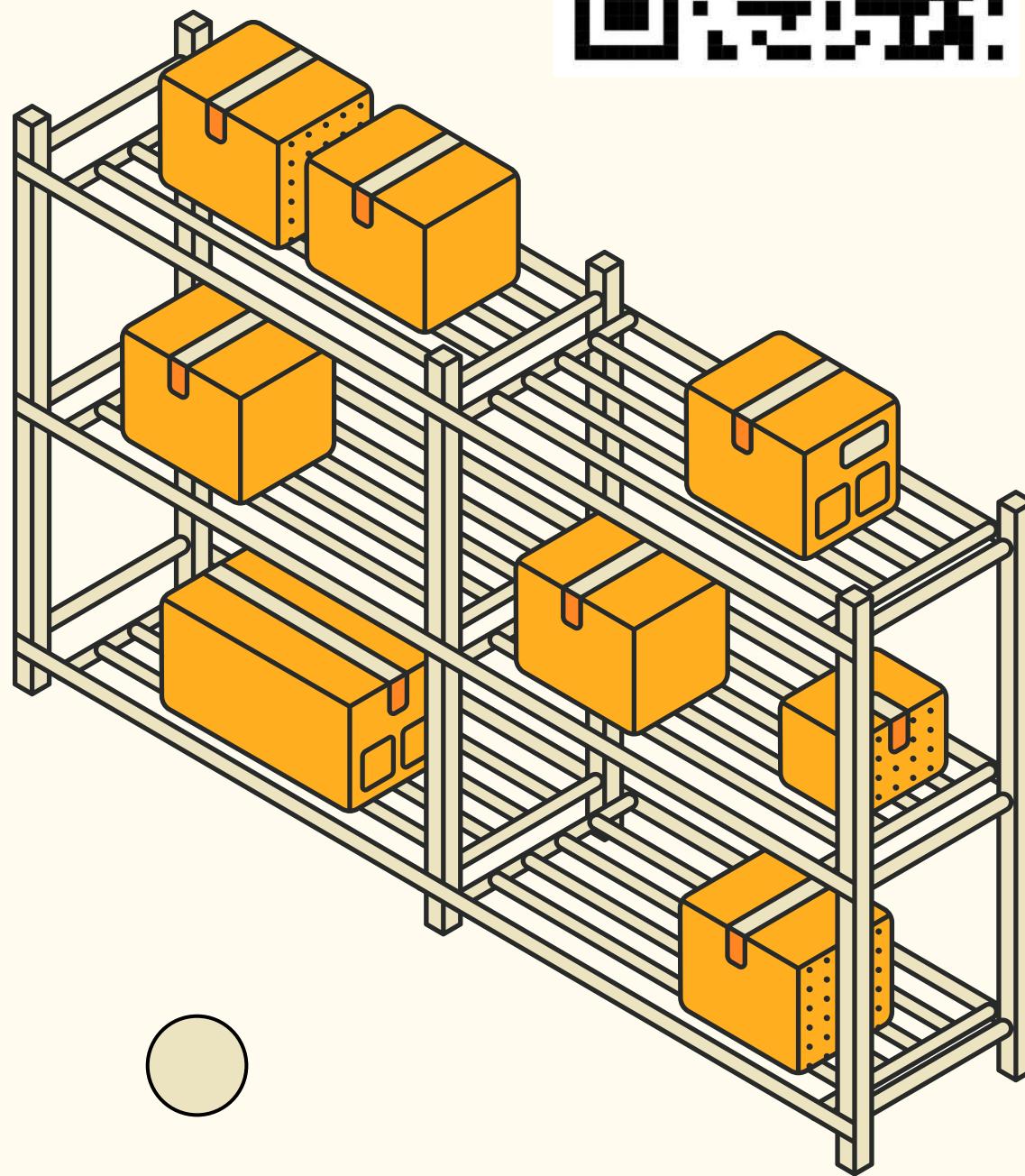


Lesson 20



Check stock from an IoT device

 *Instructor: Dong Quan Huan*

Đoàn Quốc Hưng - 10423049

Lương Gia Bảo - 10423010

Đoàn Ngọc Bảo - 10423009

Huỳnh Phú Vinh - 10423124



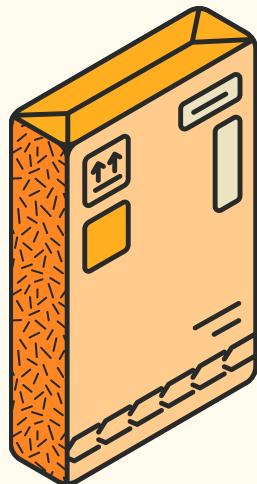


Table of Contents



1

2

3

4

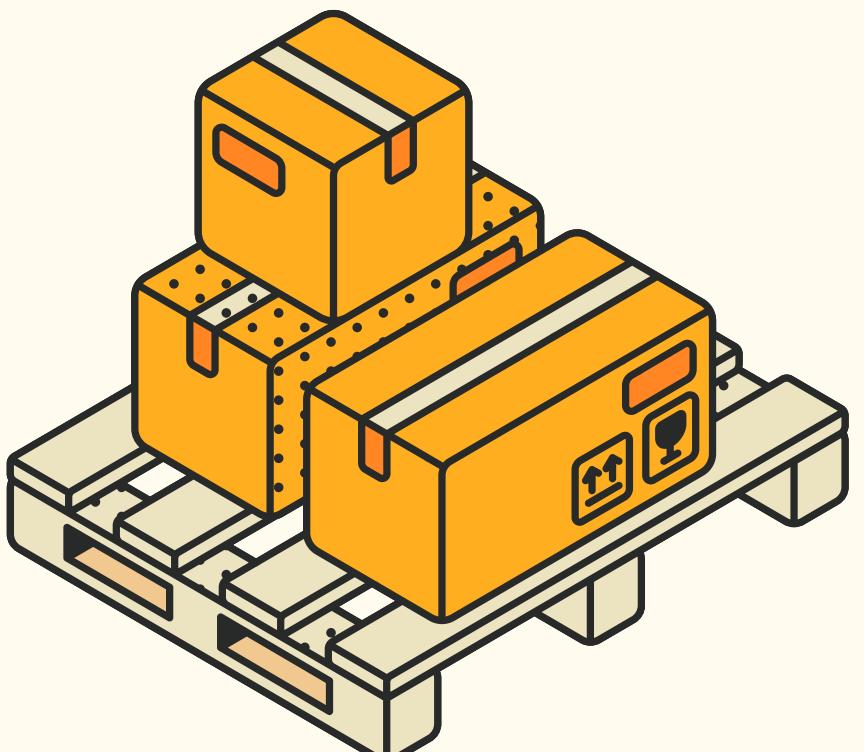
Introduction

Terminologies

Code Demo

IoT in Stock

of YOLO

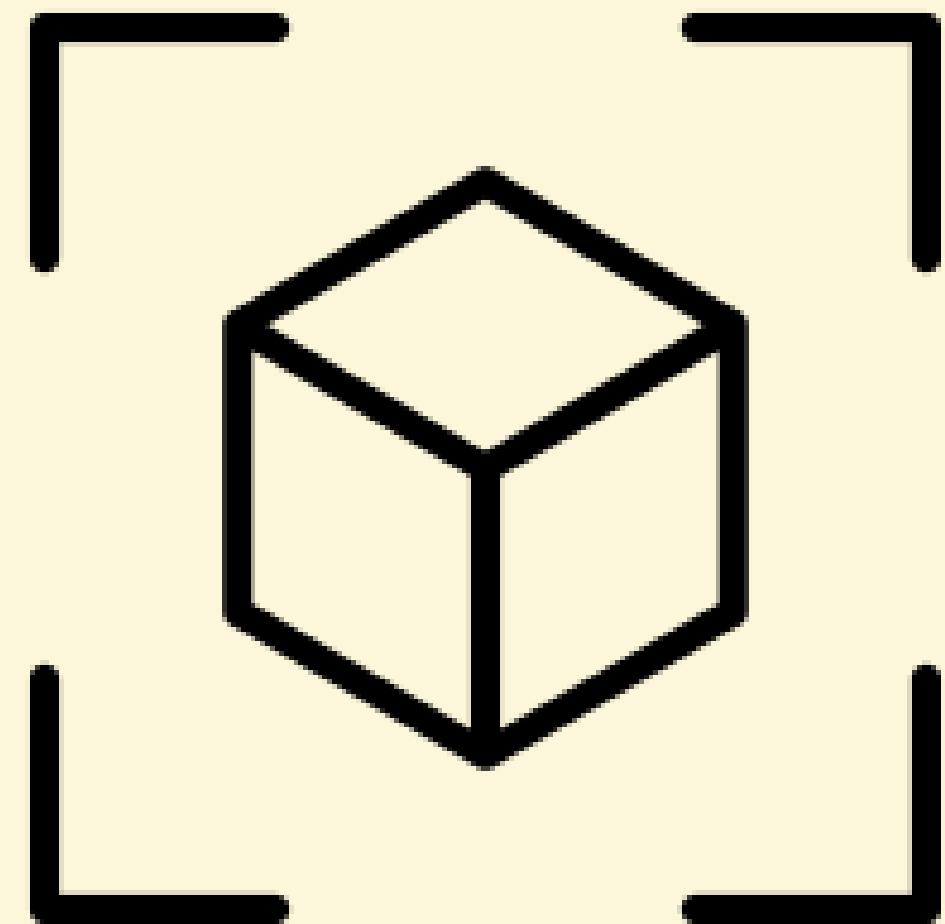


1. Introduction



Object DETECTION

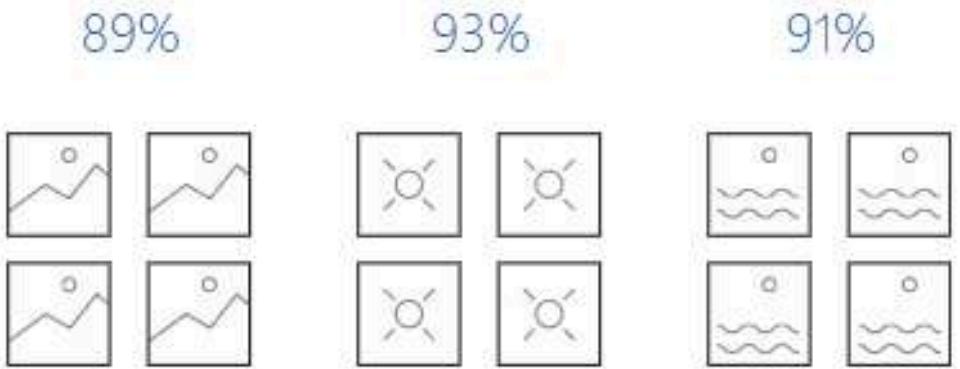
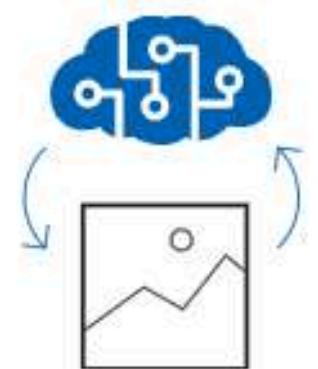
