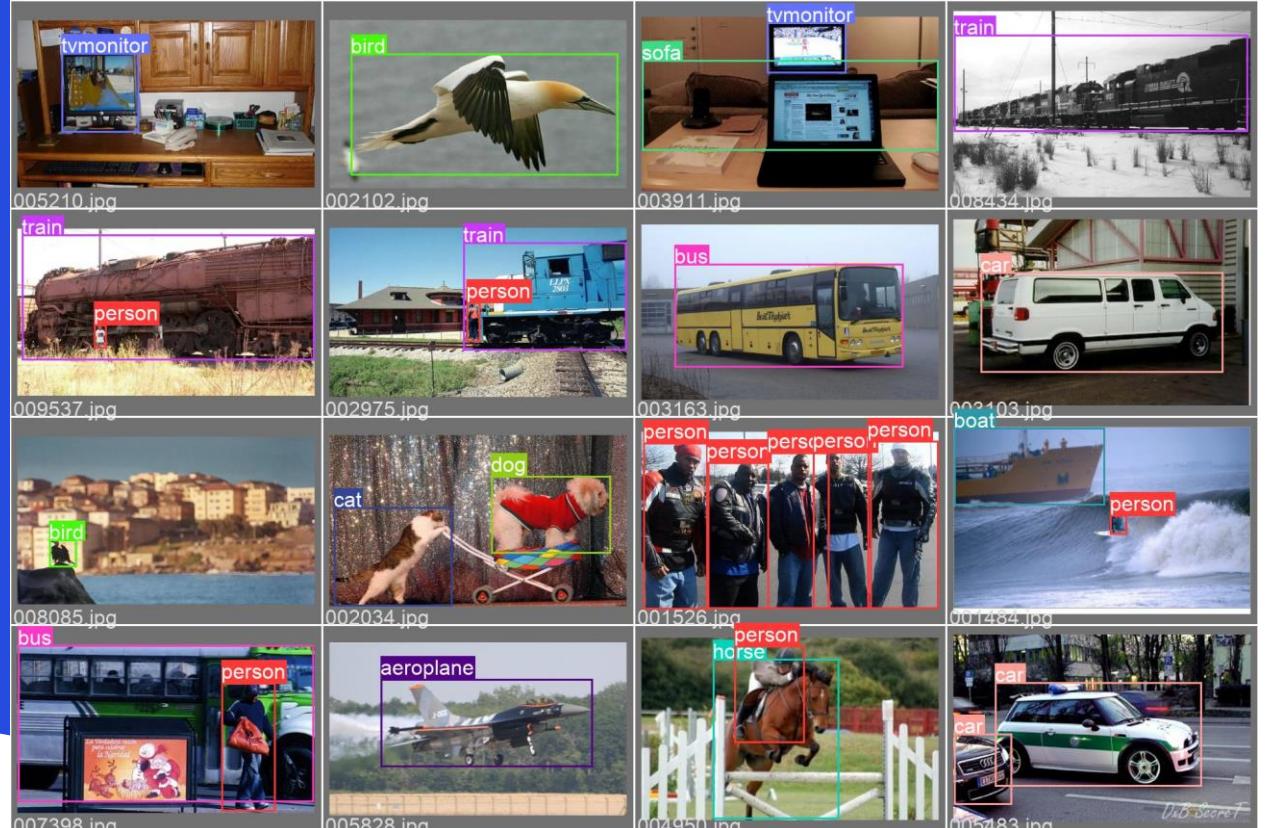


### Prediction



# Validation results

## Actual



## Prediction





## Confusion matrix



|               | True   |      |       |        |             |      |      |      |         |       |      |           |      |           |      |       |           |       |             |      |               |      |
|---------------|--------|------|-------|--------|-------------|------|------|------|---------|-------|------|-----------|------|-----------|------|-------|-----------|-------|-------------|------|---------------|------|
| Predicted     | person | car  | chair | bottle | pottedplant | bird | dog  | sofa | bicycle | horse | boat | motorbike | cat  | tvmonitor | cow  | sheep | aeroplane | train | diningtable | bus  | background FN |      |
| person        | 0.84   | 0.01 |       |        |             | 0.01 | 0.01 |      |         | 0.03  | 0.02 |           | 0.04 |           |      |       |           | 0.02  |             | 0.40 | 0.14          | 0.14 |
| car           |        | 0.84 |       |        |             |      |      |      |         |       | 0.03 |           |      |           |      |       |           |       |             |      | 0.10          | 0.52 |
| chair         |        |      | 0.46  |        |             |      |      |      |         | 0.09  |      |           |      |           |      |       |           |       |             |      | 0.08          | 0.50 |
| bottle        |        |      |       | 0.50   |             |      |      |      |         |       |      |           |      |           |      |       |           |       |             |      | 0.04          | 0.54 |
| pottedplant   |        |      |       |        | 0.54        |      |      |      |         |       |      |           |      |           |      |       |           |       |             |      | 0.06          | 0.01 |
| bird          |        |      |       |        |             | 0.52 | 0.01 |      |         |       |      |           |      |           |      |       |           |       |             |      | 0.02          | 0.01 |
| dog           |        |      |       |        |             | 0.01 | 0.70 | 0.01 |         |       | 0.03 |           |      |           |      |       |           |       |             |      | 0.05          | 0.04 |
| sofa          |        |      |       |        |             |      | 0.02 | 0.52 |         |       |      |           |      |           |      |       |           |       |             |      | 0.01          | 0.01 |
| bicycle       |        |      |       |        |             |      |      | 0.74 |         |       |      |           |      |           |      |       |           |       |             |      | 0.01          | 0.01 |
| horse         |        |      |       |        |             |      |      |      | 0.72    |       |      |           |      |           |      |       |           |       |             |      | 0.01          | 0.01 |
| boat          |        |      |       |        |             |      |      |      |         | 0.73  |      |           |      |           |      |       |           |       |             |      | 0.01          | 0.01 |
| motorbike     |        |      |       |        |             |      |      |      |         |       | 0.73 |           |      |           |      |       |           |       |             |      | 0.05          | 0.03 |
| cat           |        |      |       |        |             |      |      |      |         |       |      | 0.70      |      |           |      |       |           |       |             |      | 0.02          | 0.05 |
| tvmonitor     |        |      |       |        |             |      |      |      |         |       |      |           | 0.64 |           |      |       |           |       |             |      | 0.02          | 0.01 |
| cow           |        |      |       |        |             |      |      |      |         |       |      |           |      | 0.66      | 0.08 |       |           |       |             |      | 0.03          | 0.01 |
| sheep         |        |      |       |        |             |      |      |      |         |       |      |           |      |           | 0.75 | 0.03  |           |       |             |      | 0.02          | 0.02 |
| aeroplane     |        |      |       |        |             |      |      |      |         |       |      |           |      |           |      | 0.80  |           |       |             |      | 0.01          | 0.01 |
| train         |        |      |       |        |             |      |      |      |         |       |      |           |      |           |      |       | 0.73      |       |             |      | 0.01          | 0.01 |
| diningtable   |        |      |       |        |             |      |      |      |         |       |      |           |      |           |      |       |           | 0.73  |             |      | 0.02          | 0.01 |
| bus           |        |      |       |        |             |      |      |      |         |       |      |           |      |           |      |       |           |       | 0.65        |      | 0.01          | 0.01 |
| background FN | 0.14   | 0.14 | 0.52  | 0.50   | 0.46        | 0.46 | 0.16 | 0.38 | 0.20    | 0.16  | 0.23 | 0.21      | 0.24 | 0.36      | 0.19 | 0.13  | 0.19      | 0.25  | 0.44        | 0.33 | 0.14          | 0.14 |

01

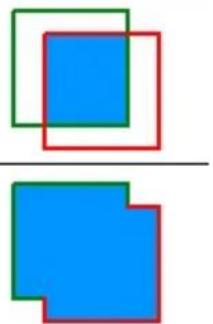


## Intersection over Union (IoU)

$$\text{IoU} = \frac{\text{area}(gt \cap pd)}{\text{area}(gt \cup pd)}$$

02



$$IOU = \frac{\text{area of overlap}}{\text{area of union}} = \frac{\text{area of overlap}}{\text{area of union}}$$


