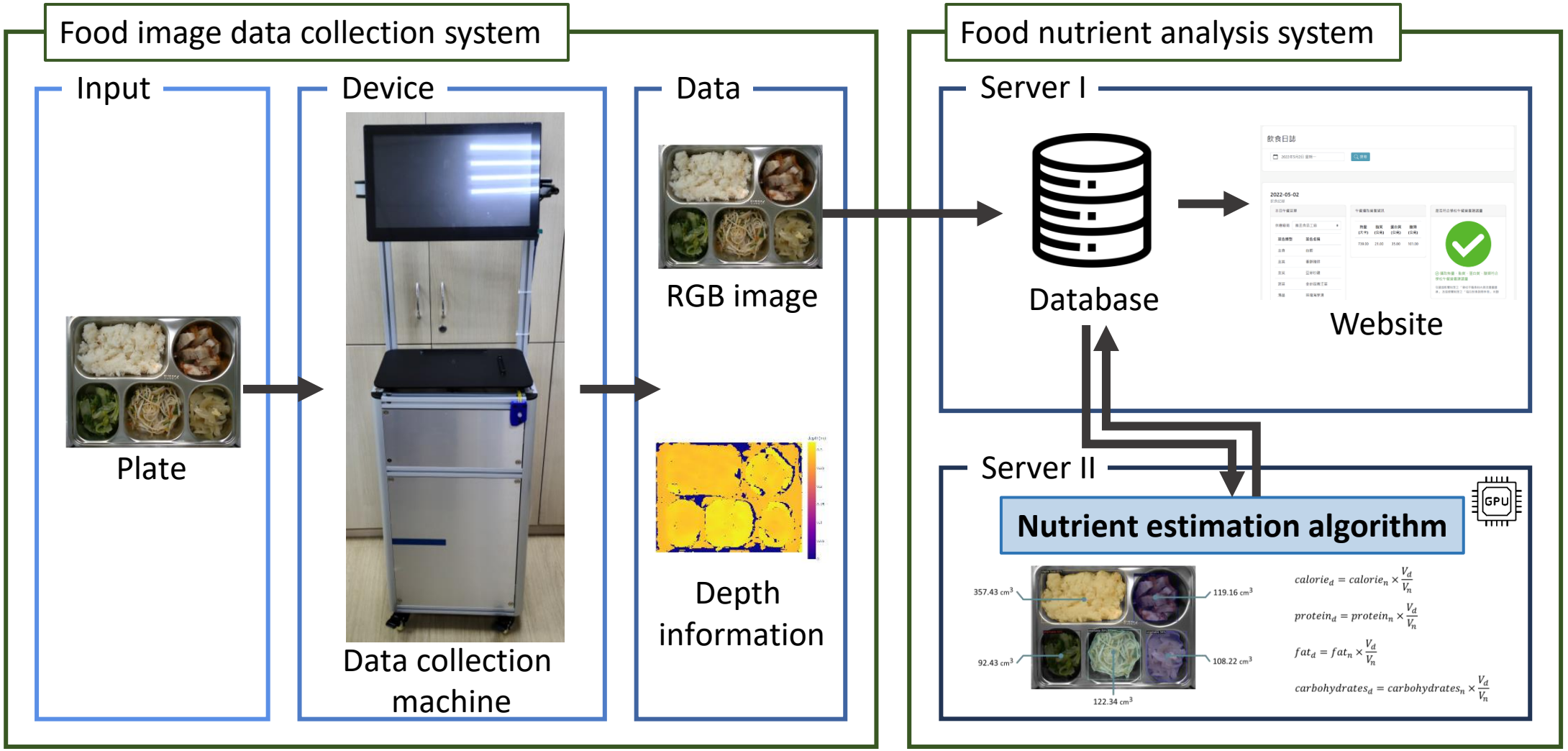
