



LVIS Fruits And Vegetables Dataset

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<https://github.com/henningheyen/Fruits-And-Vegetables-Detection-Dataset>

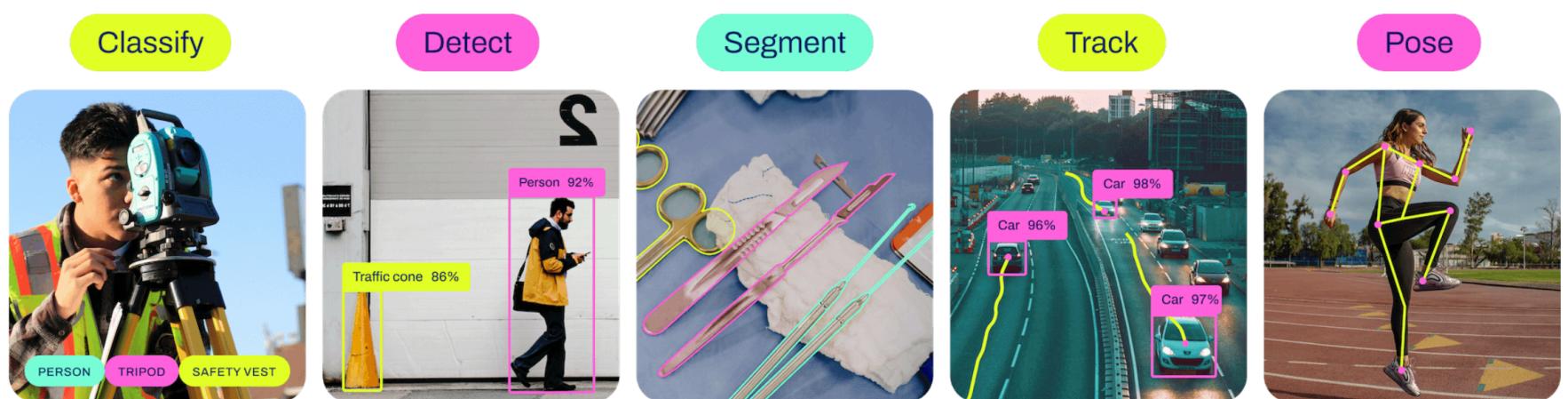
The Problem

Goal: Detect Fruits and Vegetables in Images

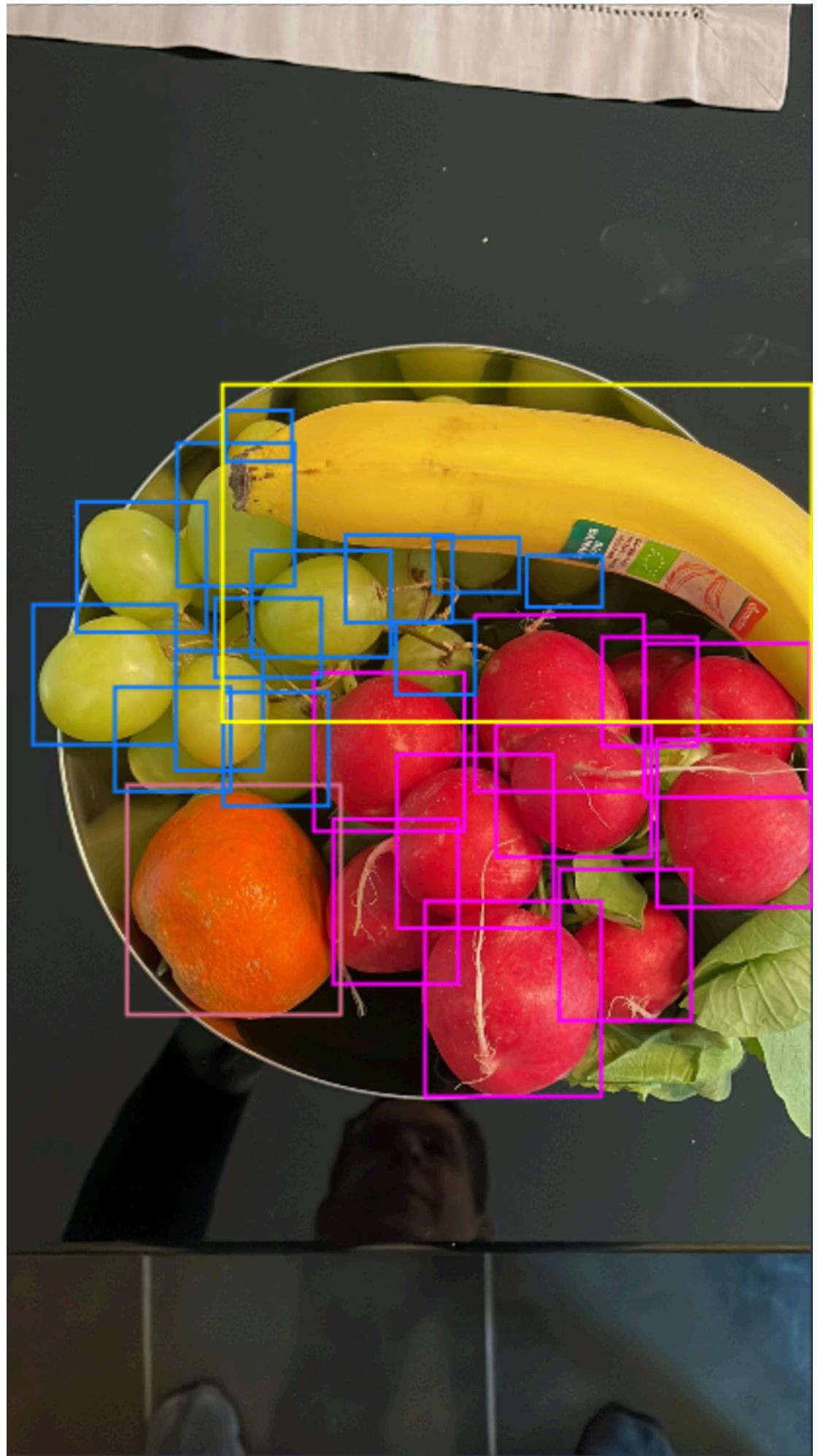
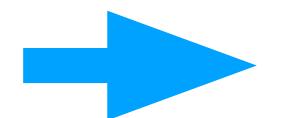
Type of Computer Vision Problem?

(Classification, Segmentation, Detection...)

→ Detection



Most open-source datasets are either too small (<100MB) or have few classes (<10)



The Dataset

- **Problem:** Where can we find a **BIGGGG** dataset of fruits and vegetables **with labels?**
- **Idea:** Take **LVIS dataset** (1200 classes, 100000 images, >25GB) and only keep images with fruits and vegetables
- **Result: LVIS-Fruits-And-Vegetables-Dataset** (63 classes, 8221 images) -> including multiple items per image, Example Images:



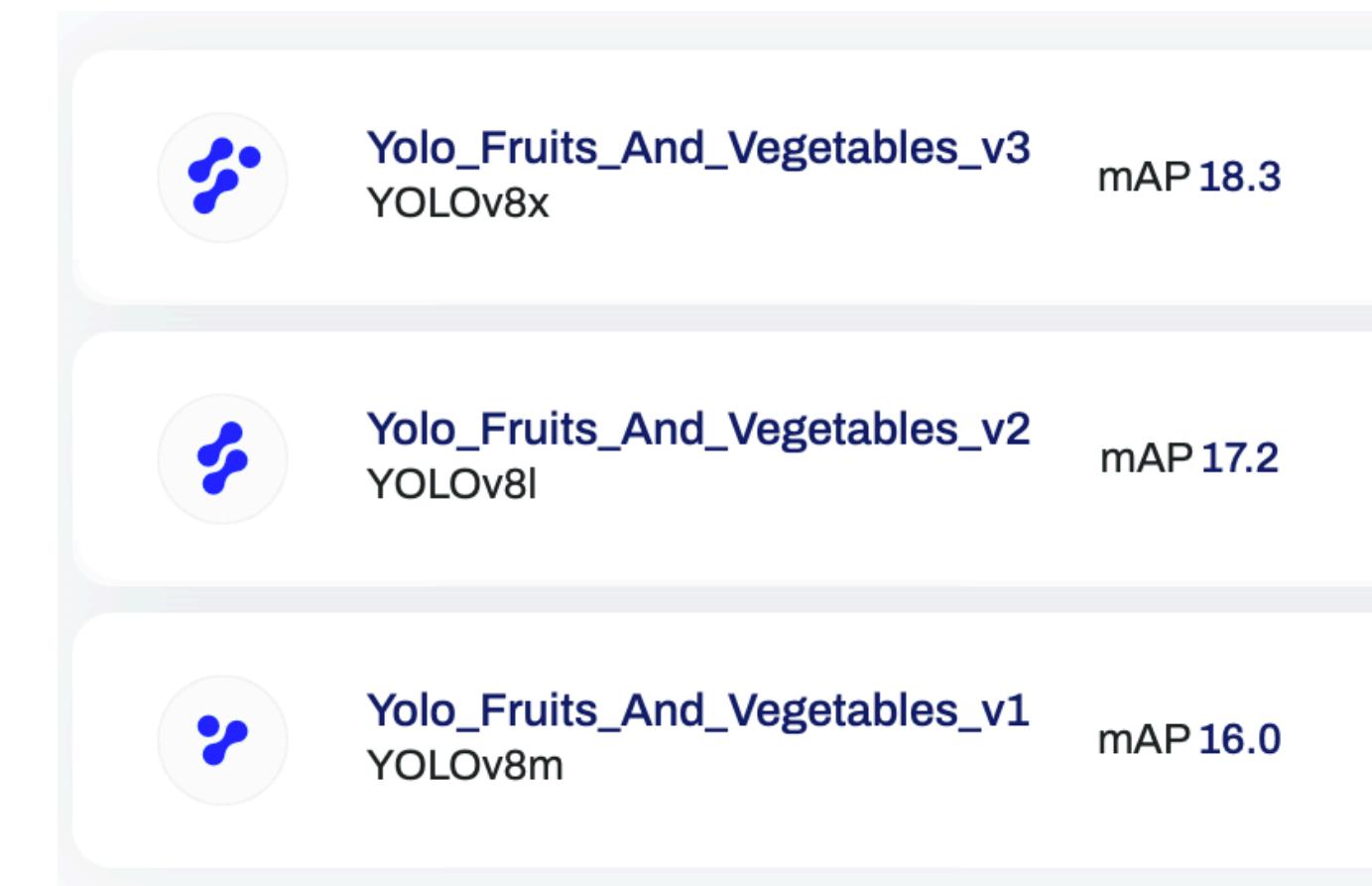
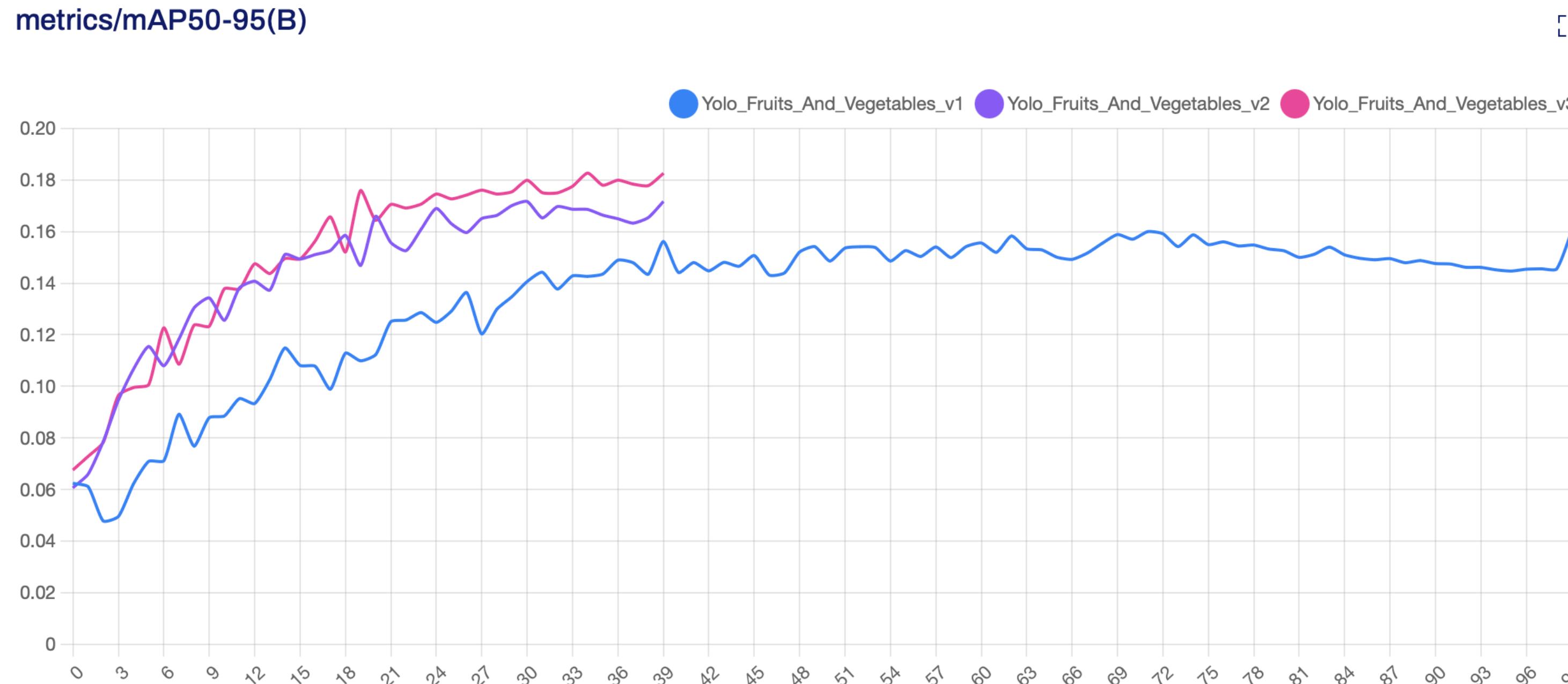
Fine Tuning on Custom Dataset