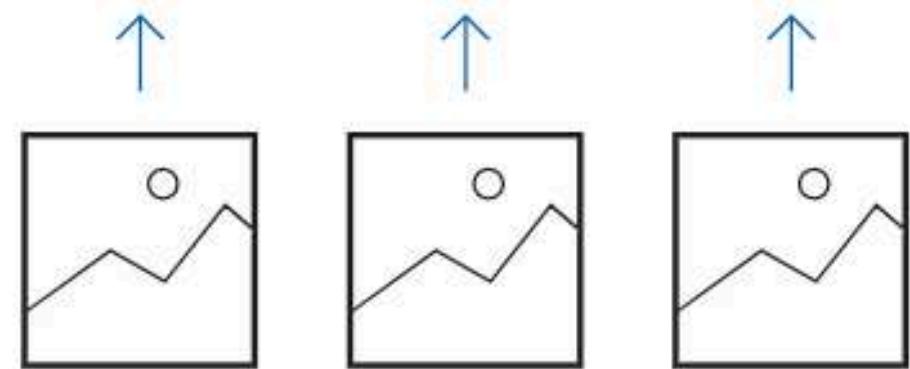
Locates objects in an image and predicts their class label with bounding boxes.



Object CLASSIFICATION

Only looks at the image and predicts the class label of the object





Upload Images

Bring your own labeled images, or use Custom Vision to quickly add tags to any unlabeled images.

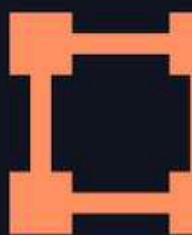
Train

Use your labeled images to teach Custom Vision the concepts you care about.

Evaluate

Use simple REST API calls to quickly tag images with your new custom computer vision model.