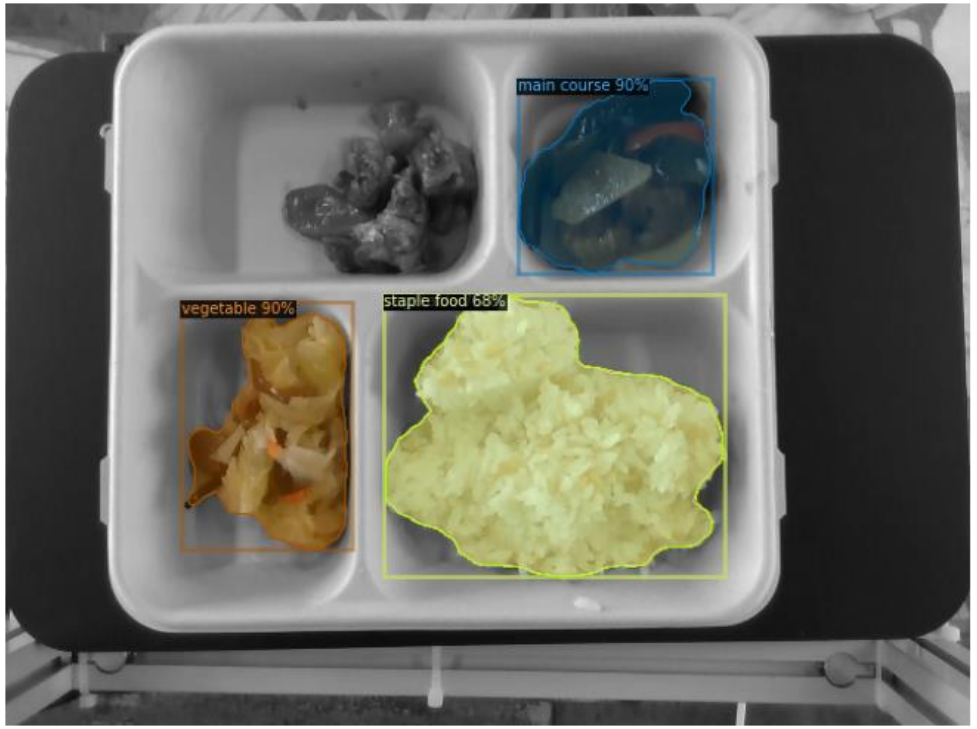
Food Instance Segmentation