Fine Tuning YOLOv8 on LVIS-Fruits-And-Vegetables-Dataset

1. Convert annotations from COCO (.json) format to YOLO (.txt) format
2. Trained custom model on [Ultralytics Hub](#) (too intense for local or Colab)
3. Trained on YOLOv8m, YOLOv8 and YOLOv8x models

Model	size (pixels)	mAP ^{val} 50-95	Speed CPU ONNX (ms)	Speed A100 TensorRT (ms)	params (M)	FLOPs (B)
YOLOv8n	640	37.3	80.4	0.99	3.2	8.7
YOLOv8s	640	44.9	128.4	1.20	11.2	28.6
YOLOv8m	640	50.2	234.7	1.83	25.9	78.9
YOLOv8l	640	52.9	375.2	2.39	43.7	165.2
YOLOv8x	640	53.9	479.1	3.53	68.2	257.8

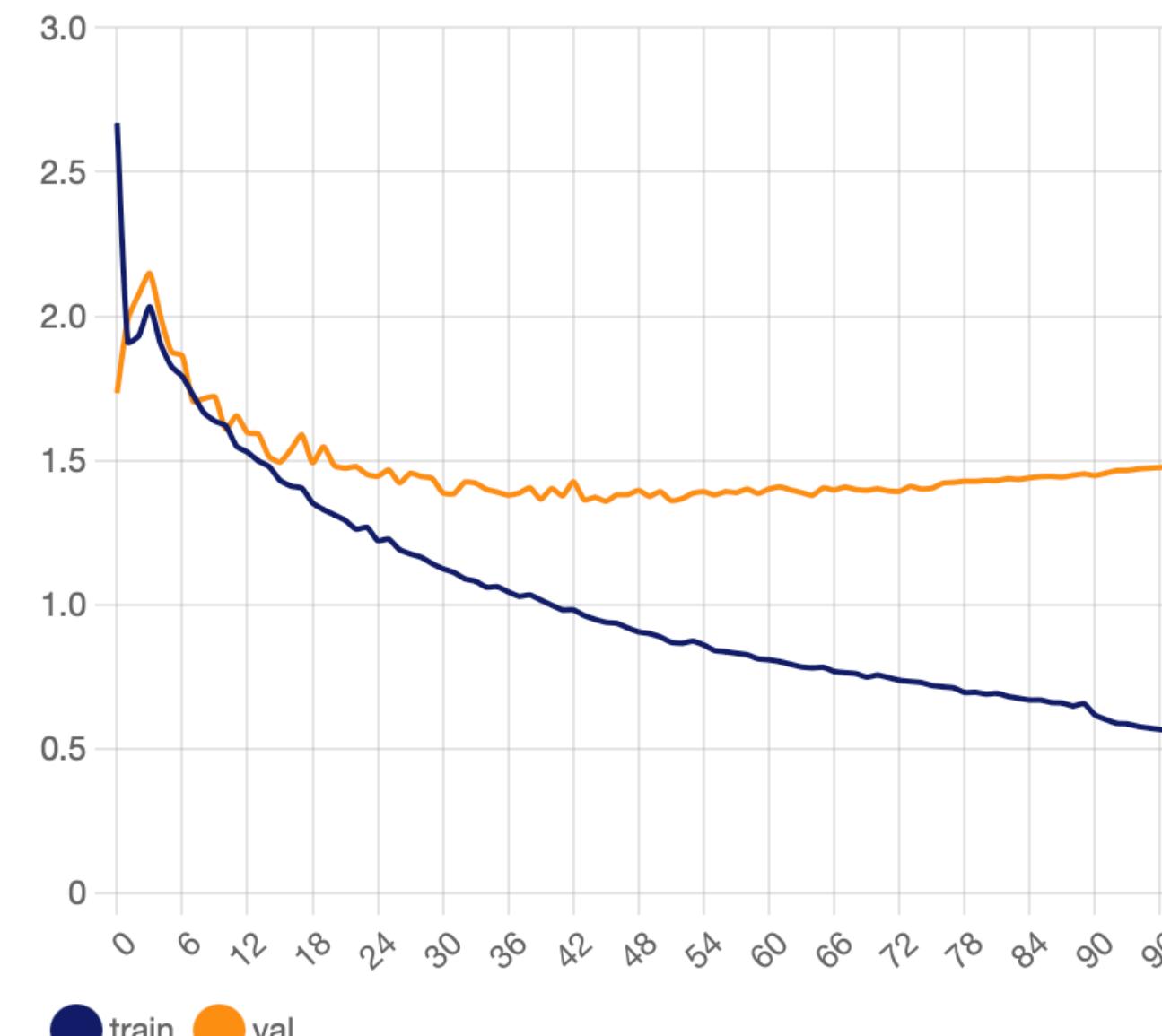
metrics/mAP50-95(B)



Fine Tuning on Custom Dataset

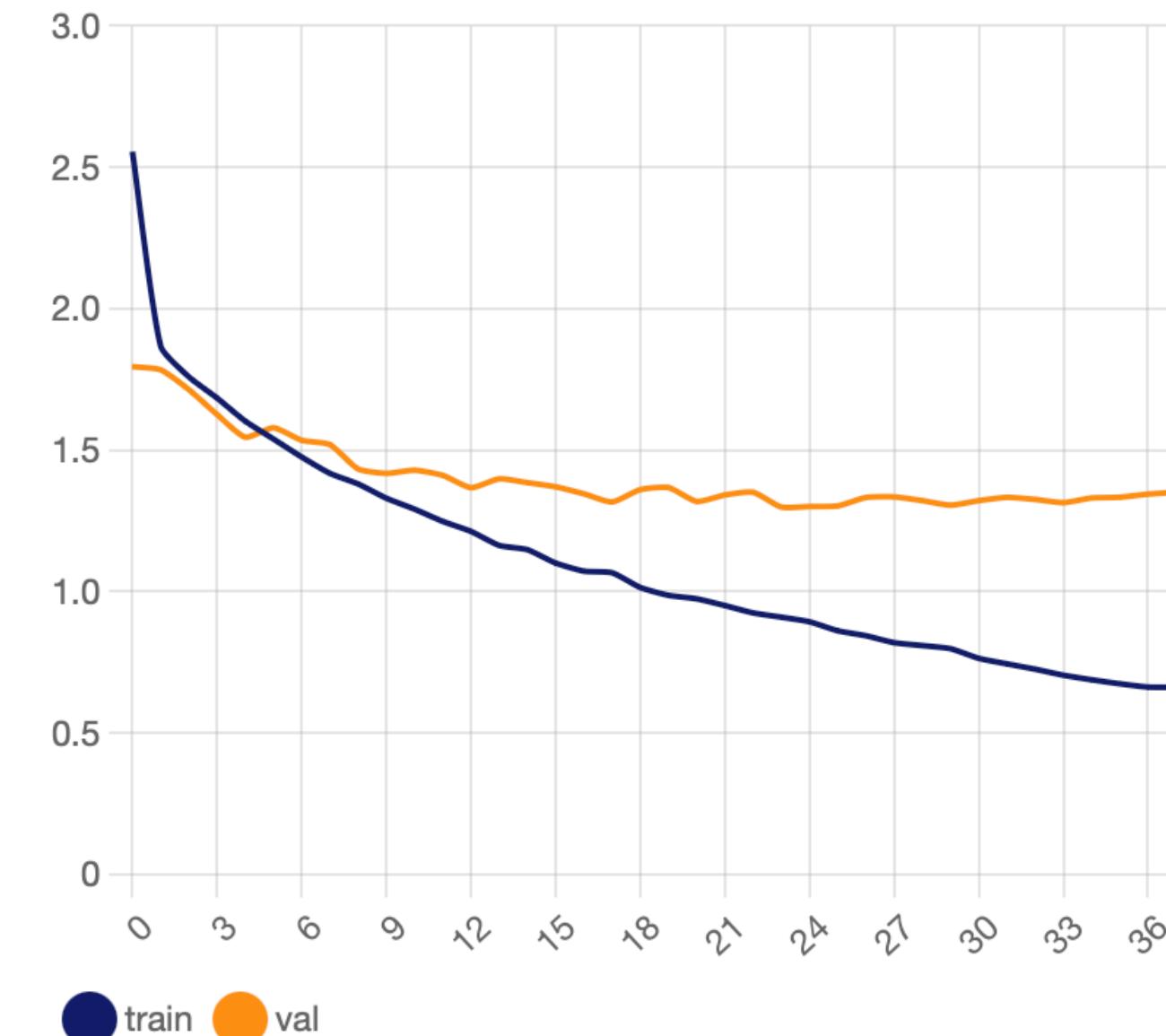
Fine Tuning YOLOv8 on LVIS-Fruits-And-Vegetables-Dataset → Class Loss