Platforms we are using to train YOLO

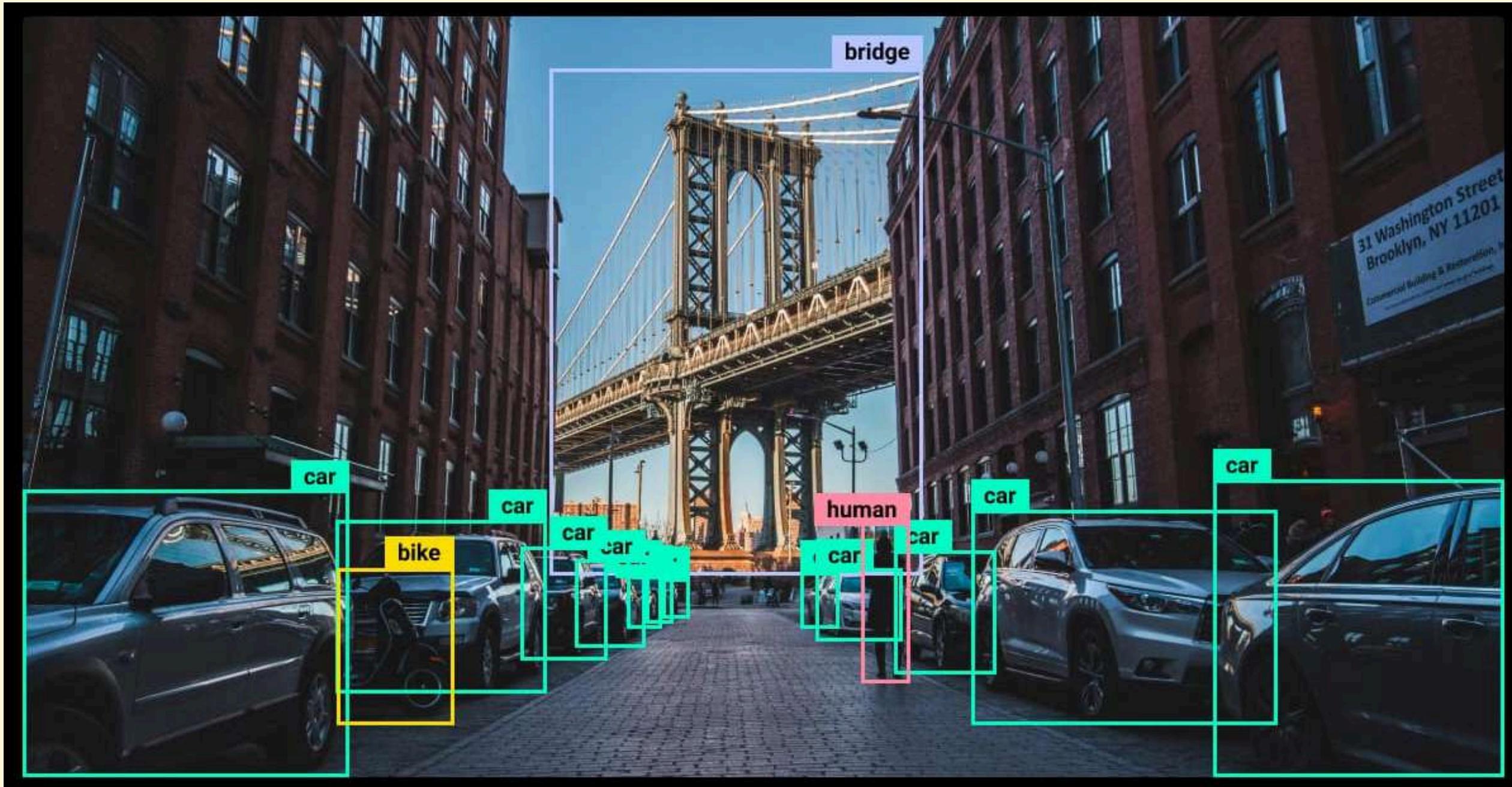


Label Studio



**Google Cloud
AutoML Vision**

WHAT IS YOLO?



YOLO (You Only Look Once) is a real-time object detection algorithm that can identify multiple objects in one pass through a CNN model

YOLO

- Real-time, fast, accurate multi-object detection
- Handles overlap well
- Customizable with own data
- Runs offline on edge devices
- Needs coding, struggles with tiny things



CUSTOM VISION

- No code, easy and quick to set up
- Not ideal for real-time use
- Slower with many object classes
- Needs cloud connection
- Less flexible, higher cost for more features



YOLO'S VERSIONS





Joseph Redmon

(YOLOv1 - YOLOv2 - YOLOv3)



Ultralytics

(YOLOv5 - YOLOv8 - YOLOv11)

YOLOv8

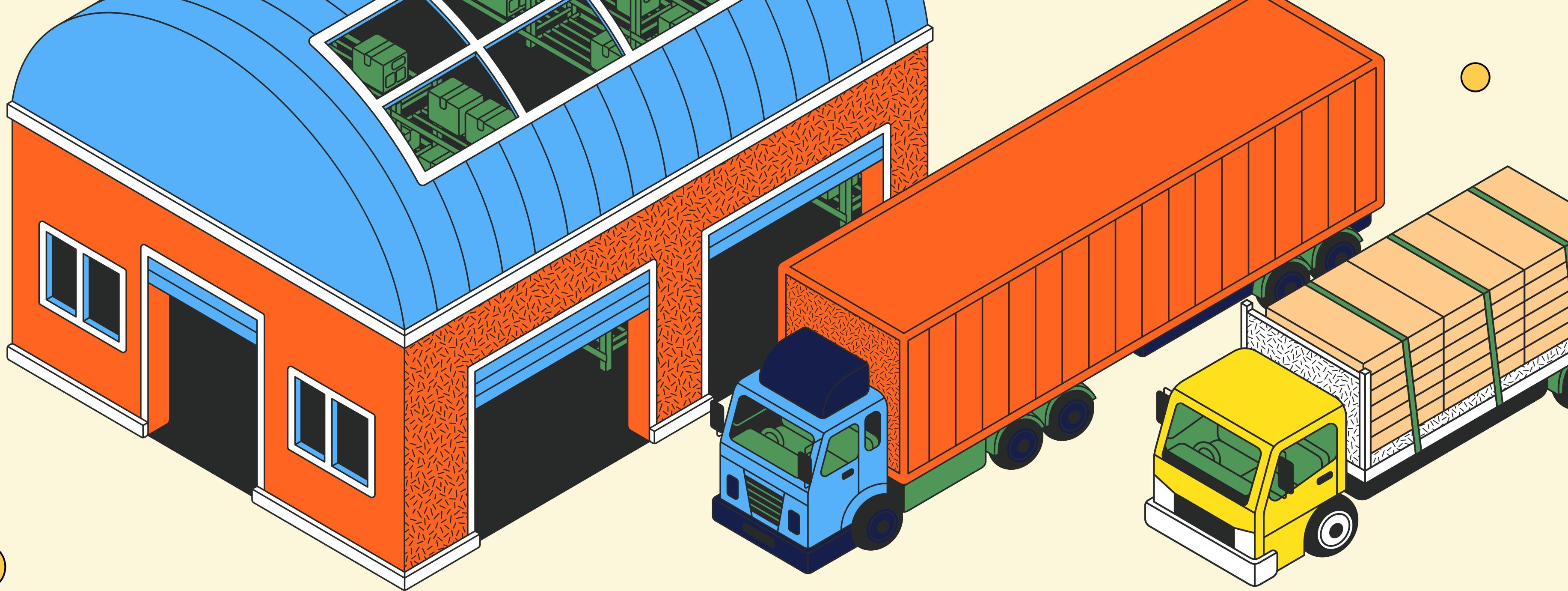
It offers a great balance between speed, accuracy, and efficiency

It's lightweight and easy to deploy, making it suitable for real-time use

It supports object detection, segmentation, and pose estimation in a single framework