IoU metric ranges from 0 and 1



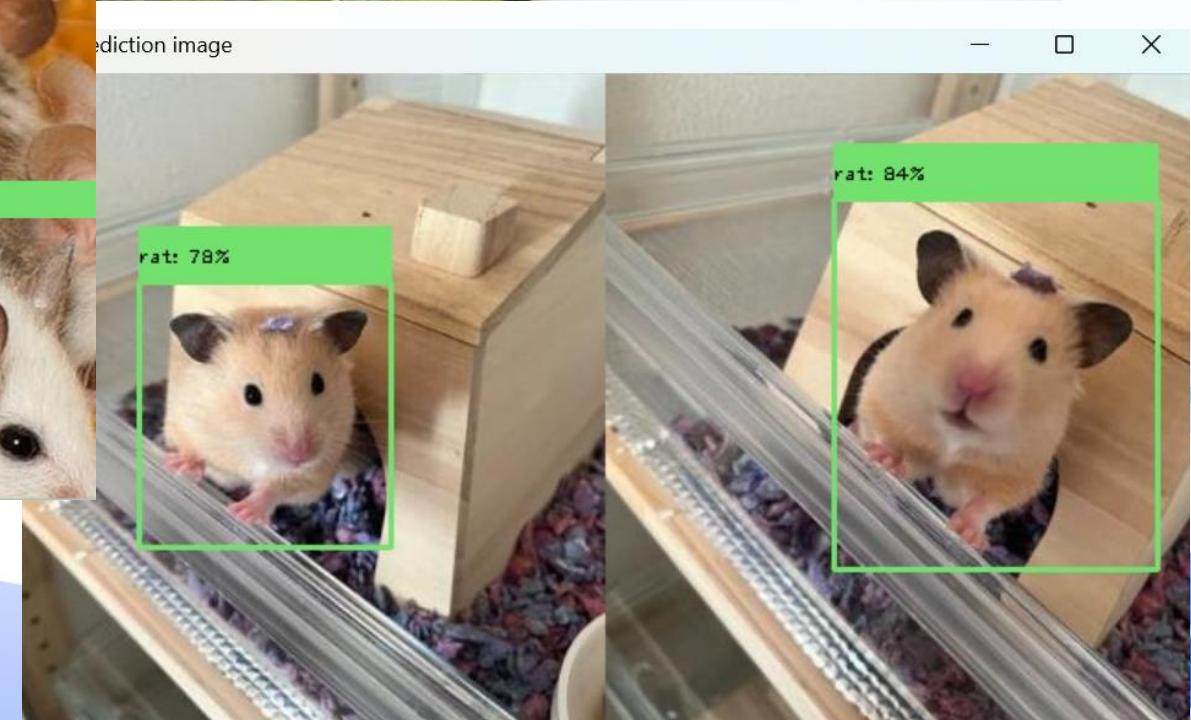