Food Nutrient Analysis



Instance Segmentation

- Detecting instances of objects and demarcating their boundaries



Grading

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Data

- Training data
  - 455 images

Category	# instance
staple food	442
main course	434
side dish	394
vegetable	708
total	1978

- Validation data
  - 93 images

Category	# instance
staple food	89
main course	87
side dish	82
vegetable	146
total	404

Download link: https://drive.google.com/file/d/1p5EL-gYd6KKggaHMS4GOXR_DligvcjTl/view?usp=share_link

Process

ANNOTATION

MODEL CONSTRUCTION

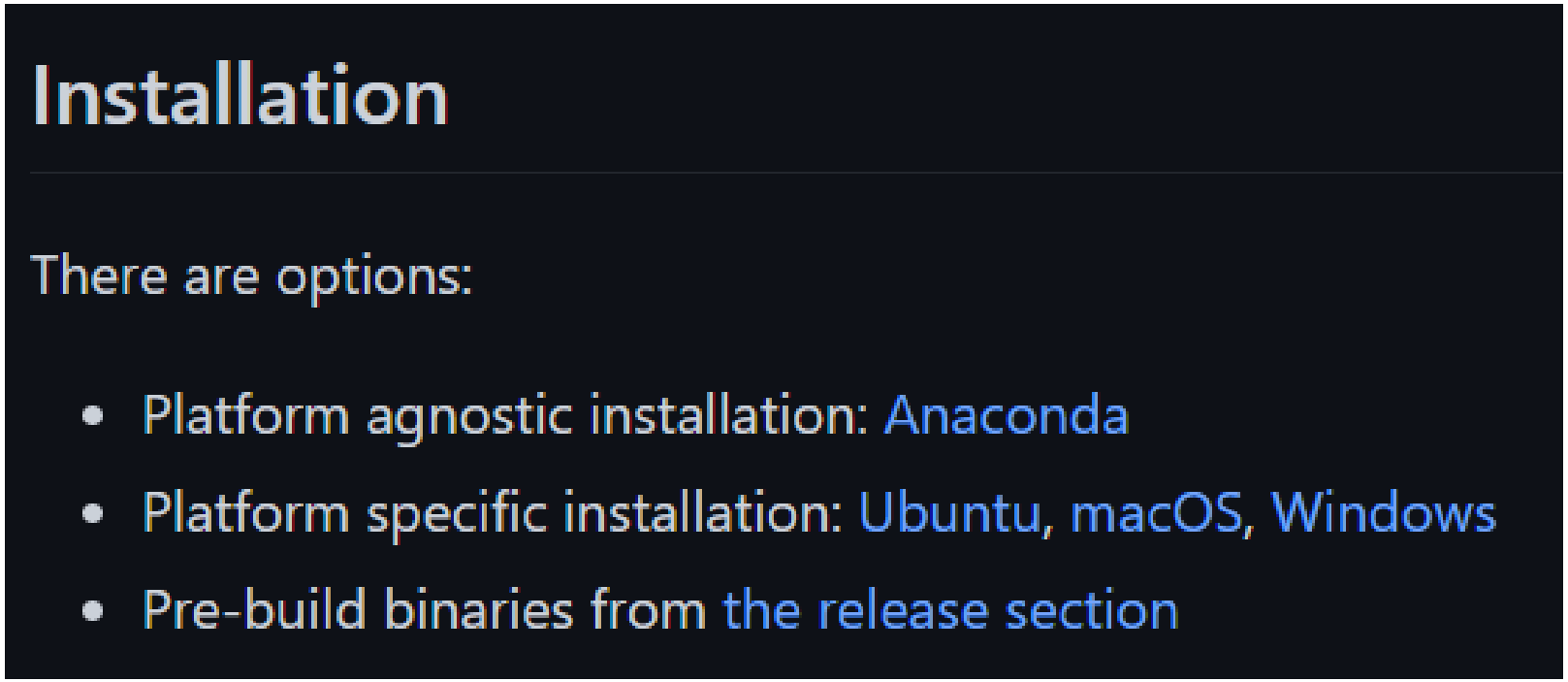
ANNOTATION FORMAT TRANSFORM