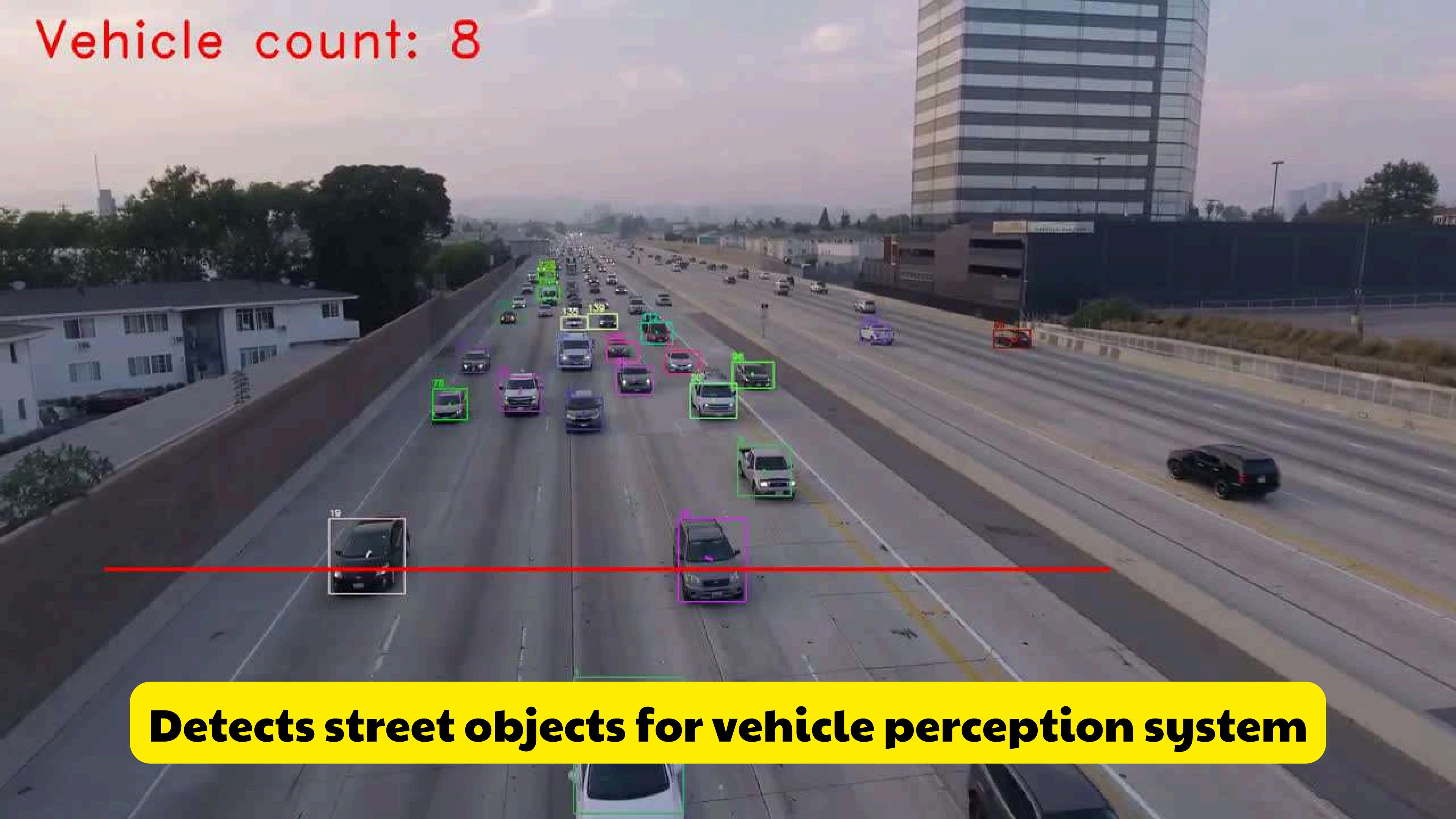


 ultralytics
YOLOv8



Real-life Application of YOLO

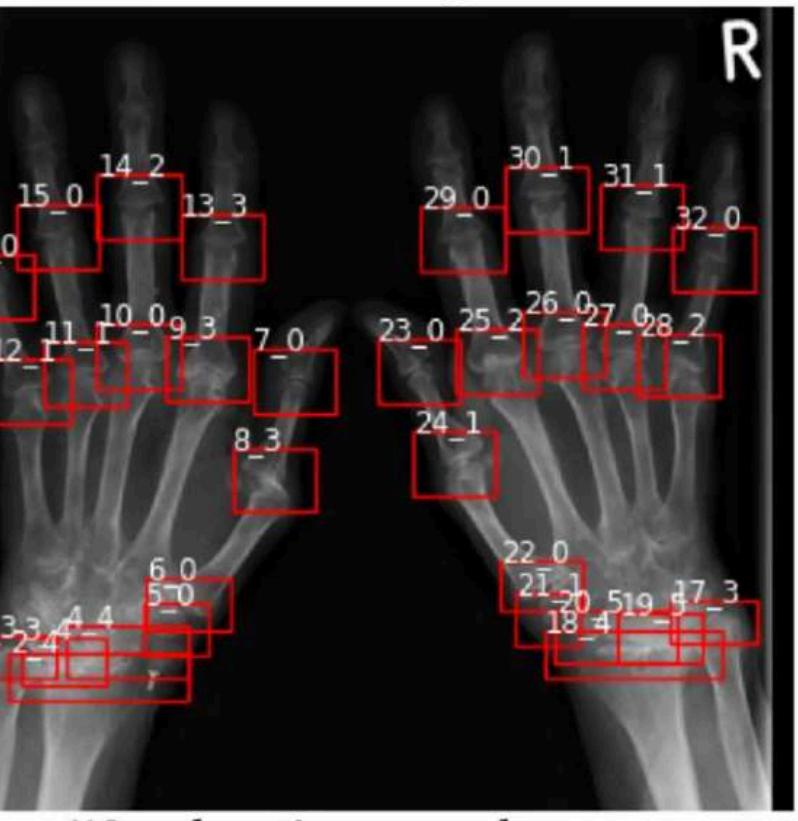
Vehicle count: 8



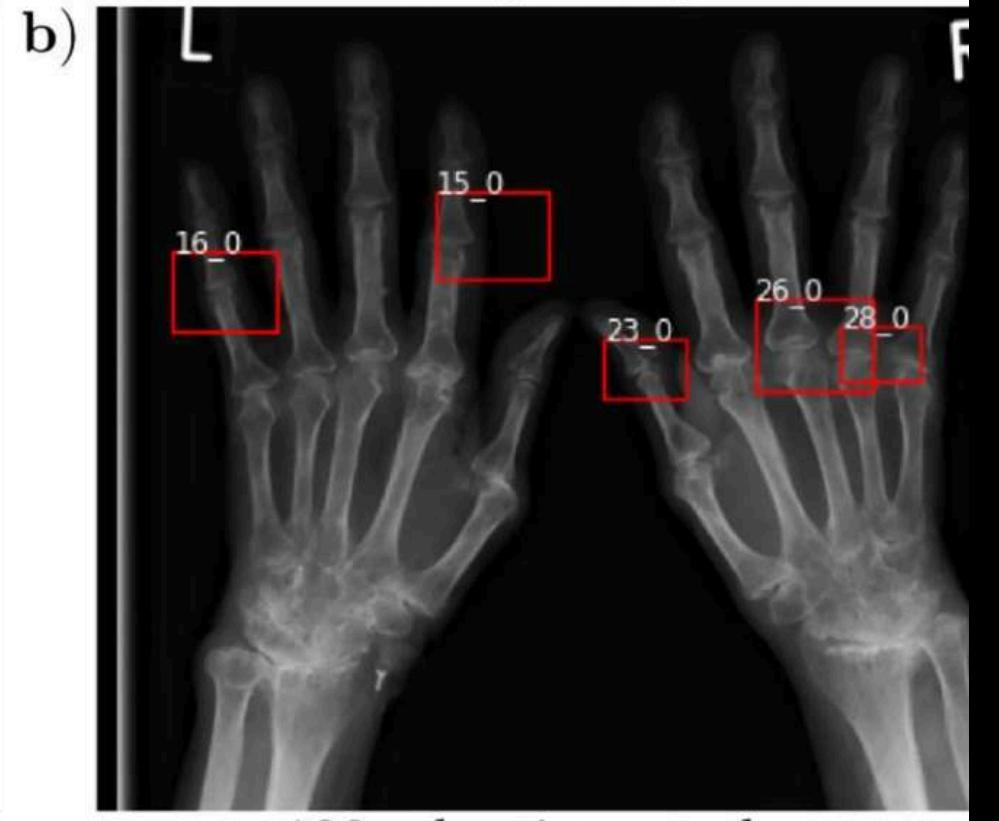
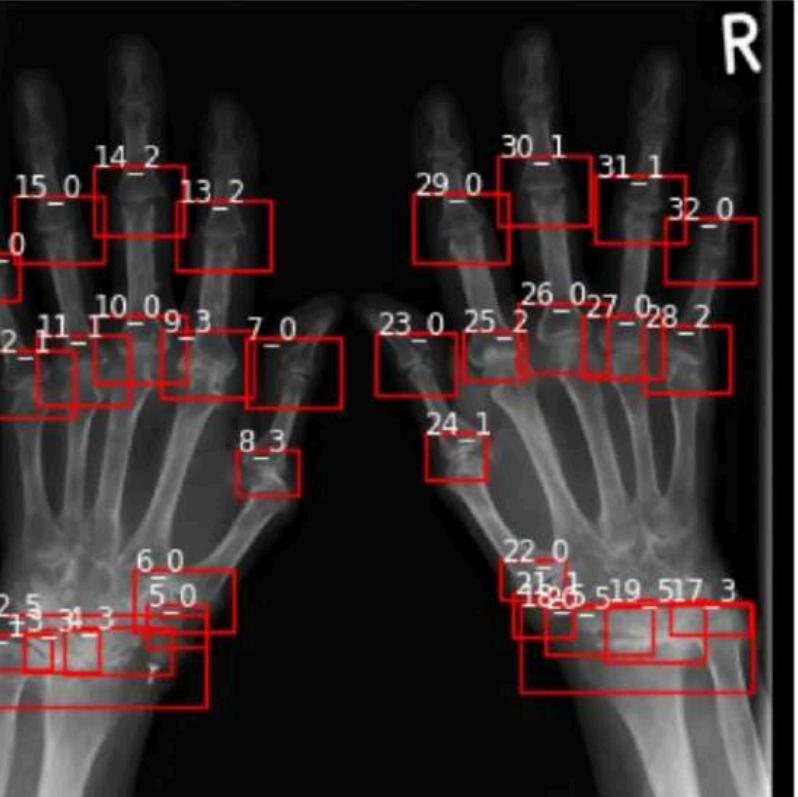
Detects street objects for vehicle perception system