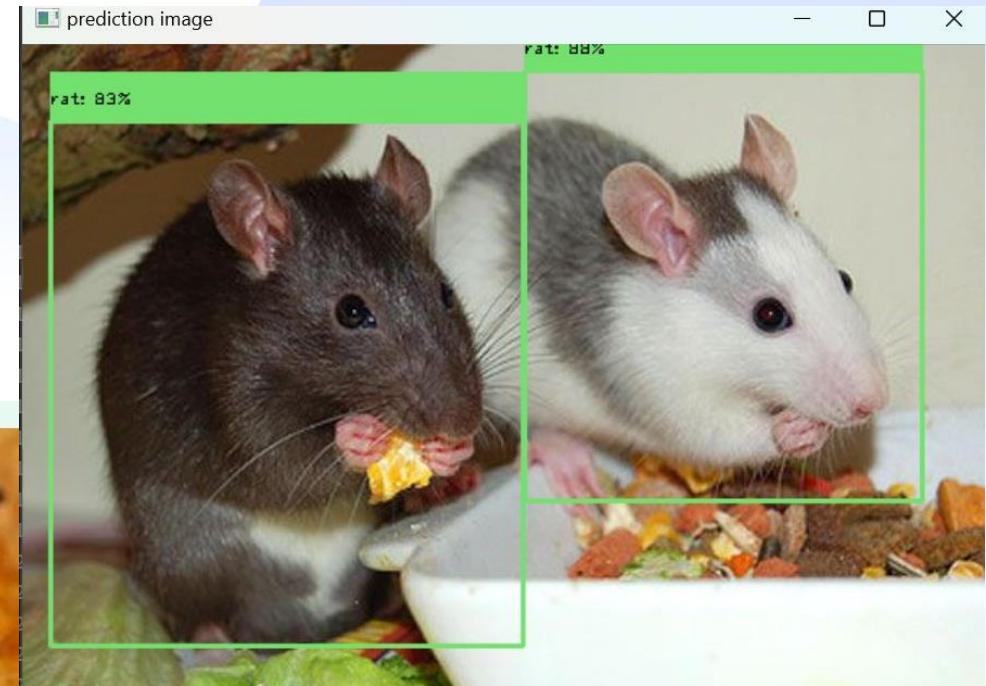
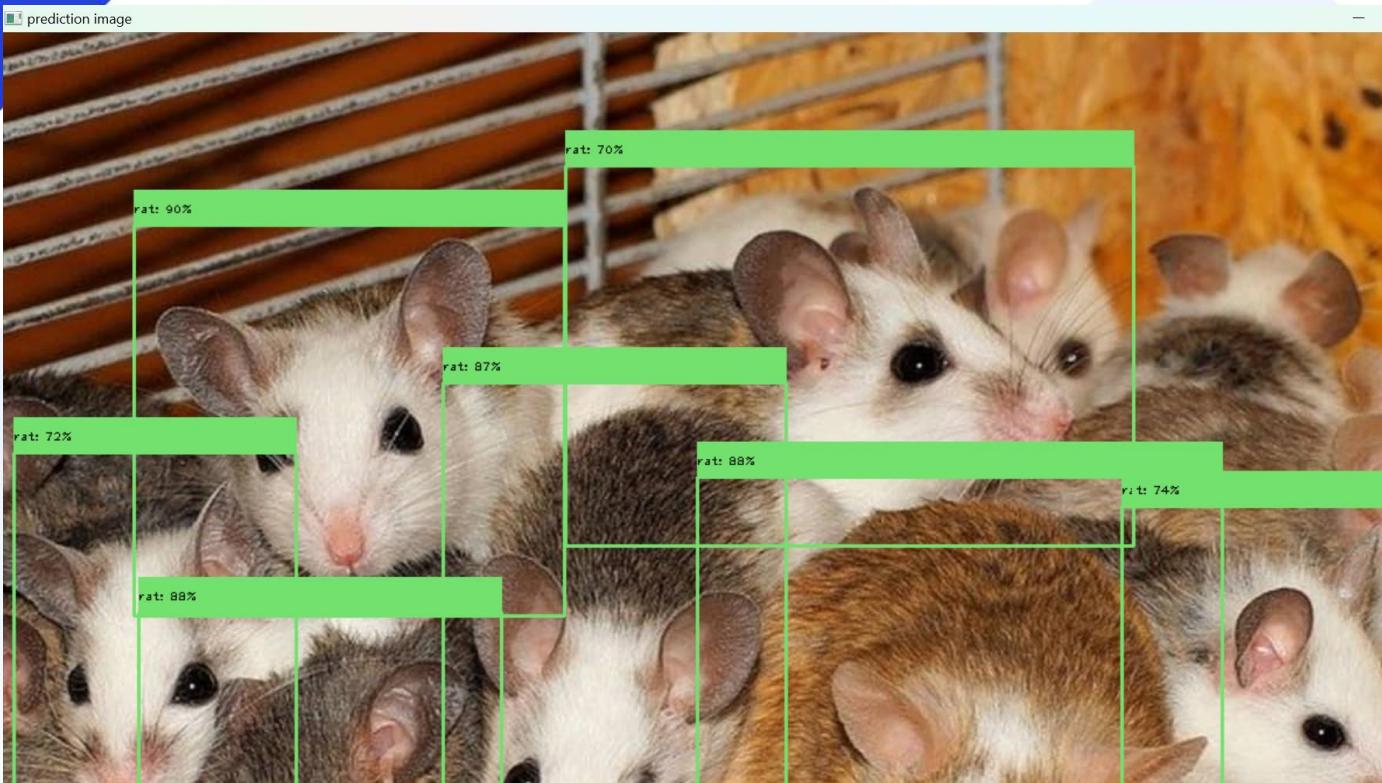