Class Loss
The accuracy of the classes in each detection



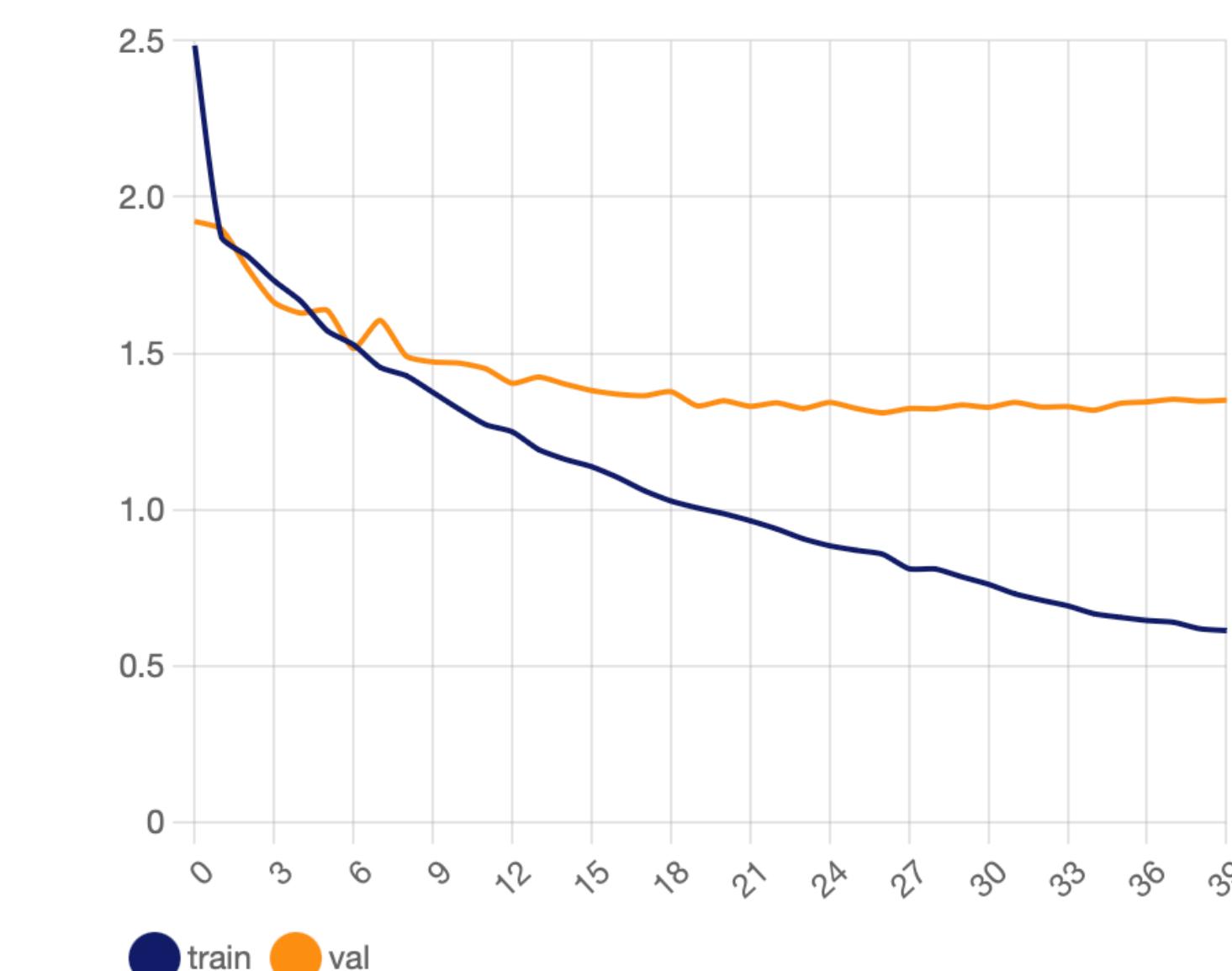
 Yolo_Fruits_And_Vegetables_v1
YOLOv8m

Class Loss
The accuracy of the classes in each detection



 Yolo_Fruits_And_Vegetables_v2
YOLOv8l

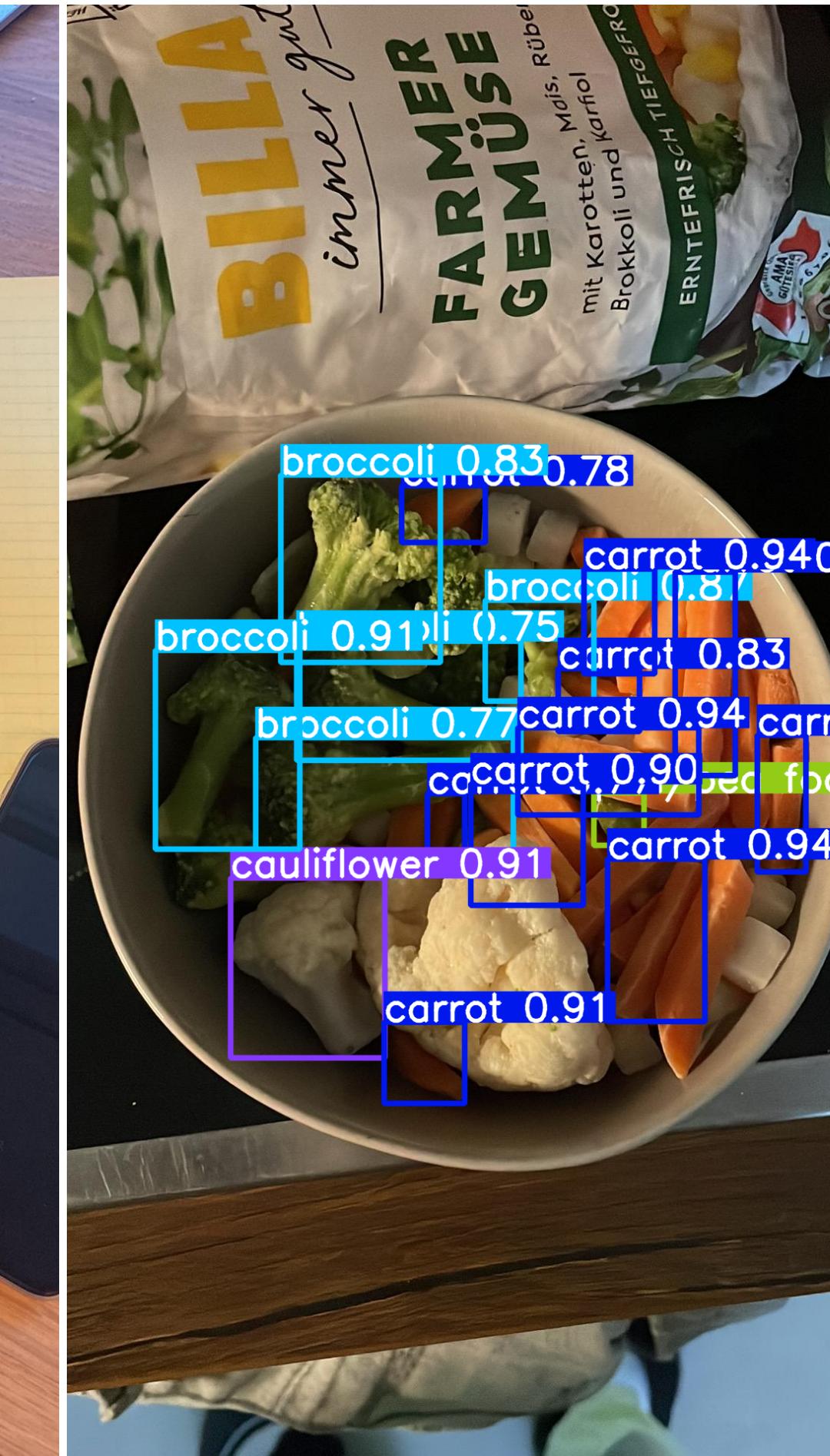
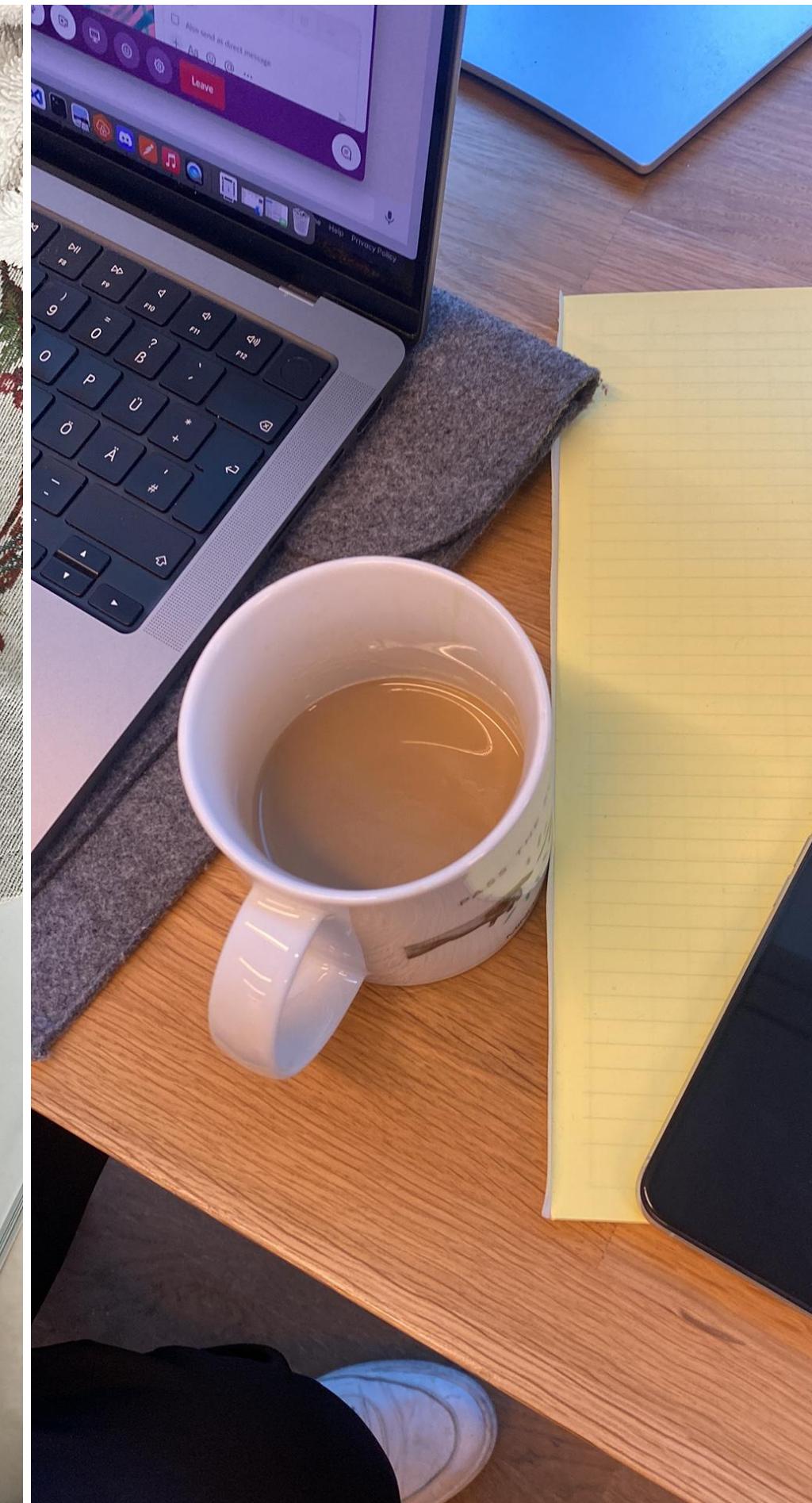
Class Loss
The accuracy of the classes in each detection