MODEL TRAINING

EVALUATION

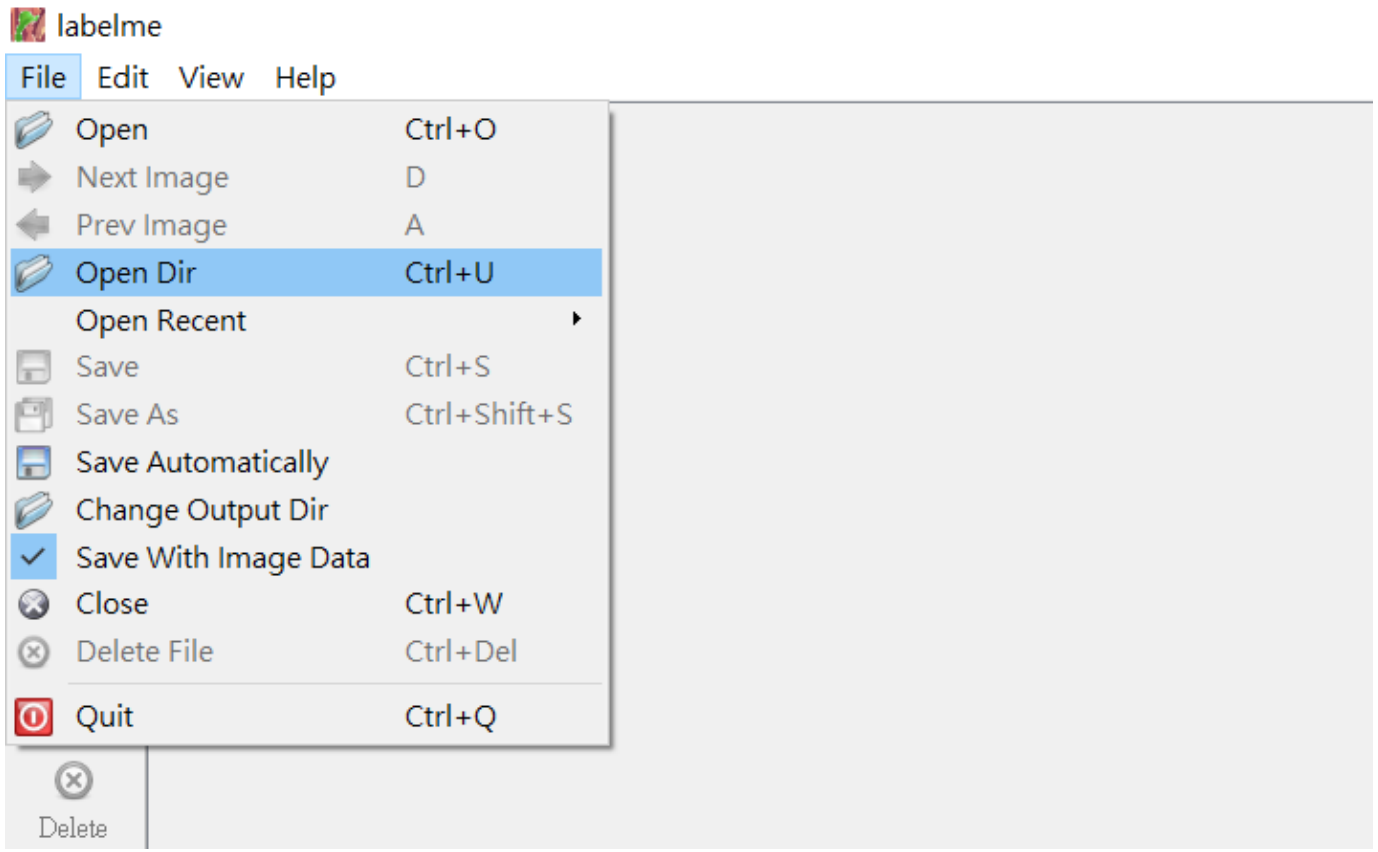
Annotation

1. Install labelme



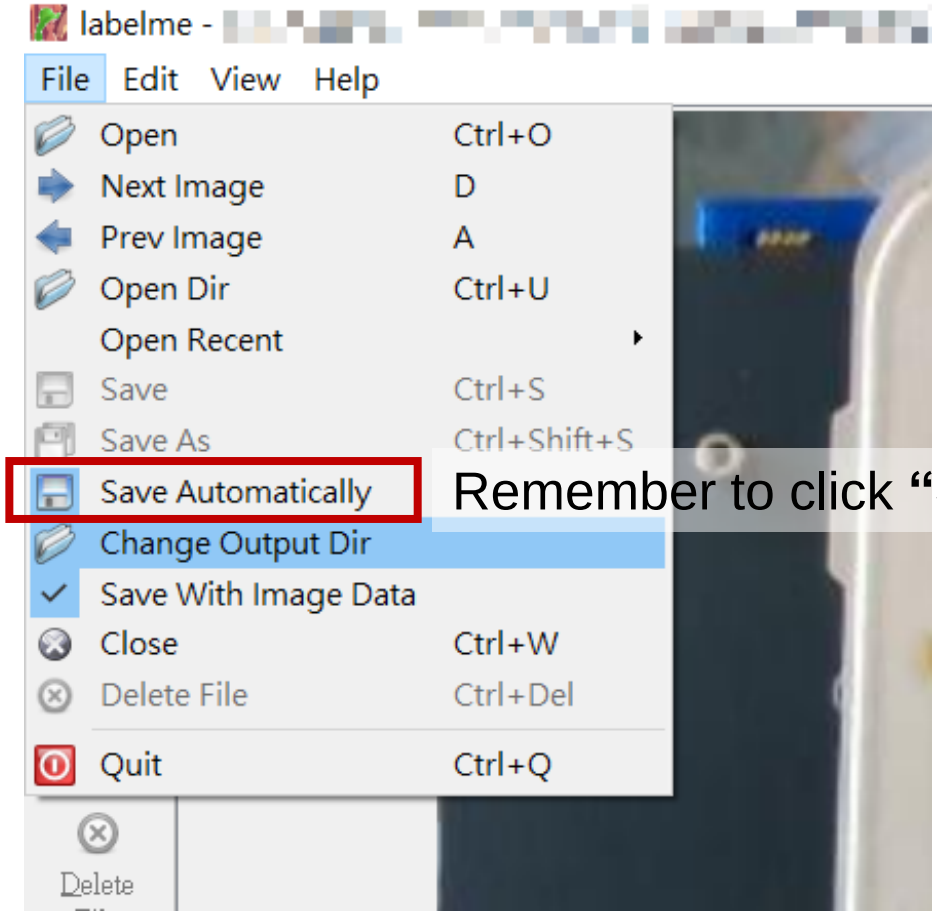
Annotation

2. Open image directory



Annotation

3. Change output directory



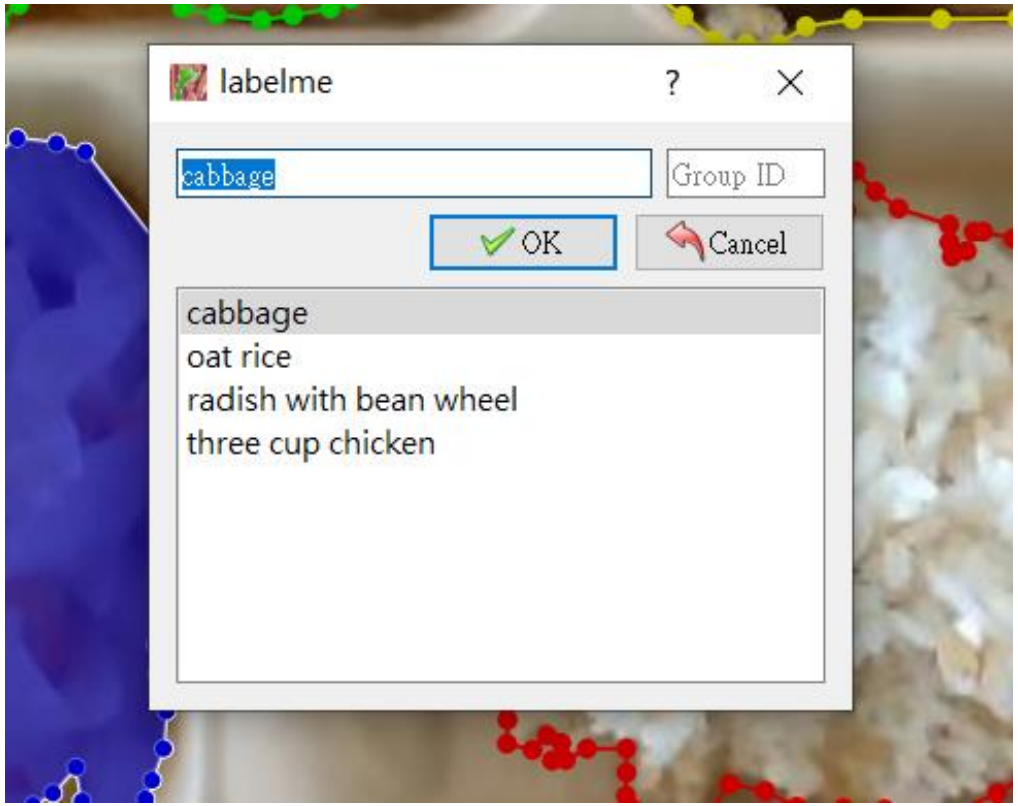
Remember to click **“Save Automatically”**