# Part four

**Prediction and results**

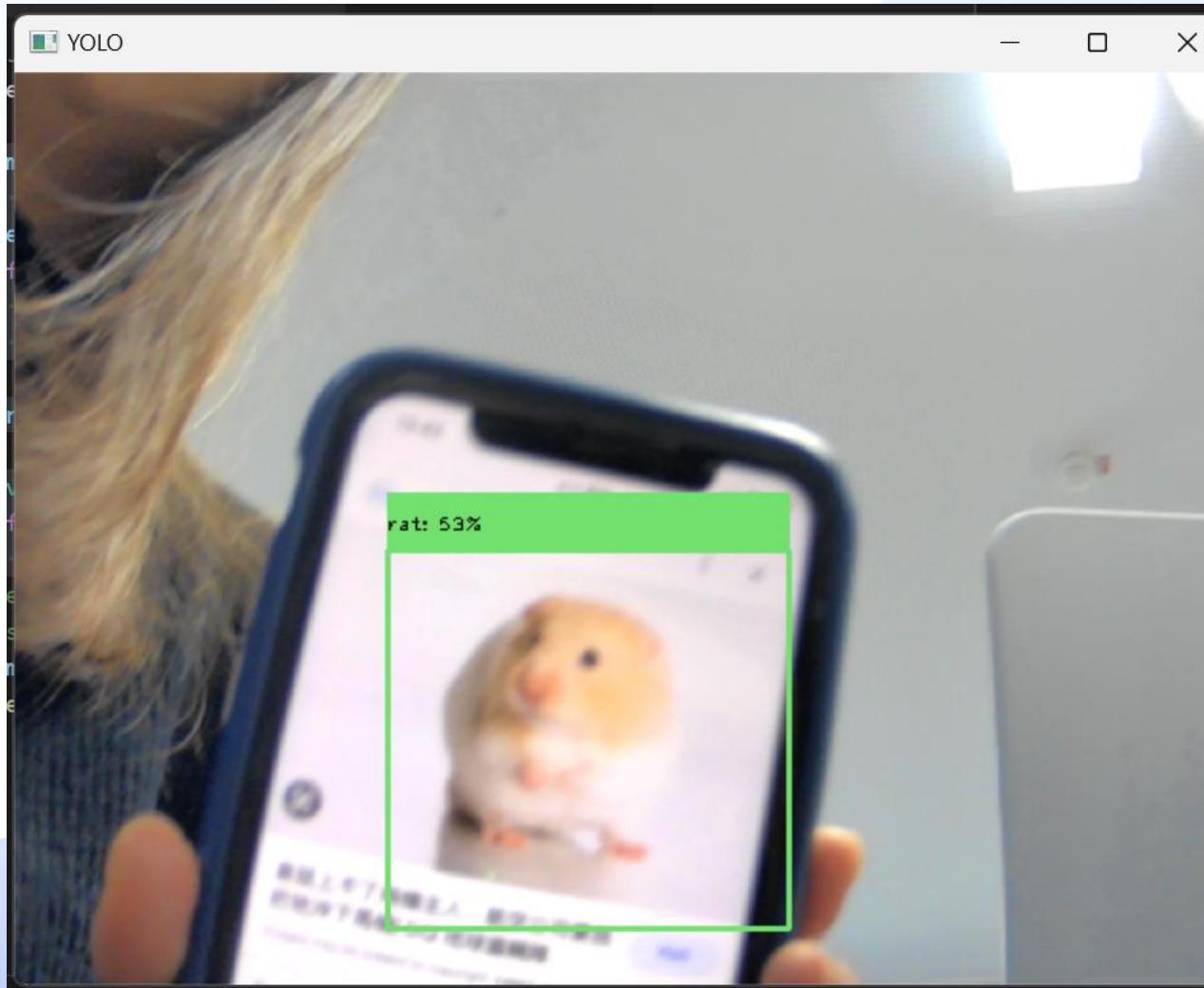