 Yolo_Fruits_And_Vegetables_v3
YOLOv8x

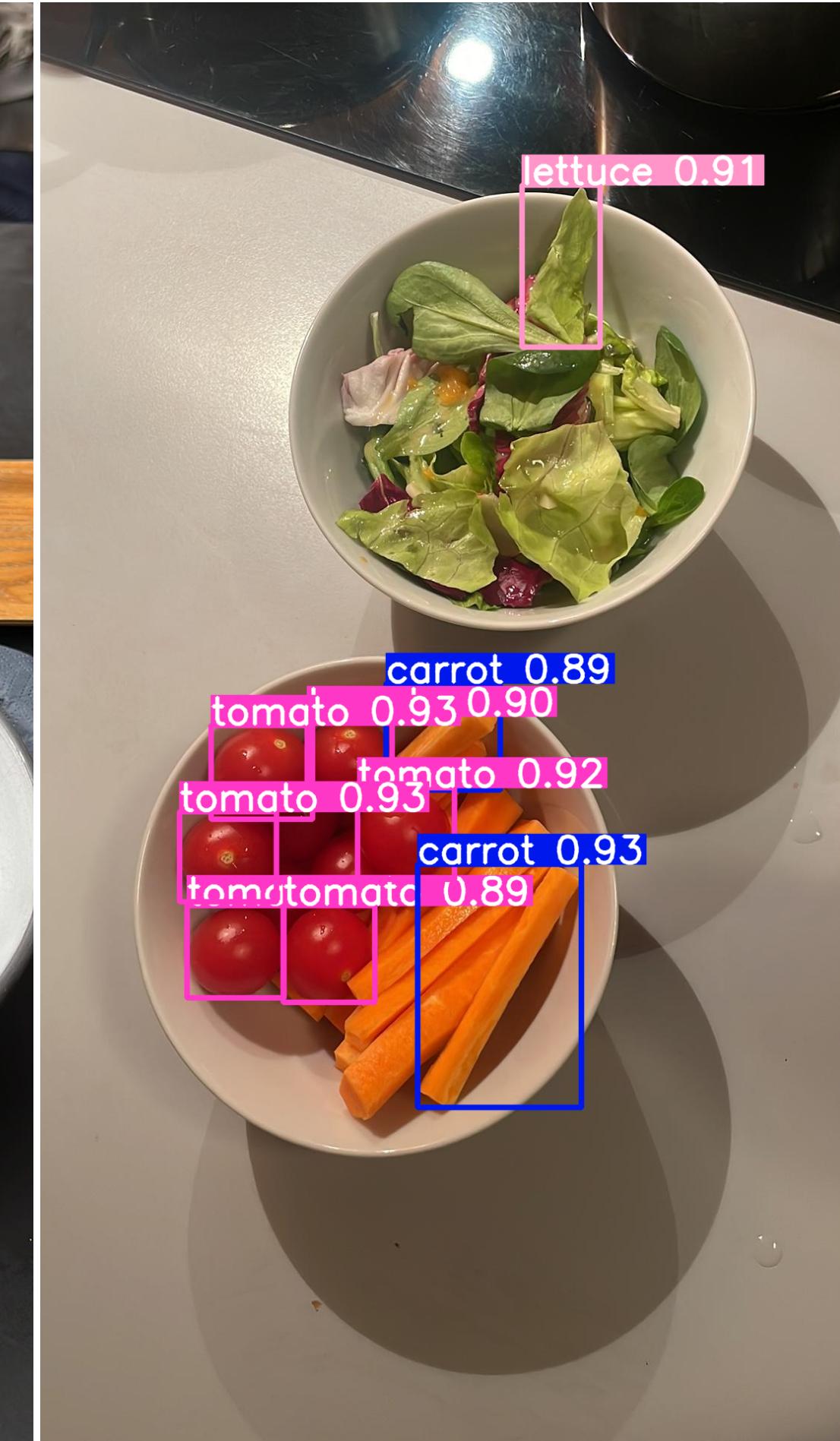
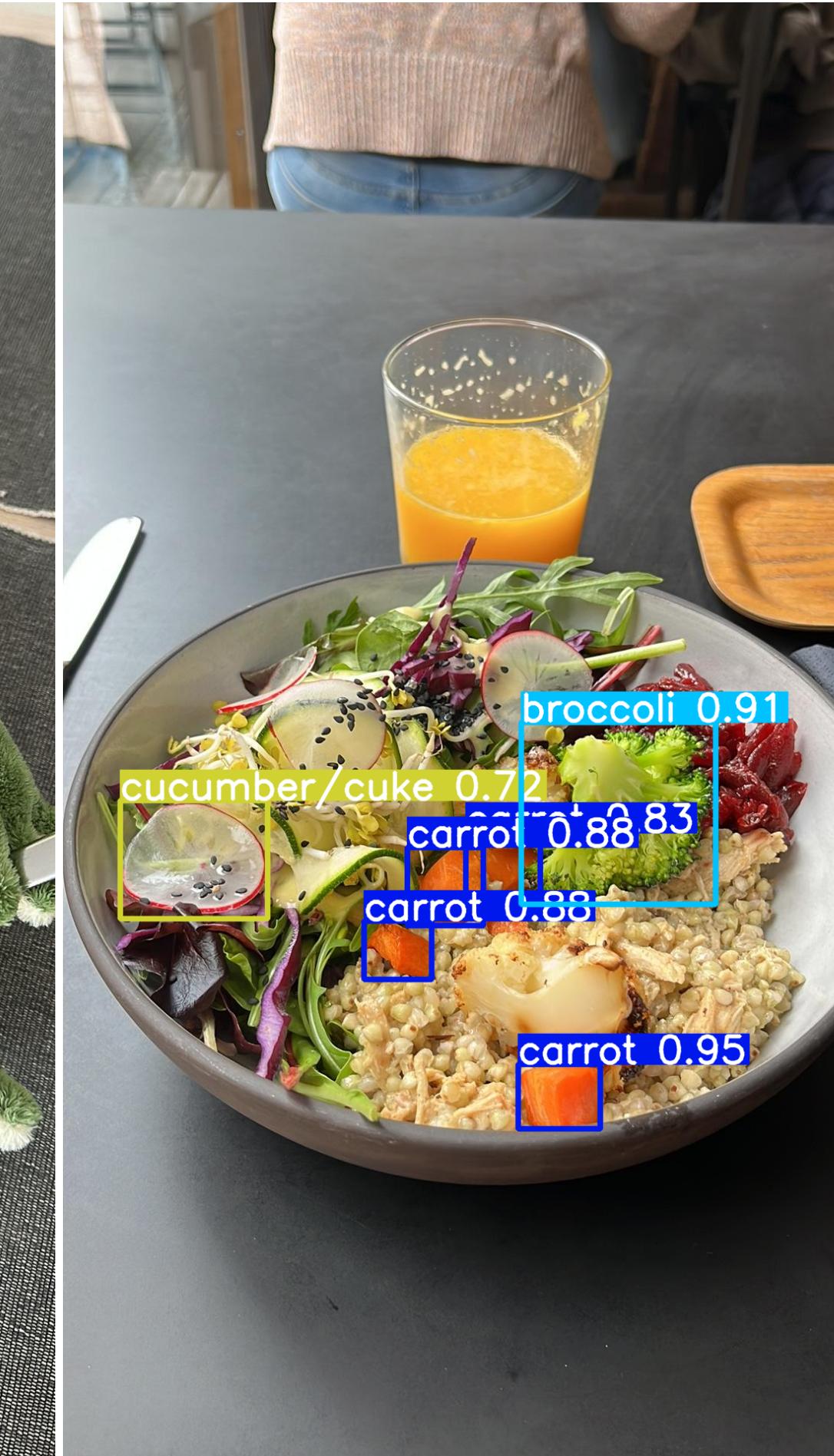
Fine Tuning on Custom Dataset