GT Scoring

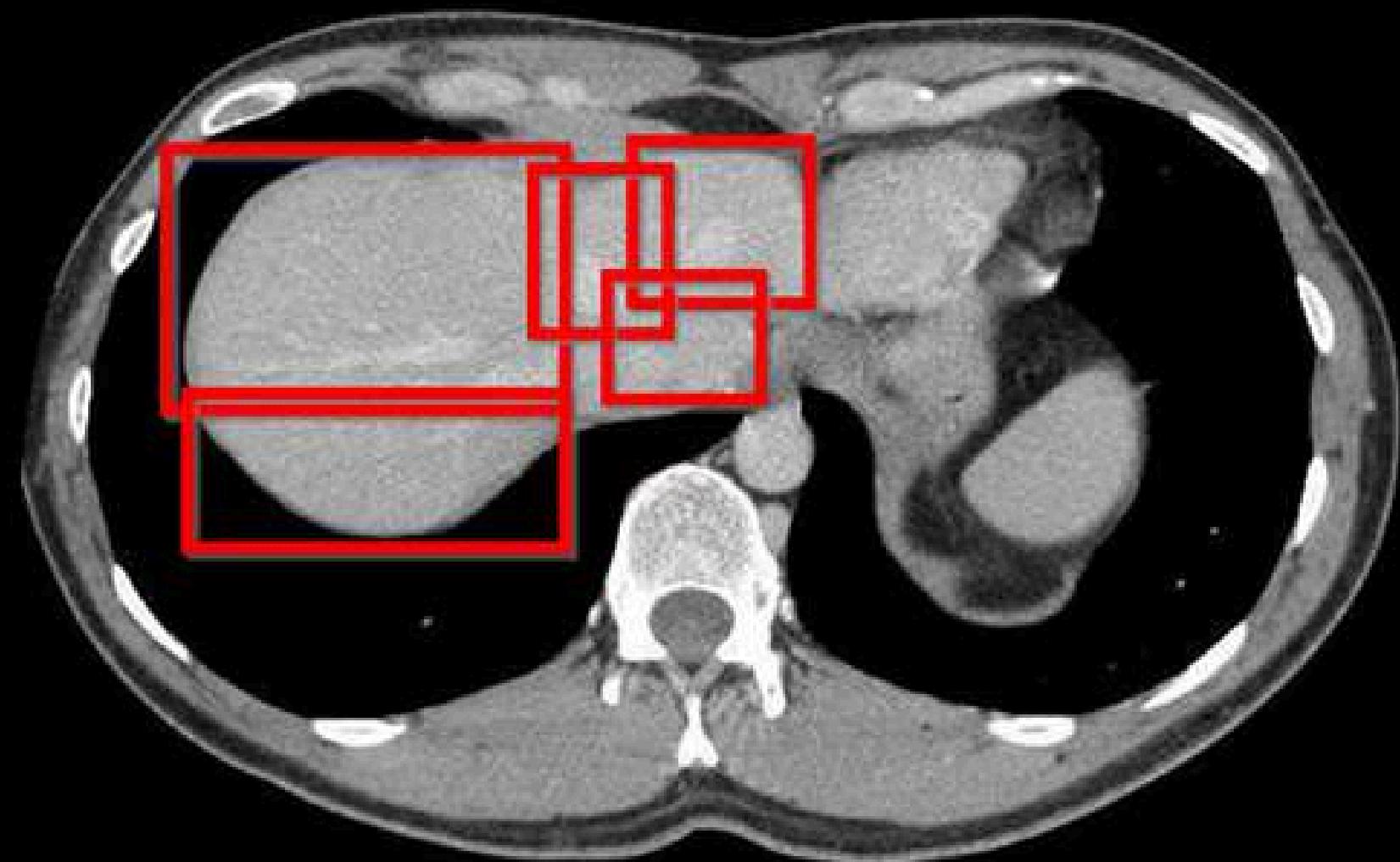
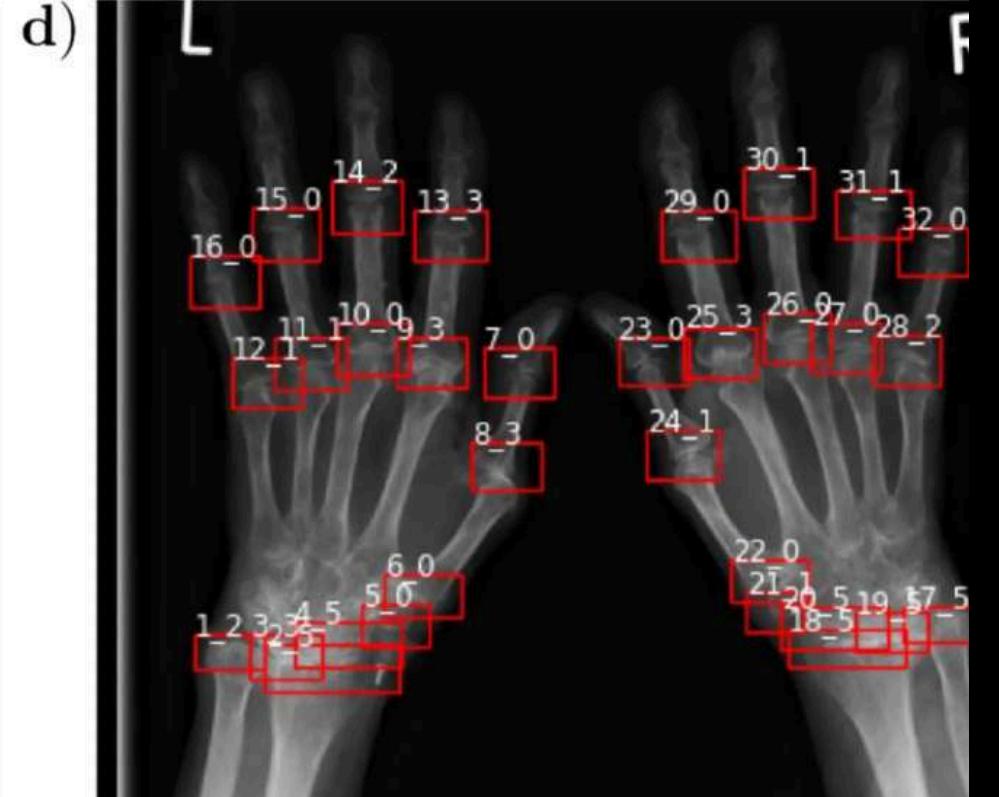
None adaptive epochs



50 adaptive epochs



100 adaptive epochs



Detects problems in body parts through X-rays



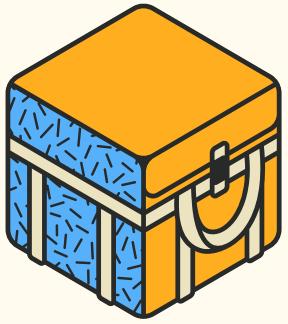
Results saved to runs\detect\predict140
There are 14 products on 1. shelf
There are 16 products on 2. shelf
There are 27 products on 3. shelf
There are 38 products on 4. shelf