# Rat detection



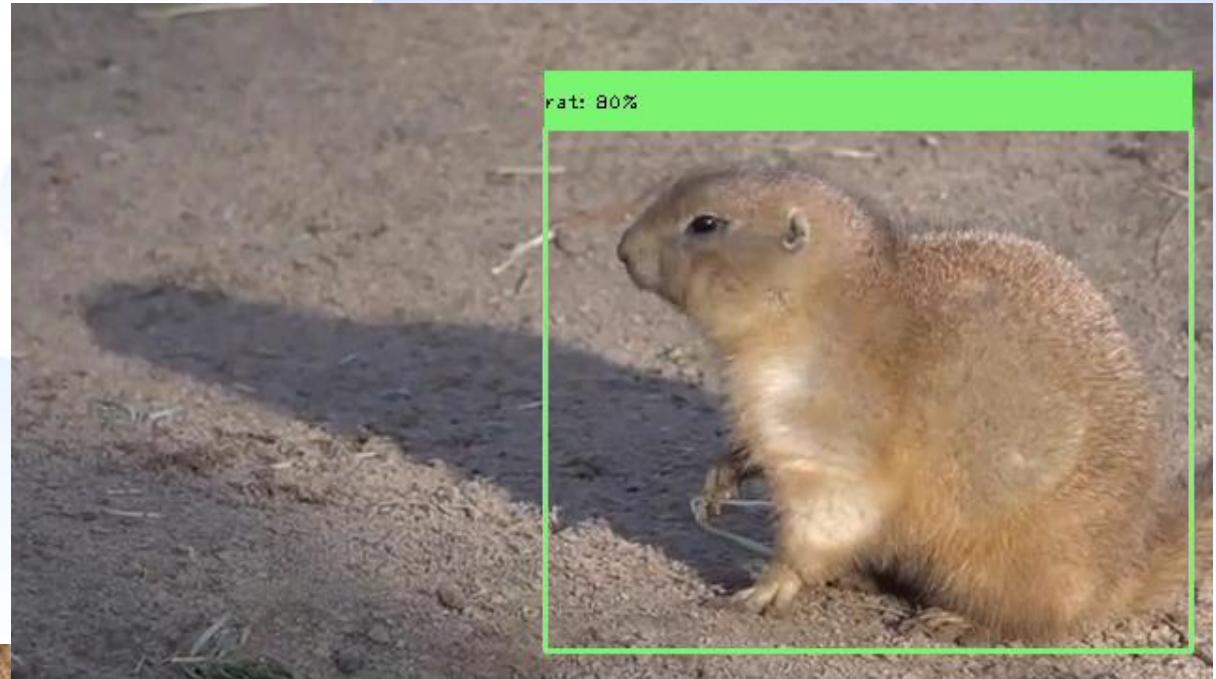
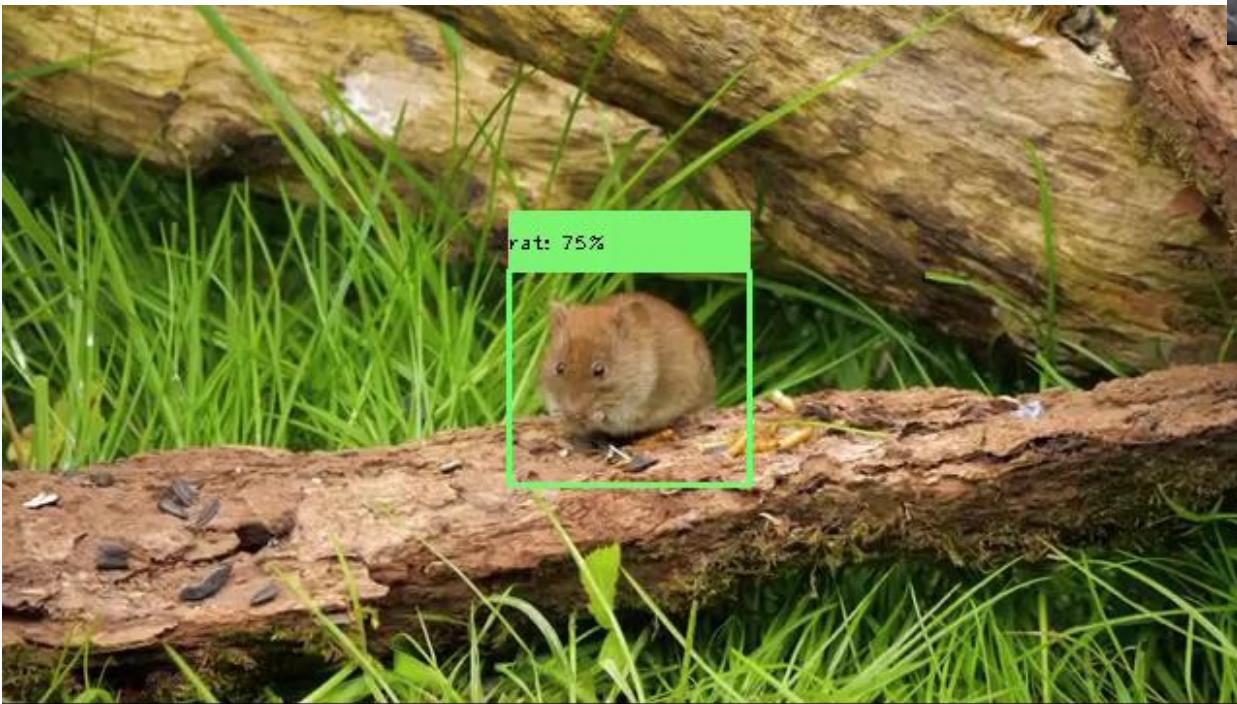