Annotation

4. Click “Create Polygons” and mark along the food contour

Annotation

5. After marking, set the label of the food



Annotation

6. If tray is empty, skip it

Annotation

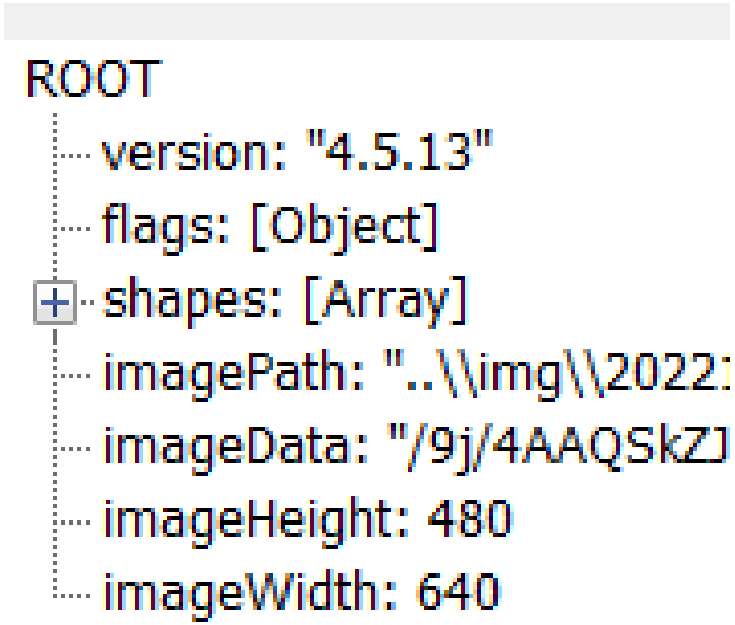
- For more label information, please refer to: https://github.com/huang0819/food-segmentation#label

Model Construction

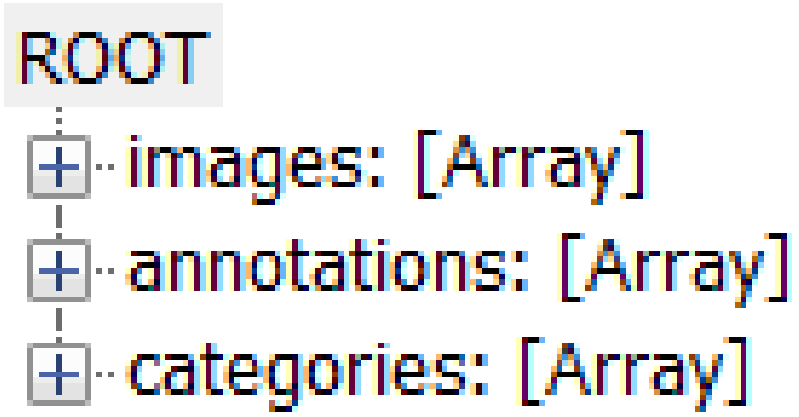
- Select instance segmentation model
  - EVA, GitHub
  - Mask DINO, GitHub
  - Swin Transformer V2, GitHub
  - …

Annotation Format Transform

- Check the format specified by your model
- In this tutorial, we used COCO dataset format



20221123174818_357_0.json
20221123174858_265_0.json
⋮



dataset.json

Model Training

- Sample code: Mask R-CNN

- More model structures: https://github.com/facebookresearch/detectron2/blob/main/MODEL_ZOO.md
- Do not use test data during model training

Evaluation

- Use the trained model to predict test data and generate reports
- Evaluation sample code: https://gist.github.com/huang0819/3f6bf5b8d0f0ad5c8954c9d0ce559f02

```
Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.719
Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 0.859
Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 0.820
Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.252
Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.484
Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.784
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.706
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.763
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.763
Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.250
Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.524
Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.825
```

Any questions ?