Checks stock in retail stores

**BUT how exactly does YOLO detect and
recognize objects so effectively?**

2. Terminologies of YOLO



Bounding box



Anchor box



Confusion matrix



*Non-Maximum
Suppression (NMS)*



*Intersection over
Union (IoU)*

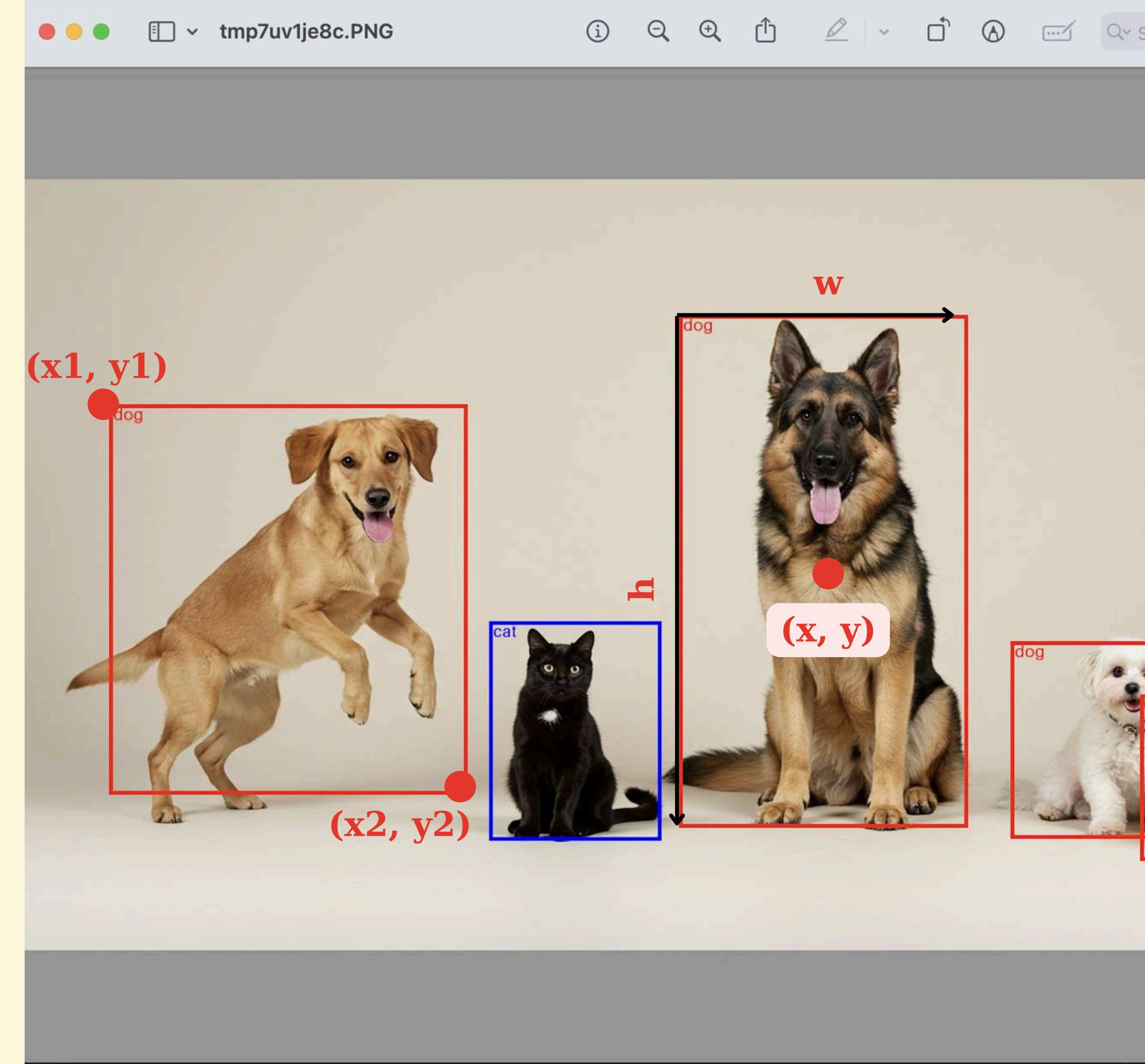


BOUNDING BOX

A rectangular box that surrounds an object in an image, defining its position and size.

Represented in 2 formats:

- Corner Format: (x_1, y_1, x_2, y_2)
- Center Format: (x, y, w, h)



(0, 0)

4284

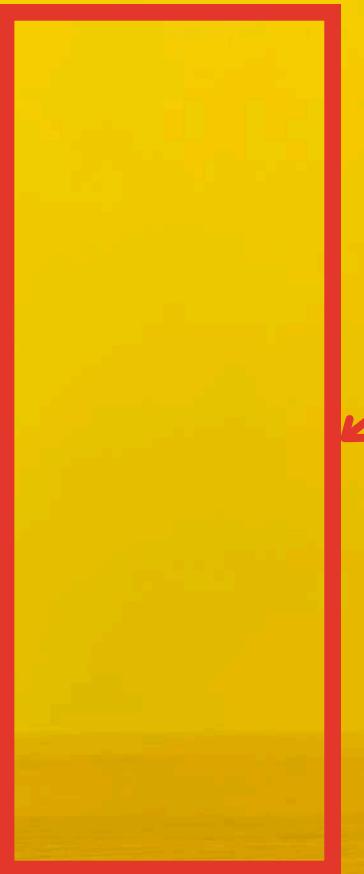
width

5712

height

(4284, 5712)

Bounding box



I need to have a
tool to draw this

2a9c6a34-MILO1.png Properties

General Security Details Previous Versions

Property Value

Origin

Date taken

Image

Dimensions 4284 x 5712

Width 4284 pixels

Height 5712 pixels

Bit depth 24

File

Name 2a9c6a34-MILO1.png

Item type PNG File

File location C:\Users\Administrator\OneDrive\Docum...

Date created 5/24/2025 11:13 PM

Date modified 5/24/2025 12:50 PM

Size 14.3 MB

Attributes N

Availability

Offline status

Shared with

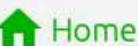
Owner OIIOCHI INGPO\Administrator

[Remove Properties and Personal Information](#)

OK

Cancel

Apply



Home



All applications

on

base (root)

Channels



PyCharm Professional

A full-fledged IDE by JetBrains for both Scientific and Web Python development. Supports HTML, JS, and SQL.

Install



Anaconda Toolbox

0.4.0

Anaconda Assistant JupyterLab supercharged with a suite of Anaconda extensions, starting with the Anaconda Assistant AI chatbot.

Install



Anaconda Cloud Notebooks

Cloud-hosted notebook service from Anaconda. Launch a preconfigured environment with hundreds of packages and store project files with persistent cloud storage.

Launch



jupyter Notebook

7.0.6

Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.

Launch



Qt Console

5.4.2

PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.

Launch



Spyder

5.4.3

Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features

Launch



VS Code

1.87.2

Streamlined code editor with support for development operations like debugging, task running and version control.

Launch



Anaconda on AWS Graviton

Running your Anaconda workloads on AWS Graviton-based processors could provide up to 40% better price performance

Launch

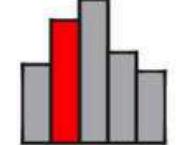


Cloud Infrastructure

Oracle Data Science Service

OCI Data Science offers a machine learning platform to build, train, manage, and deploy your machine learning models on the cloud with your favorite open-source tools

Launch



Glueviz

1.2.4

Multidimensional data visualization across files. Explore relationships within and among related datasets.

Install



JupyterLab

4.0.11

An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.



Orange 3

3.34.0

Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.

Documentation

ANACONDA

Welcome

Label Studio Community Edition

A full-fledged open source solution for data labeling

[SIGN UP](#)

[LOG IN](#)

EMAIL

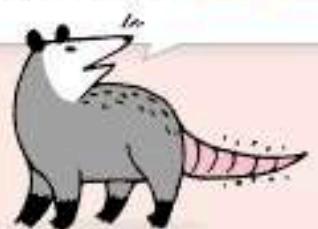
PASSWORD

Keep me logged in this browser

[LOG IN](#)

Did you know?