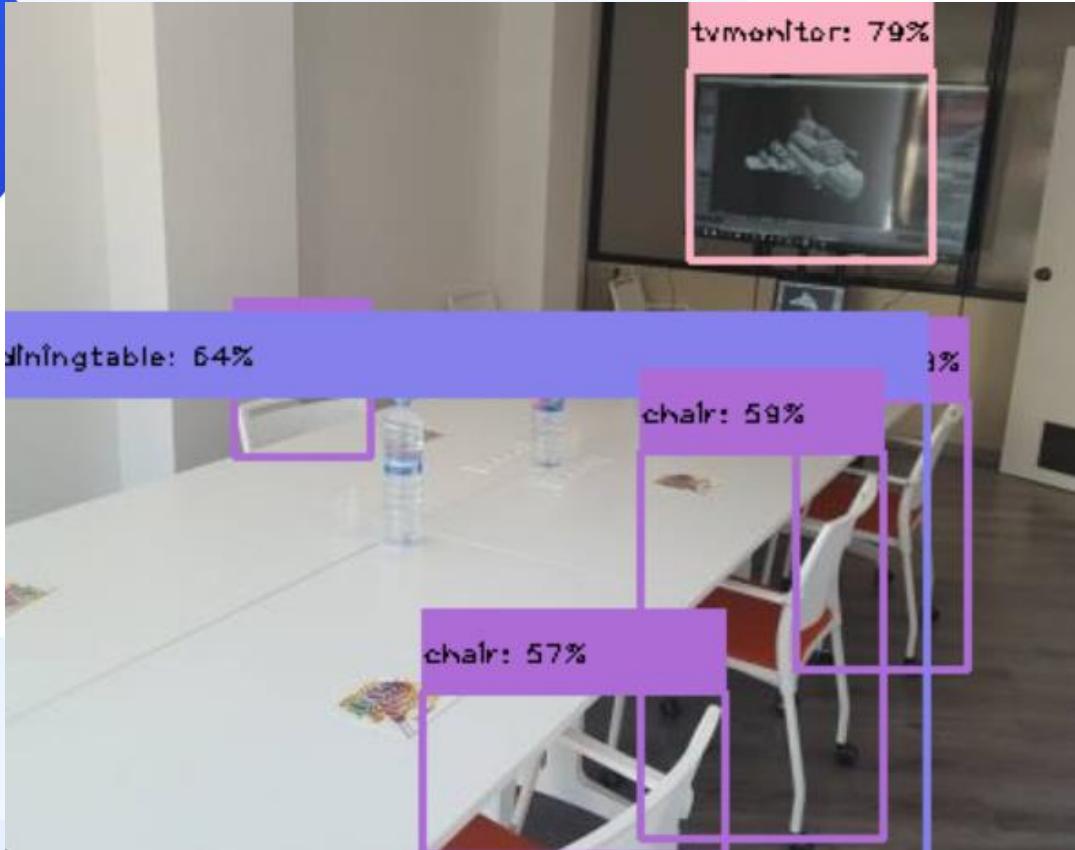
# Rat detection





# Rat detection

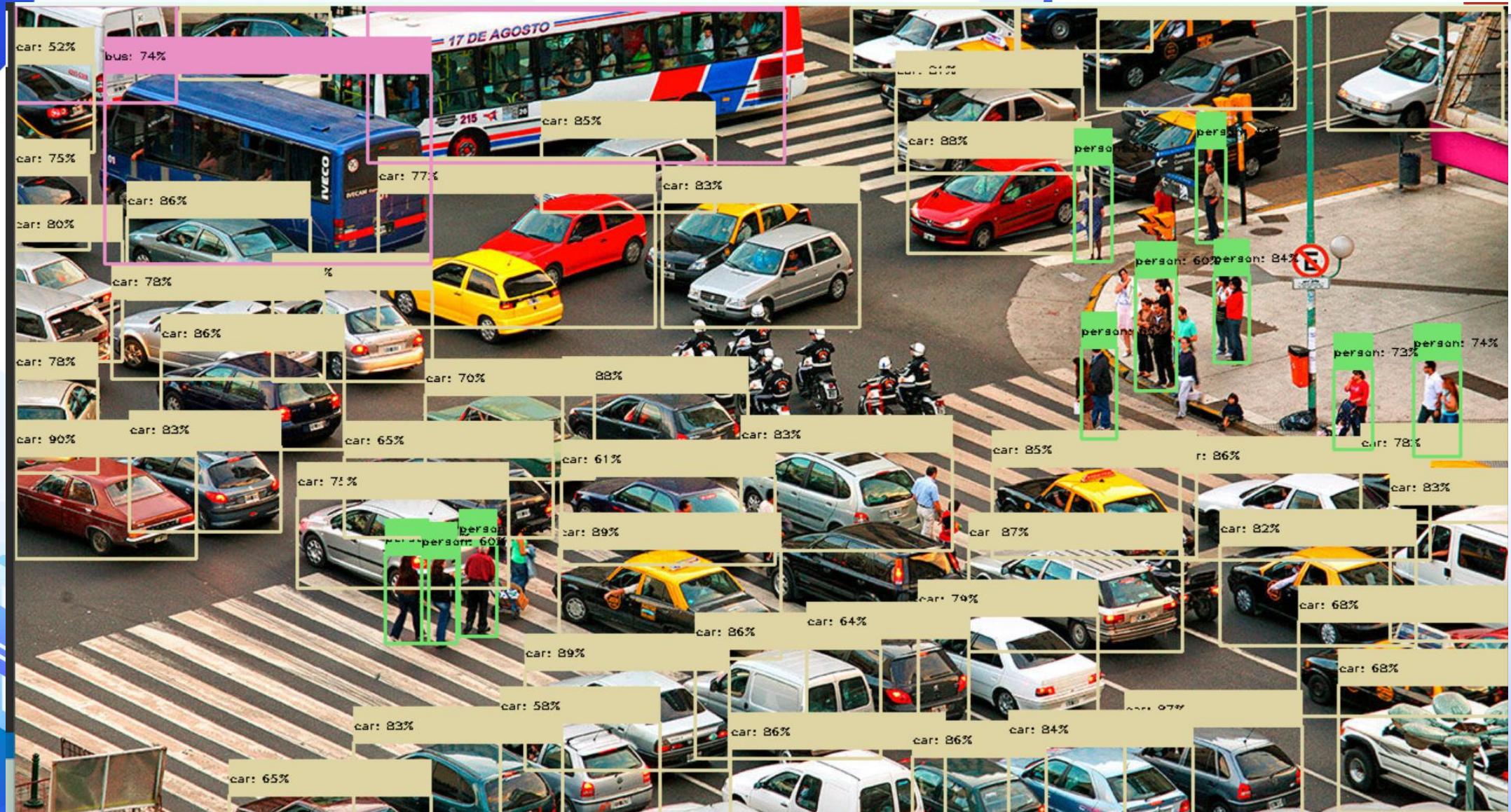