Fine Tuning YOLOv8 on LVIS-Fruits-And-Vegetables-Dataset → Quatative Assessment



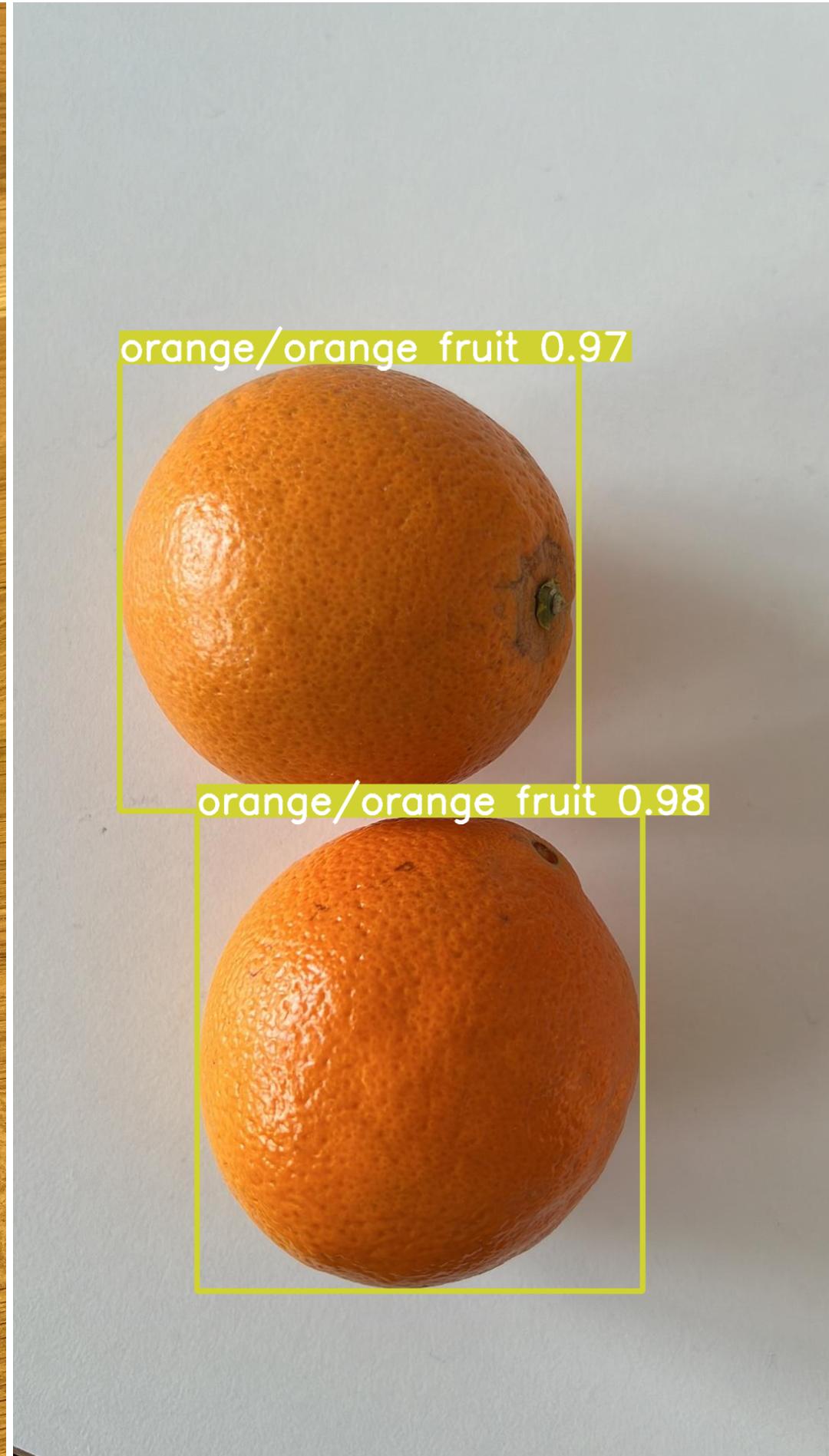
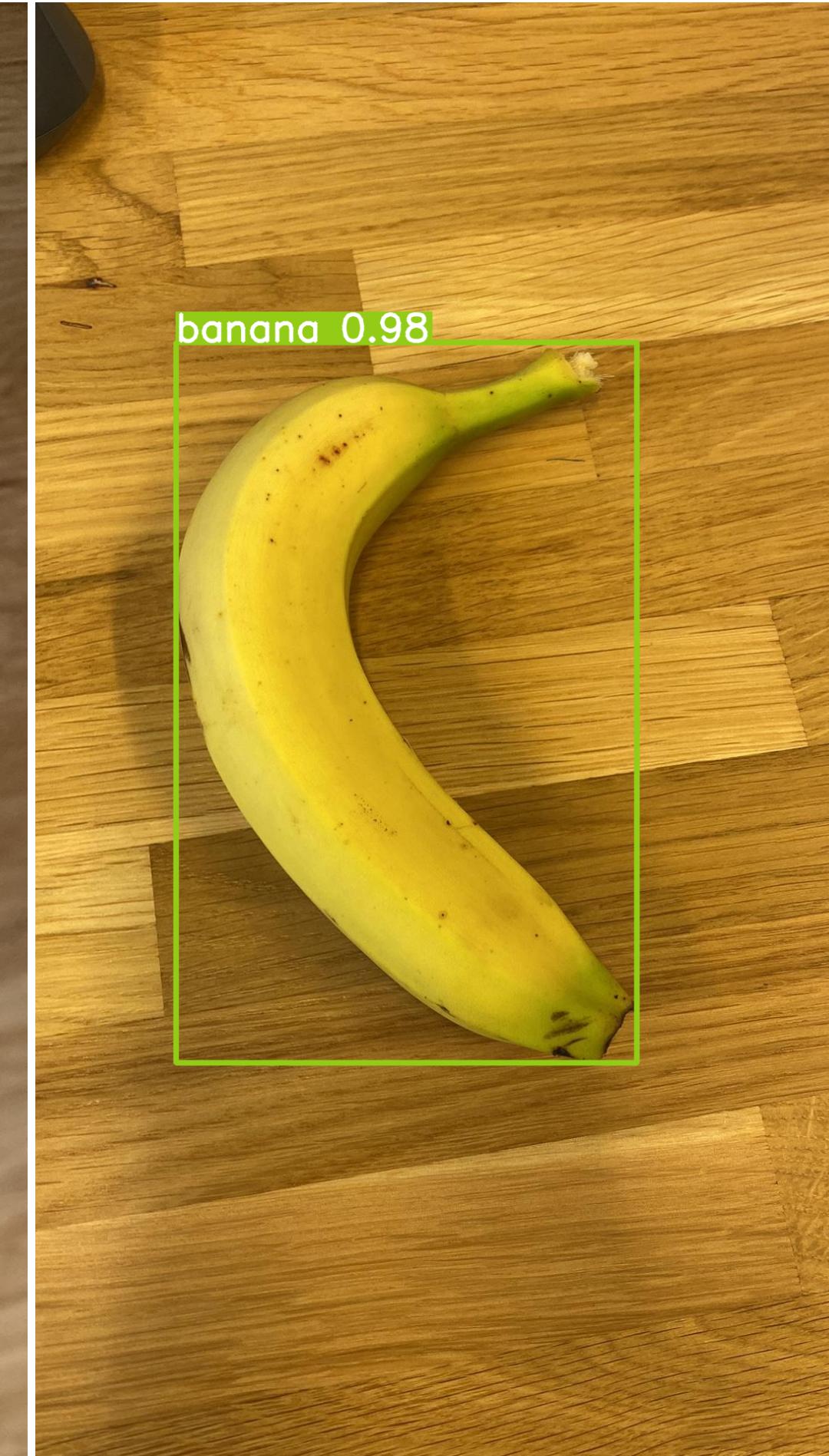
Fine Tuning on Custom Dataset

Fine Tuning YOLOv8 on LVIS-Fruits-And-Vegetables-Dataset → Quatative Assessment



Fine Tuning on Custom Dataset

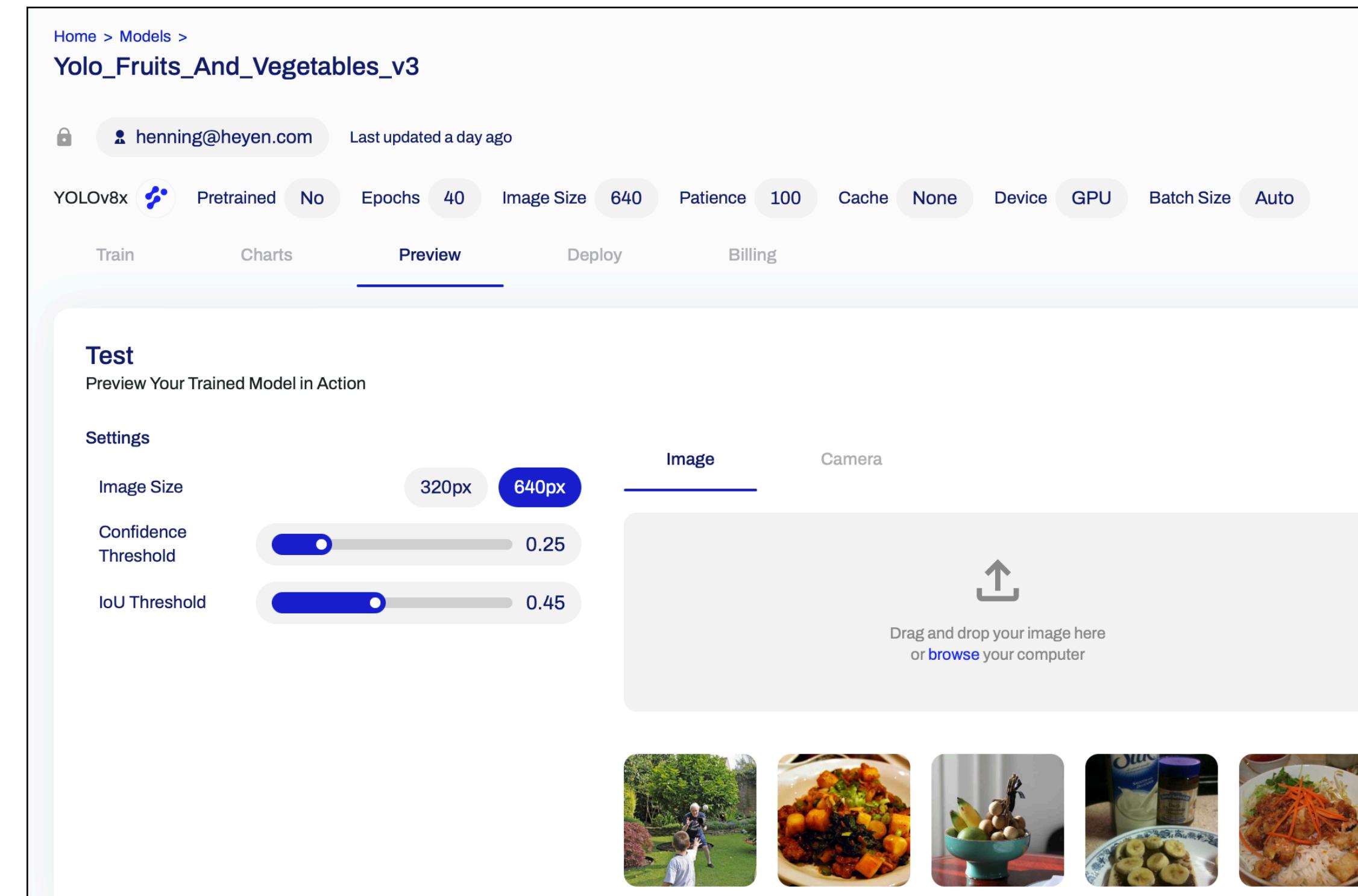
Fine Tuning YOLOv8 on LVIS-Fruits-And-Vegetables-Dataset → Quatative Assessment