You can use keyboard shortcuts, or hotkeys, to speed up labeling. Click Settings while annotating to enable predefined hotkeys or see how you can customize your own. [Learn more](#)



LABEL-STUDIO

PyTorch

Get Started Features Ecosystem Blog Tutorials Docs Resources GitHub 

supported version of PyTorch 1.2. This should be suitable for many users. Preview is available if you want the latest, not fully tested and supported, 1.2 builds that are generated nightly. Please ensure that you have **met the prerequisites below (e.g., numpy)**, depending on your package manager. Anaconda is our recommended package manager since it installs all dependencies. You can also [install previous versions of PyTorch](#). Note that LibTorch is only available for C++.

Get up and running with my courses quickly through popular cloud platforms and machine learning services.

PyTorch Build	Stable (1.2)	Preview (Nightly)
Your OS	Linux	Mac
Package	Conda	Pip
Language	Python 2.7	Python 3.5
CUDA	9.2	10.0

Run this Command:

```
pip3 install https://download.pytorch.org/whl/cpu/torch-1.1.0-cp37-cp37m-w  
in_amd64.whl  
pip3 install https://download.pytorch.org/whl/cpu/torchvision-0.3.0-cp37-c  
p37m-win_amd64.whl
```

[Previous versions of PyTorch](#)

PyTorch

NEW

DARK MODE IS HERE

LABEL STUDIO 1.18.0 RELEASE



Use Cases

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Docs

Integrations

Enterprise

Search

22,250

Quick Start

Open Source Data Labeling Platform

The most flexible data labeling platform to fine-tune LLMs, prepare training data, or validate AI models.

[Download OSS](#)[Try Cloud for Free](#)

Quick Start

[PIP](#) [BREW](#) [GIT](#) [DOCKER](#)

```
1 # Install the package
# into python virtual environment
2 pip install -U label-studio
3
4 # Launch it!
```

image

#2 [] + 10423049 #i2BDw 1 minute ago



Milo 1 Ojita 2 Fami 3 TH 4 Vina 5

↶ ↻ ✖ ↻

Submit

Info

History

Selection Details



Regions

Relations

Manual By Time



It took me 1h48:)

(0, 0)

2127

4284

width

2313

2737

1042



(2127, 2313)

(4284, 5712)

5712

height

images vary in
different sizes

*But we don't use
these values*

2a9c6a34-MILO1.png Properties

General Security Details Previous Versions

Property Value

Origin

Date taken

Image

Dimensions 4284 x 5712

Width 4284 pixels

Height 5712 pixels

Bit depth 24

File

Name 2a9c6a34-MILO1.png

Item type PNG File

File location C:\Users\Administrator\OneDrive\Docum...

Date created 5/24/2025 11:13 PM

Date modified 5/24/2025 12:50 PM

Size 14.3 MB

Attributes N

Availability

Offline status

Shared with

Owner OIIOCHI INGPO\Administrator

[Remove Properties and Personal Information](#)

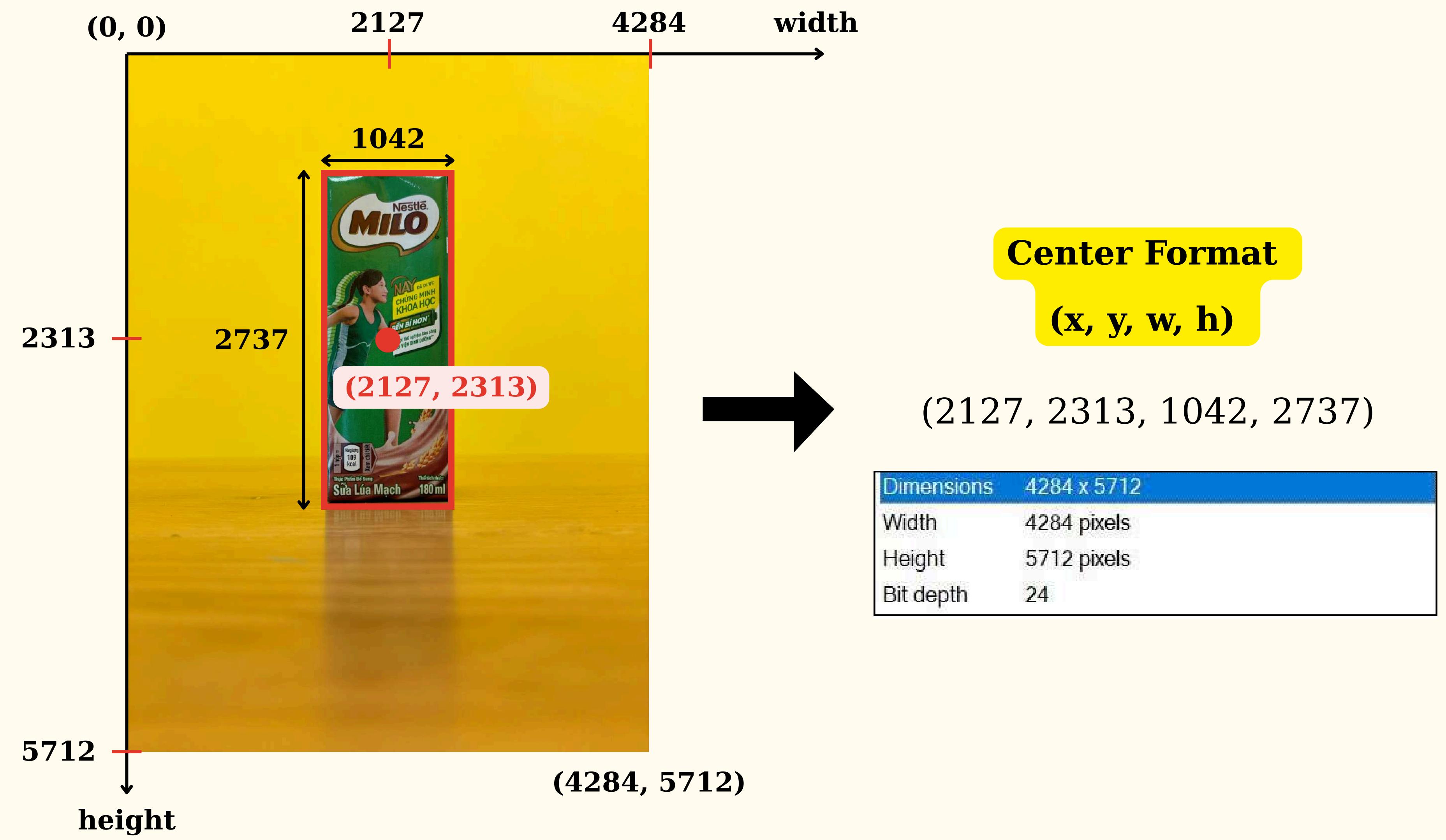
OK

Cancel

Apply

Normalize

by dividing by the original image size, so that the model
can learn better with the inputs varying from 0 to 1,