**20 objects  
detection**

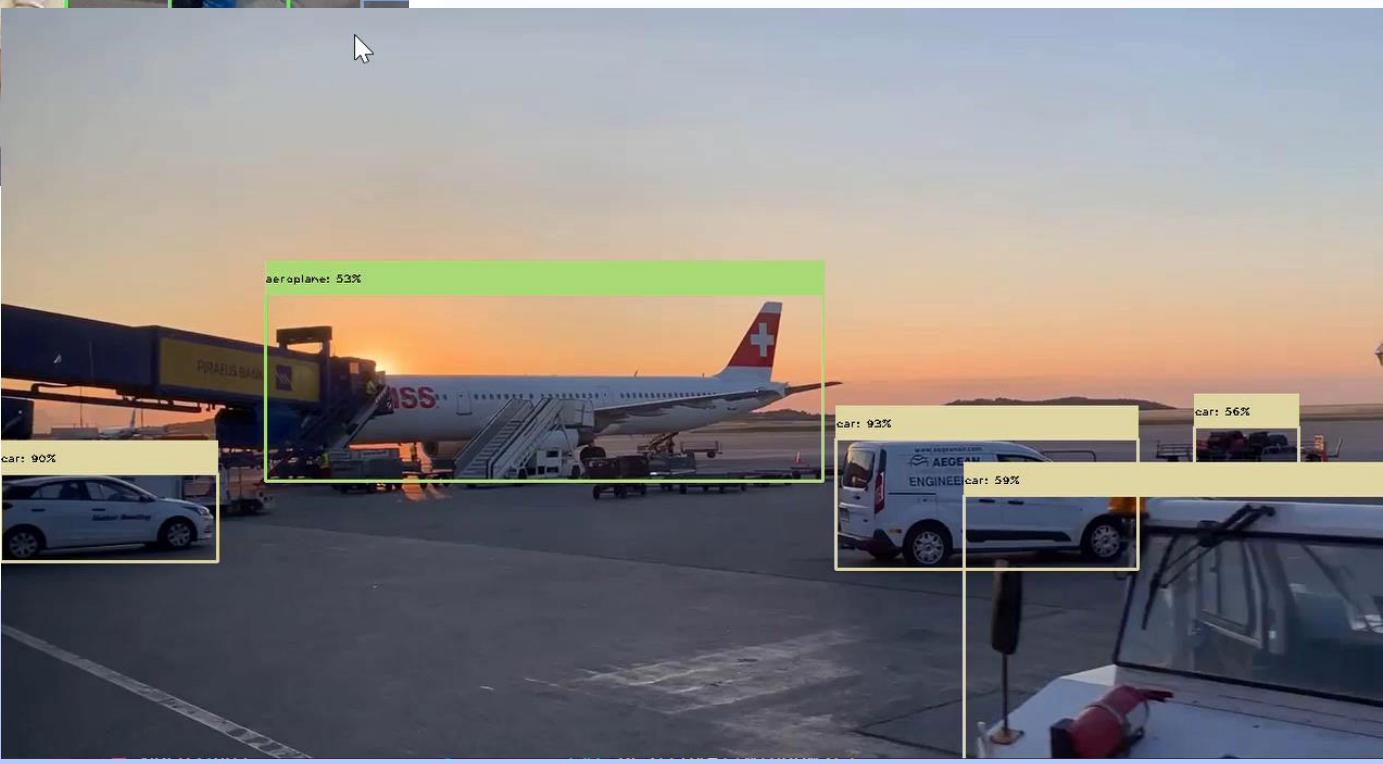
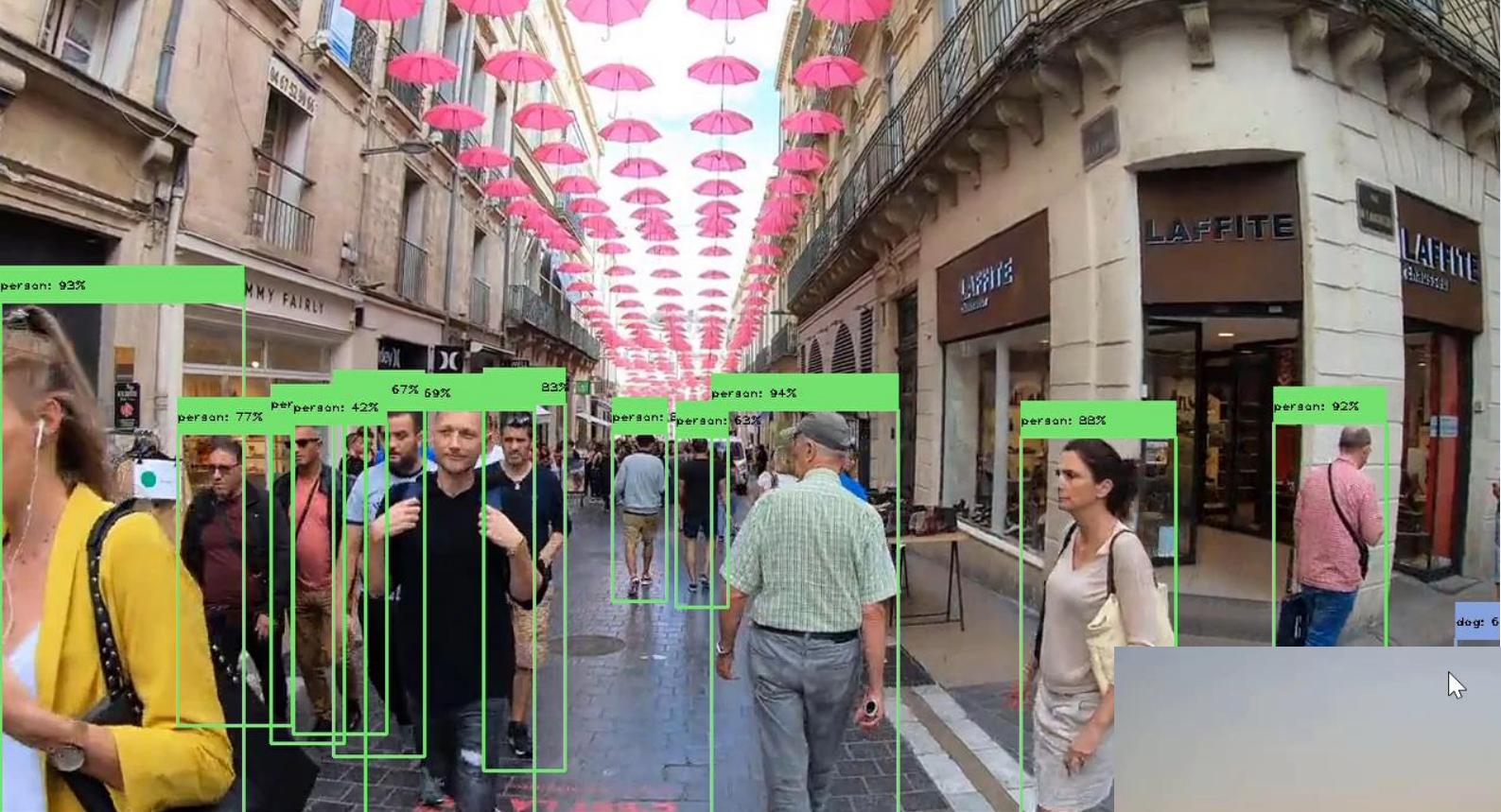


# 20 objects detection





**20 objects  
detection**



# THANK YOU



Szu-Chi Huang

