

OBJECT DETECTION

PRACTICAL SESSION

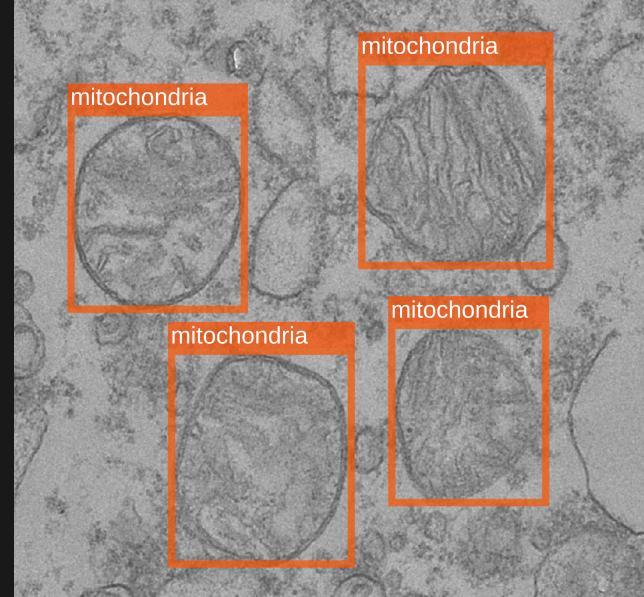
EIAS 2025

YOU ONLY LOOK ONCE (YOLO)



Real-time applications

Source: *Ultralytics*



Scientific imaging applications

Source: *LBEN, EPFL*

- Detect bounding boxes and classify them in one go.
- Implemented in Python in the [Ultralytics](#) library.

LET'S BUILD A SMART MICROSCOPE

EPFL ■ Center for Imaging

Configuration

Confidence Threshold
0.25

IoU Threshold
0.45

Classes

- Quinoa seed ×
- Chia seed ×

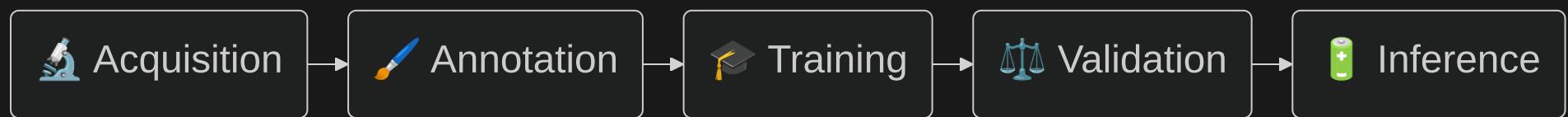
Start Camera

Object Detection with YOLO

Object	Score
Quinoa seed	0.68
Quinoa seed	0.65
Quinoa seed	0.55
Quinoa seed	0.72
Chia seed	0.81
Quinoa seed	0.43
Quinoa seed	0.61
Quinoa seed	0.59
Quinoa seed	0.38
Quinoa seed	0.60
Chia seed	0.76
Quinoa seed	0.56
Quinoa seed	0.55
Quinoa seed	0.50
Chia seed	0.64
Quinoa seed	0.50

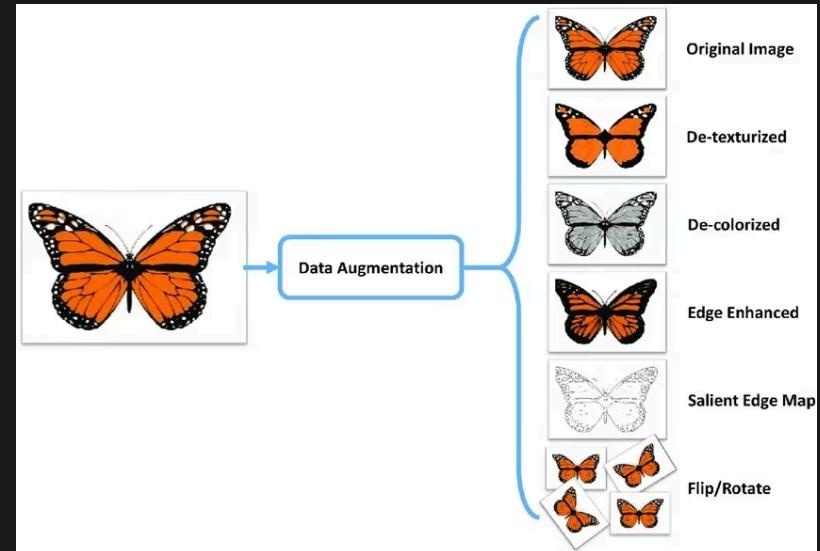
Stop Camera

STEPS OF A COMPUTER VISION PROJECT



STRATEGY FOR MODEL TRAINING

Model	size (pixels)	mAP _{val} 50-95	Speed CPU ONNX (ms)	Speed T4 TensorRT10 (ms)	params (M)	FLOPs (B)
YOLO11n	640	39.5	56.1 ± 0.8	1.5 ± 0.0	2.6	6.5
YOLO11s	640	47.0	90.0 ± 1.2	2.5 ± 0.0	9.4	21.5
YOLO11m	640	51.5	183.2 ± 2.0	4.7 ± 0.1	20.1	68.0
YOLO11l	640	53.4	238.6 ± 1.4	6.2 ± 0.1	25.3	86.9
YOLO11x	640	54.7	462.8 ± 6.7	11.3 ± 0.2	56.9	194.9



Pretrained models

Data augmentations

Result: you can train a model for your application with few annotated images.

PRACTICE



UNTIL 12:00

In groups of 3 to 5



As a group, you should be equipped with:

- A USB microscope
- A laptop with Python
- Some dry seeds



Workshop guide