Fine Tuning on Custom Dataset

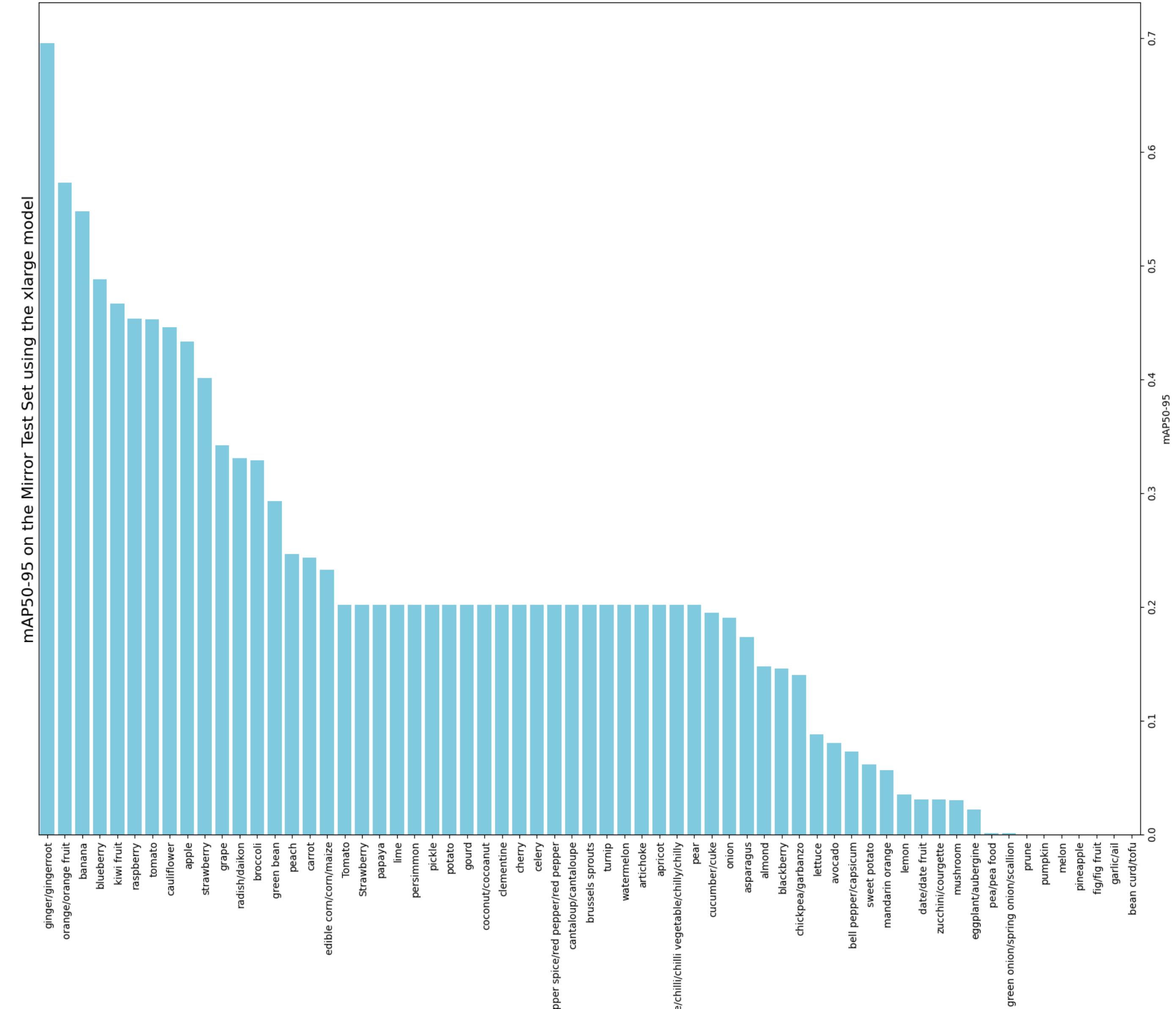
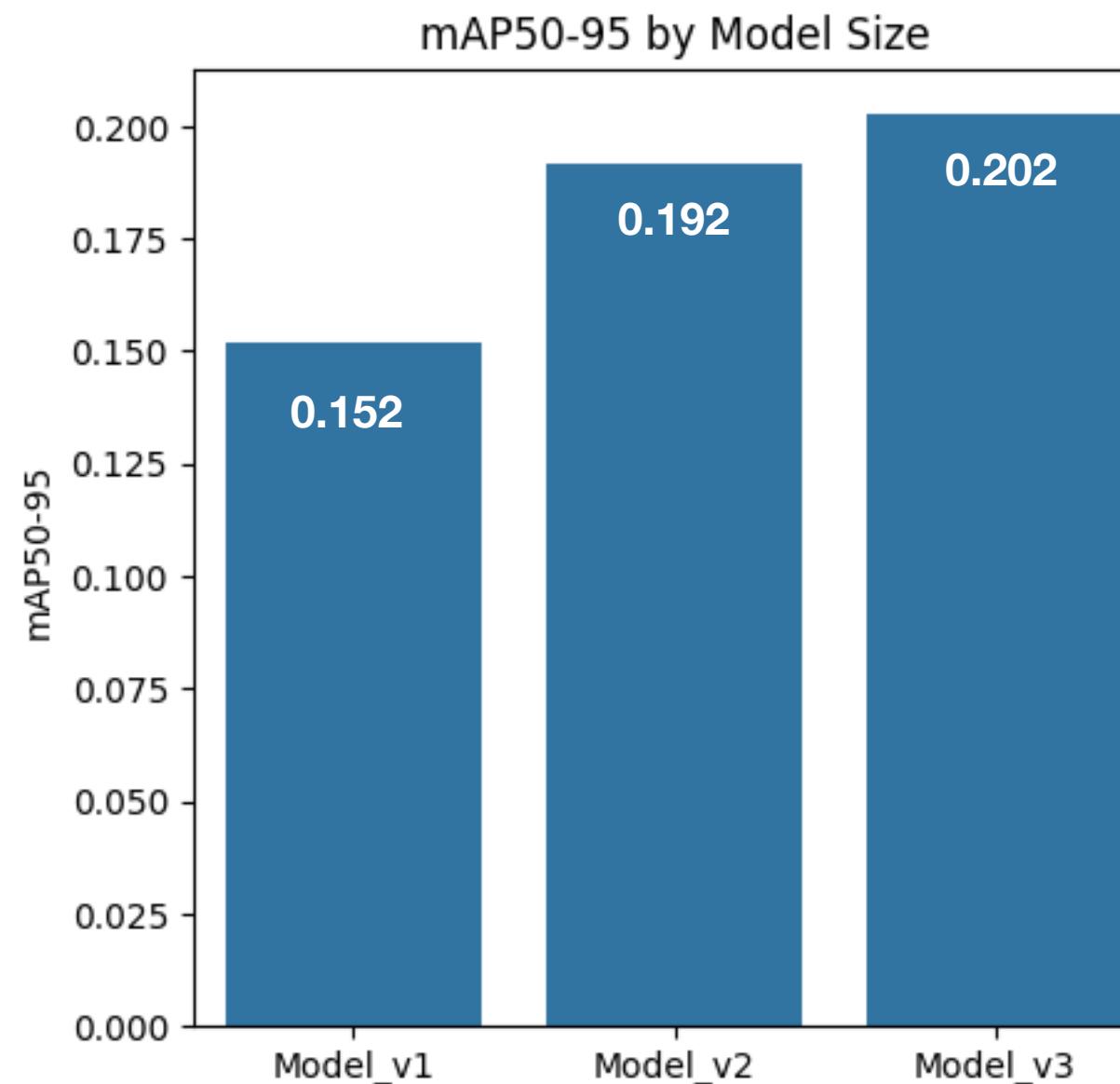
Live Demo:

Try it out yourself 😊 <https://hub.ultralytics.com/projects/AlhZh0IIAJko7snRmM5f>

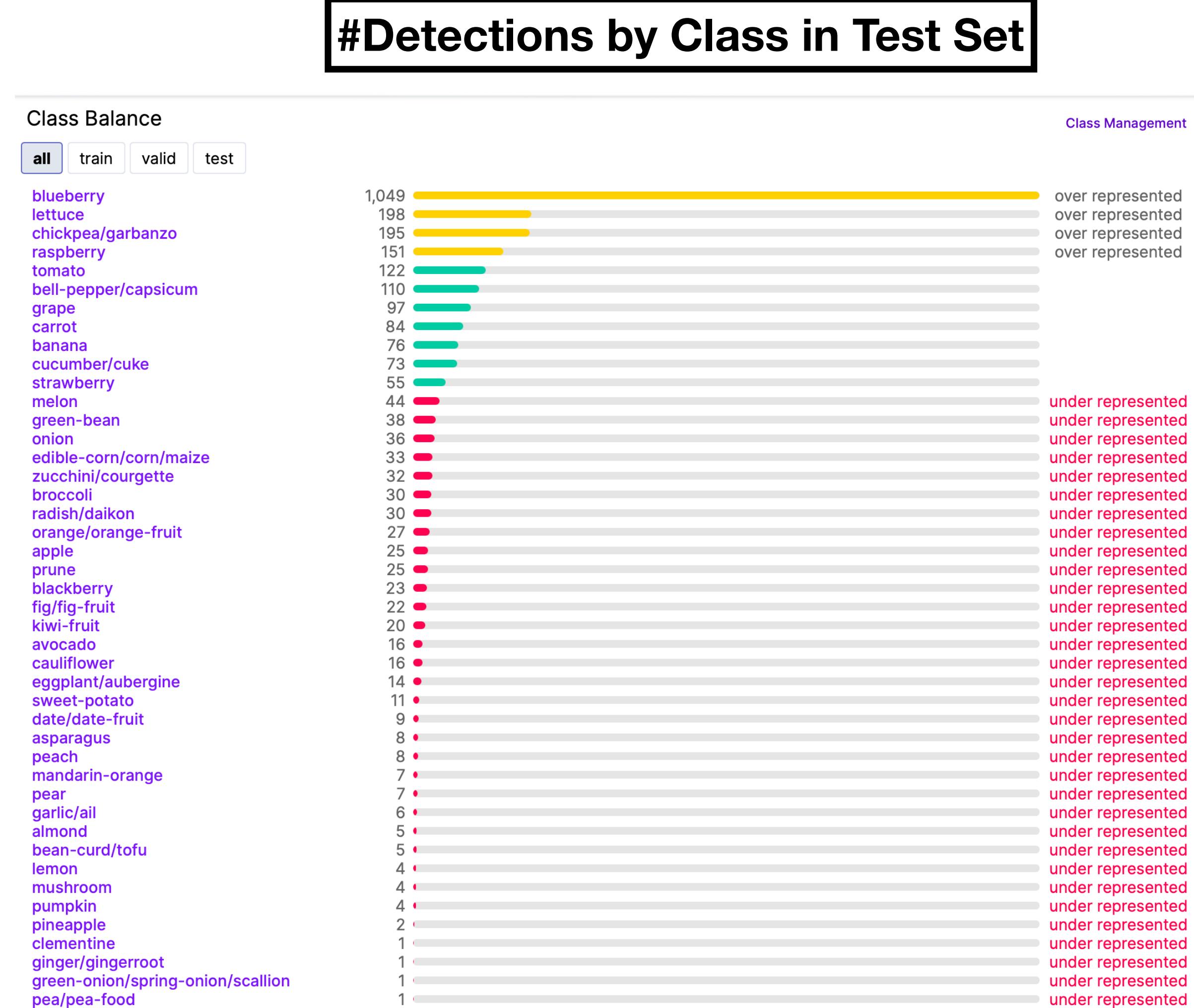


Fine Tuning on Custom Dataset

Results on Test set:



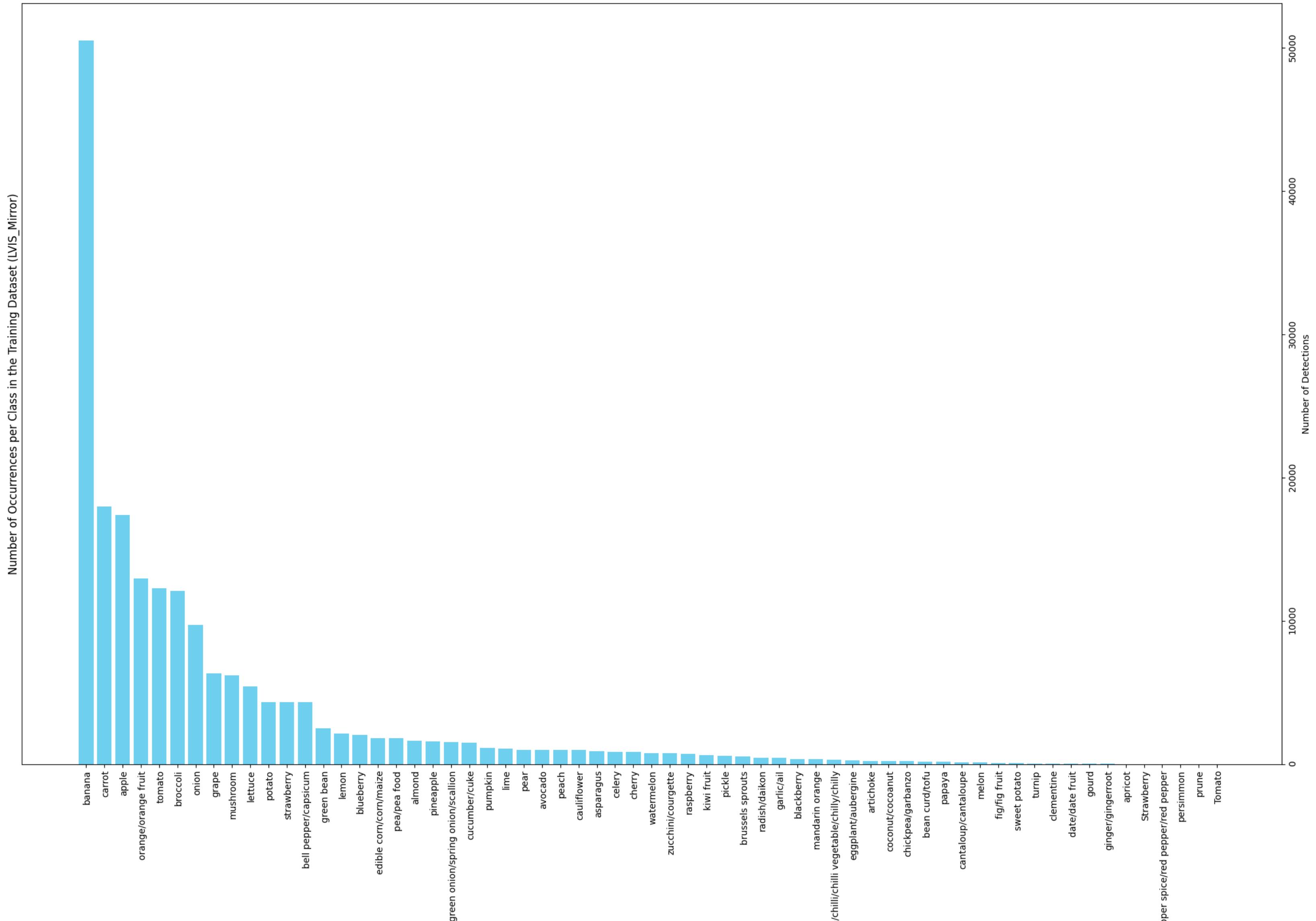
Fine Tuning on Custom Dataset



Fine Tuning on Custom Dataset

How can we do better?

→ Need more labelled images for underrepresented classes!!!



Application: Meal Scoring

Use Case:

- Users can upload images of their meals.
- Using the detection model, each image is scored based on its healthiness.

Scoring Logic

Idea: Manually assign each fruit and vegetable to a colour class

```
color_classes = {  
    'RED': [1, 8, 16, 18, 20, 30, 35, 56, 57, 59, 61],  
    'YELLOW + ORANGE': [2, 6, 13, 14, 21, 23, 37, 40, 41, 44, 45, 47, 51, 52, 54, 58],  
    'GREEN': [3, 4, 5, 11, 12, 17, 24, 26, 31, 33, 34, 36, 38, 39, 46, 48, 50, 62],  
    'BLUE + PURPLE': [9, 10, 32, 53],  
    'DARK RED': [27, 49],  
    'WHITE + BROWN': [0, 7, 15, 19, 22, 25, 28, 29, 42, 43, 55, 60],  
}
```

- **Simple Scoring:** Give 1 Point per fruit or vegetable (counted once)
- **Complex Scoring:** Give Bonus Points for each colour class covered
(to incentivise “eating through the rainbow” )

Problem: What about fruits and vegetables that exist in multiple colours (e.g. peppers, apples, etc.)

Technical Solution: Assign each colour a separate class (e.g. Apple_red, Apple_green) -> Future
-> Again this requires a lot of data per class

Scoring Logic

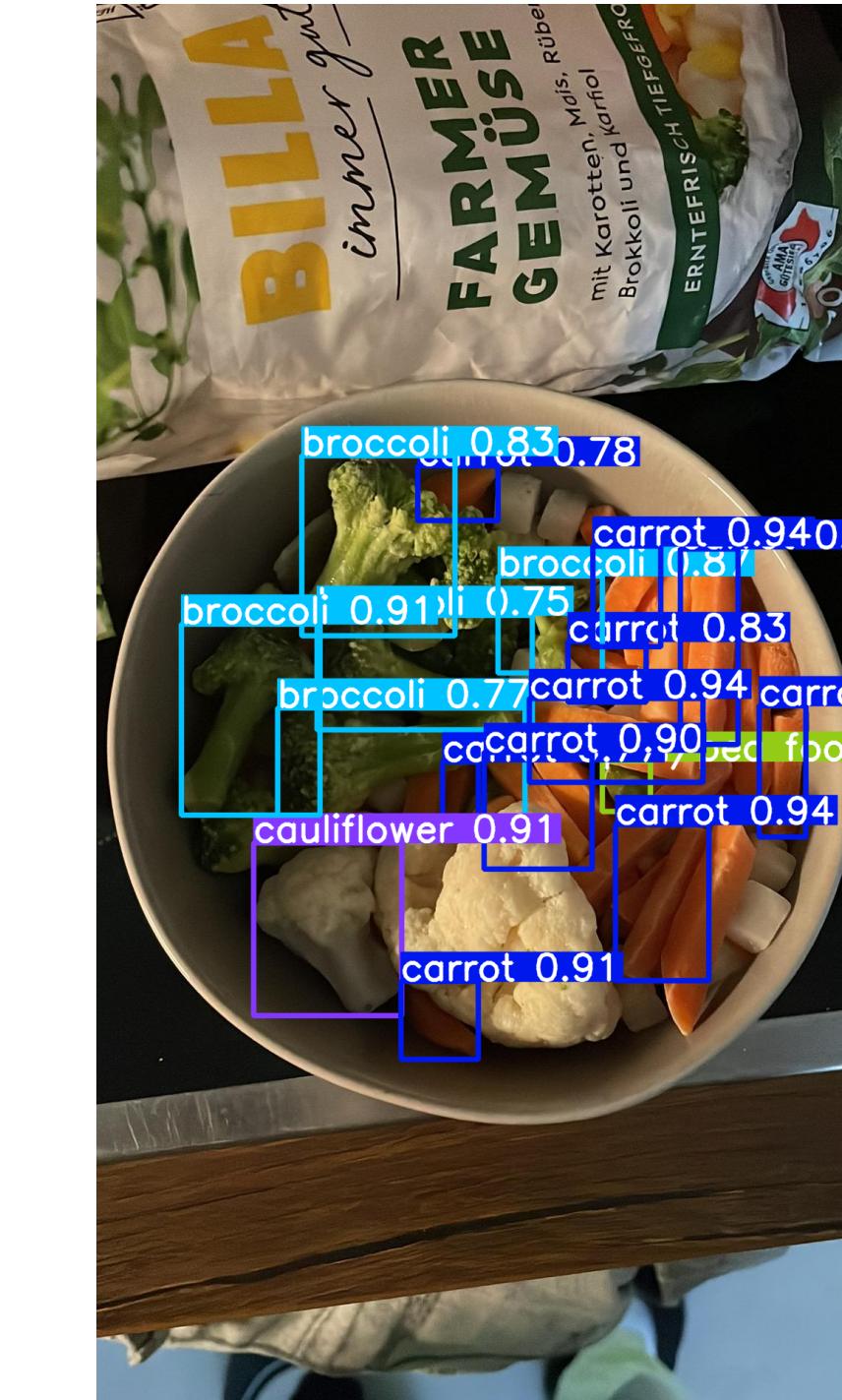
Simple:



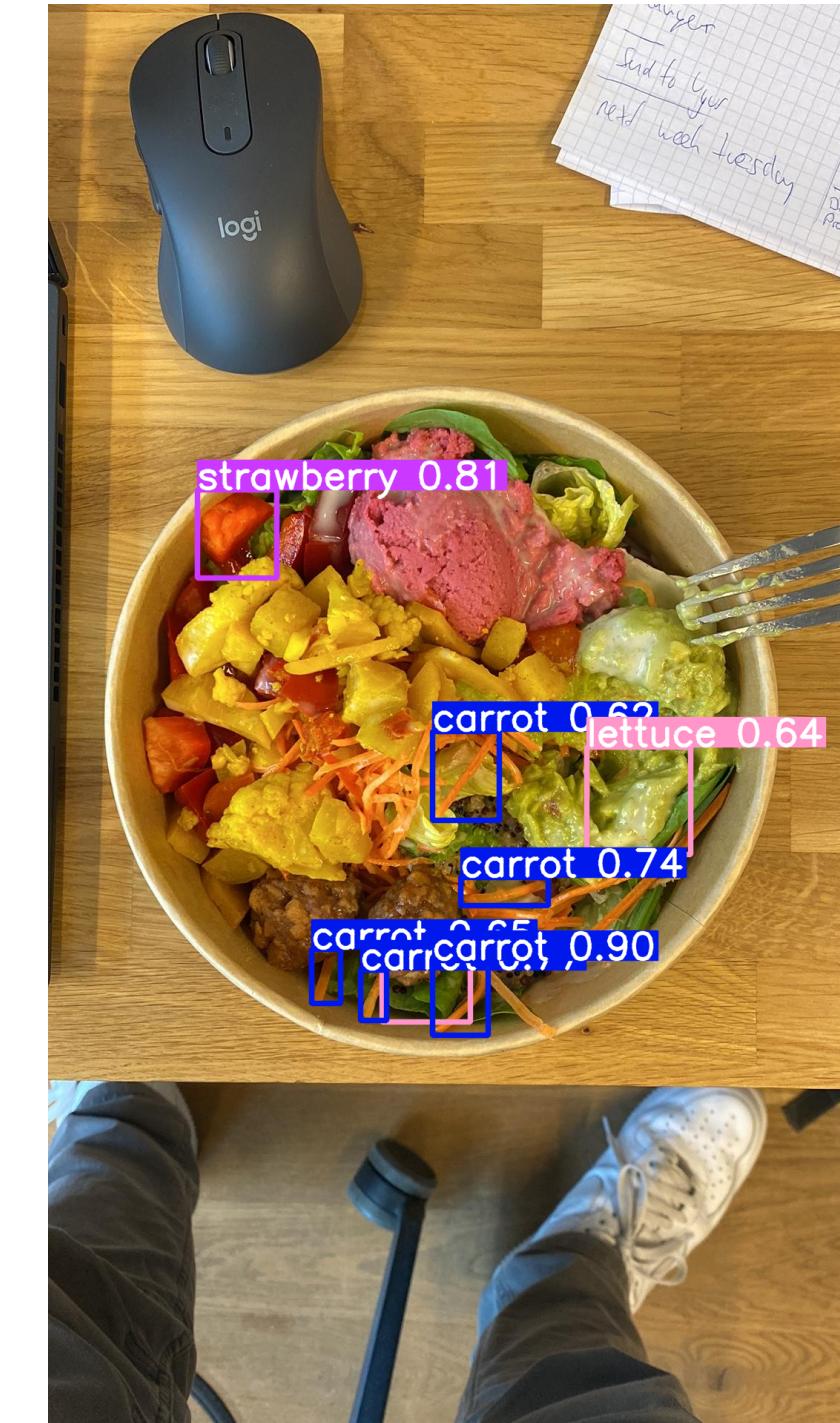
Points: 1
--BLUE + PURPLE: strawberry (1P)



Points: 1
--RED: apple (1P)



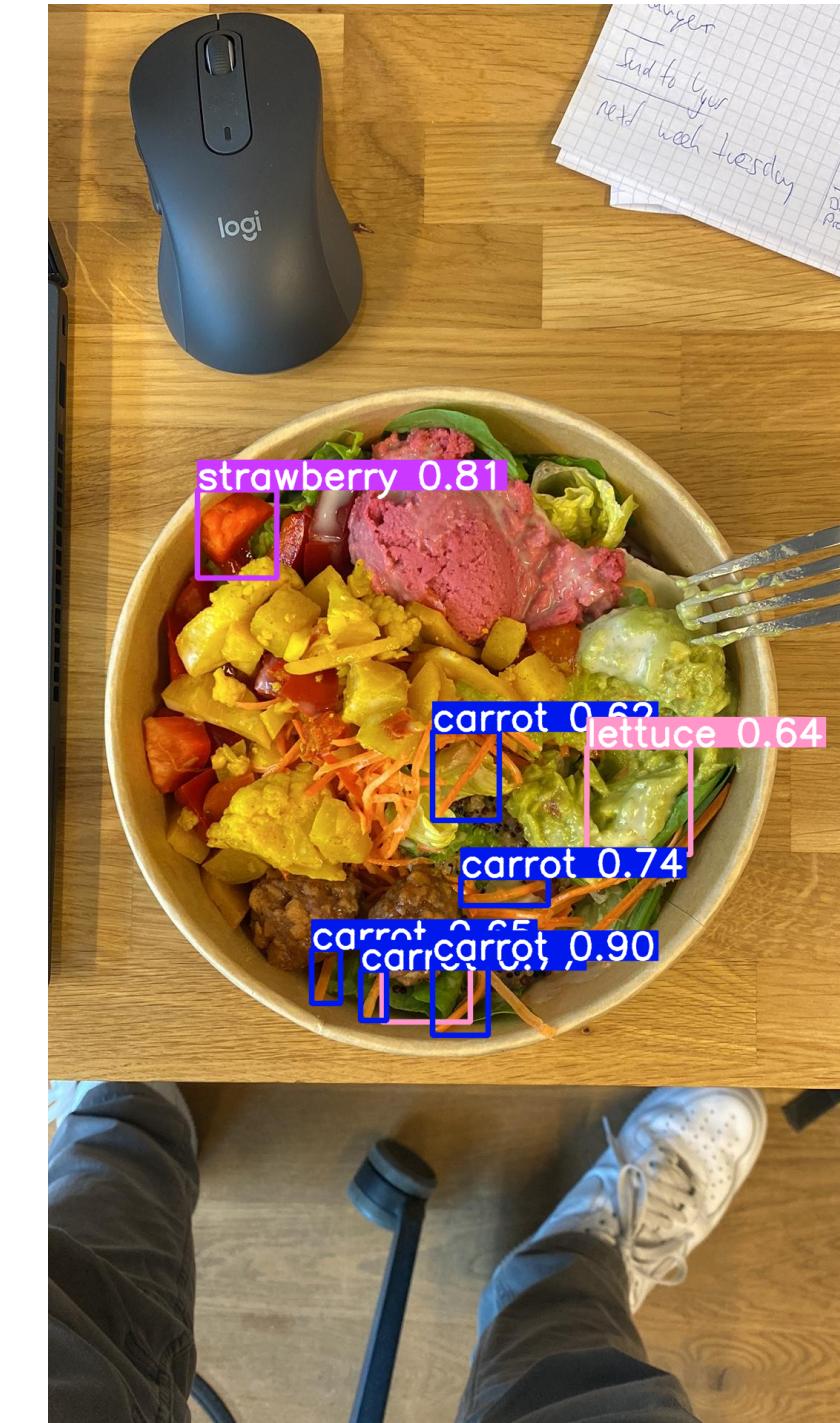
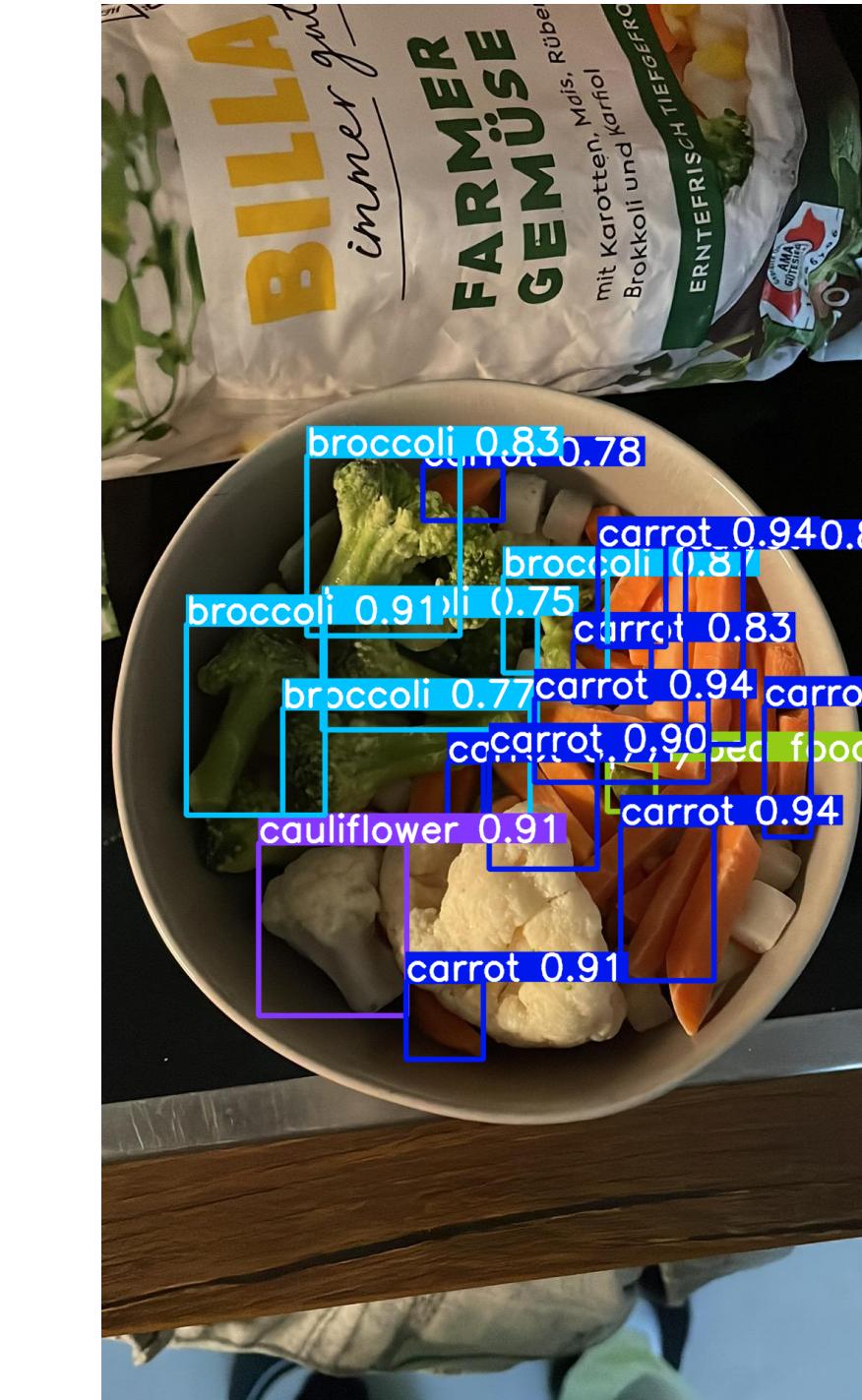
Points: 4
--GREEN: pea/pea food, broccoli (2P)
--YELLOW + ORANGE: carrot (1P)
--WHITE + BROWN: cauliflower (1P)



Points: 3
--GREEN: lettuce (1P)
--RED: strawberry (1P)
--YELLOW + ORANGE: carrot (1P)

Scoring Logic

Complex:



Creativity Metric

Idea: Colour Diversity as a proxy of how creative the food looks.

- 1) Calculate the unique RGB colours in the image
- 2) Normalise score between 0-100%