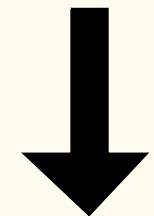
Normalize

$x_{\text{norm}} = x_{\text{pixel}} / \text{image_width}$

$y_{\text{norm}} = y_{\text{pixel}} / \text{image_height}$

$w_{\text{norm}} = \text{width}_{\text{pixel}} / \text{image_width}$

$h_{\text{norm}} = \text{height}_{\text{pixel}} / \text{image_height}$



$$x_{\text{norm}} = 2127 / 4284 = \mathbf{0.496}$$

$$y_{\text{norm}} = 2313 / 5712 = \mathbf{0.404}$$

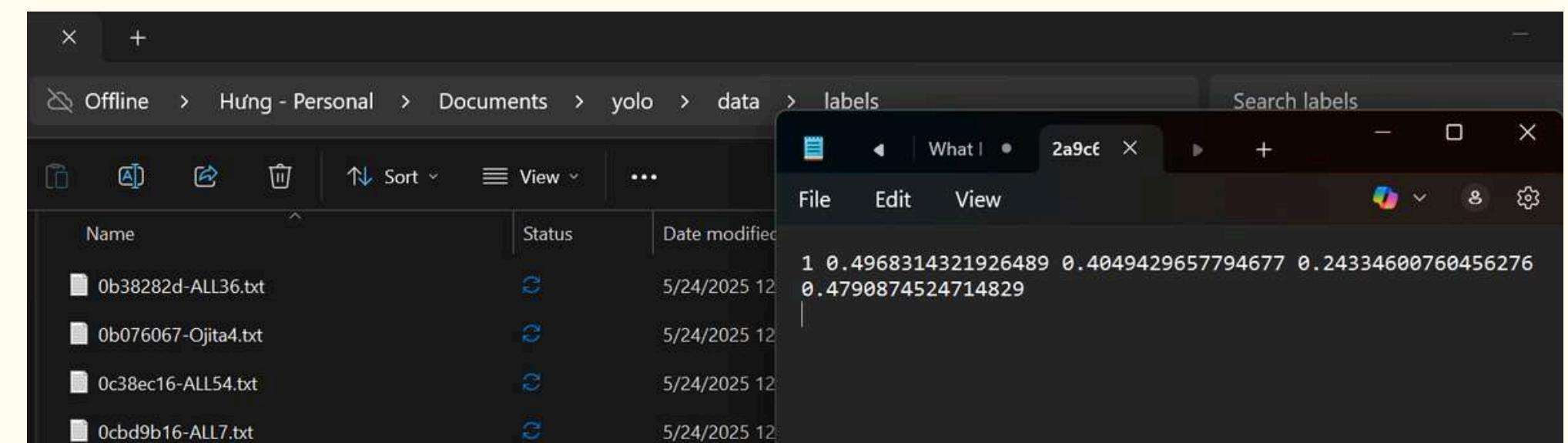
$$w_{\text{norm}} = 1042 / 4284 = \mathbf{0.243}$$

$$h_{\text{norm}} = 2737 / 5712 = \mathbf{0.479}$$

Center Format
(x, y, w, h)

(2127, 2313, 1042, 2737)

Dimensions	4284 x 5712
Width	4284 pixels
Height	5712 pixels
Bit depth	24



RECALL

(0, 0)

2127

4284

width

2313

2737

1042



(2127, 2313)

(4284, 5712)

5712

height

Selection Details

1. Milo

X: 37.51584283903676

Y: 16.53992395437262

W: 24.334600760456276

H: 47.90874524714829

Info

History

Selection Details



1 Milo

ID 6XLEeVxuIA

X: 37.51584283903676 Y: 16.53992395437262 W: 24.334600760456276

H: 47.90874524714829 E: 0



*Seems like the
values are different*

(0, 0)

2127

4284

width

2313

2737

1042



(2127, 2313)

Because we are using pixel
values, whereas Label-Studio
uses relative coordinates

5712

(4284, 5712)

height

I will show you how
to convert later

Pixel

Relative coordinates

Selection Details

1. Milo

X: 37.51584283903676

Y: 16.53992395437262

W: 24.334600760456276

H: 47.90874524714829

Info

History

Selection Details

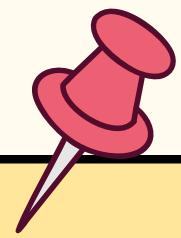


1 Milo

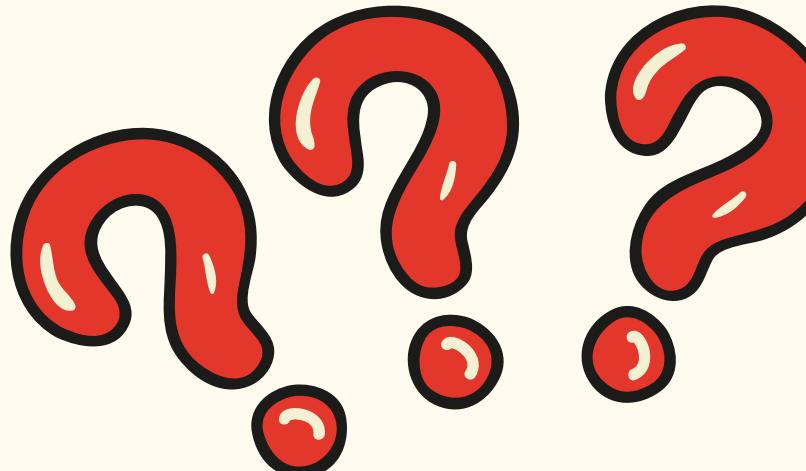
ID 6XLEeVxuIA

X: 37.51584283903676 Y: 16.53992395437262 W: 24.334600760456276

H: 47.90874524714829 E: 0



What is 1? Why x
and y are different?



1 **0.4968314321926489 0.4049429657794677**
0.24334600760456276 0.4790874524714829

A screenshot of a file explorer window. The path is Offline > Hưng - Personal > Documents > yolo > data > labels. The window shows a list of files with the following data:

Name	Status	Date modified
0b38282d-ALL36.txt	🕒	5/24/2025 12
0b076067-Ojita4.txt	🕒	5/24/2025 12
0c38ec16-ALL54.txt	🕒	5/24/2025 12
0cbd9b16-ALL7.txt	🕒	5/24/2025 12
0d63473f-ALL6.txt	🕒	5/24/2025 12
01a07352-ALL47.txt	🕒	5/24/2025 12
1ce958d6-fa9.txt	🕒	5/24/2025 12
2a9c6a34-MILO1.txt	🕒	5/24/2025 12
2a771e3b-MILO7.txt	🕒	5/24/2025 12

Selection Details

1. Milo

X: 37.51584283903676

Y: 16.53992395437262

W: 24.334600760456276

H: 47.90874524714829

Info History

Selection Details

1 Milo

ID 6XLEeVxuIA

X: 37.51584283903676 Y: 16.53992395437262 W: 24.334600760456276

H: 47.90874524714829 L: 0

In YOLO output format:

class_id x_center y_center width height

1 0.4968314321926489 0.4049429657794677 0.24334600760456276 0.4790874524714829

x center normalised

y_center_normalised

width normalised

height_normalised

class_id

Classes Lables

0 Famili

1 Mile

2 Ojita

3 TH

4 Vina



In Label-Studio format:

x_corner y_corner width height

37.51584283903676 16.53992395437262 24.334600760456276 47.90874524714829

x_corner

y_corner

width

height

*So how do we
convert Corner to
Center Format?*



Selection Details

1. Milo

X: 37.51584283903676 ← x_corner

Y: 16.53992395437262 ← y_corner

W: 24.334600760456276

H: 47.90874524714829

Bounding Box Calculation Details

Center Format → Corner Format

$$(x_{\text{center}}, y_{\text{center}}, w, h) \rightarrow (x_1, y_1, x_2, y_2)$$

$$x_1 = x - w / 2$$

$$y_1 = y - h / 2$$

$$x_2 = x + w / 2$$

$$y_2 = y + h / 2$$

Corner Format → Center Format

$$(x_1, y_1, x_2, y_2) \rightarrow (x_{\text{center}}, y_{\text{center}}, w, h)$$

$$x = (x_1 + x_2) / 2$$

$$y = (y_1 + y_2) / 2$$

$$w = x_2 - x_1$$

$$h = y_2 - y_1$$

Use for drawing boxes and calculating IoU

Use for predictions and training

Formula

$$x_{center} = x_{corner} + w / 2$$

$$y_{center} = y_{corner} + h / 2$$

Given that

$$x_{corner} = 37,515842$$

$$y_{corner} = 16.539923$$

calculate

$$x_{center} = x_{corner} + w / 2 = 37.515842 + 24.334600 / 2 = 49.683142$$

$$y_{center} = y_{corner} + h / 2 = 16.539923 + 47.908745 / 2 = 40.4942955$$

Now the value is **almost** the same as in the class label output

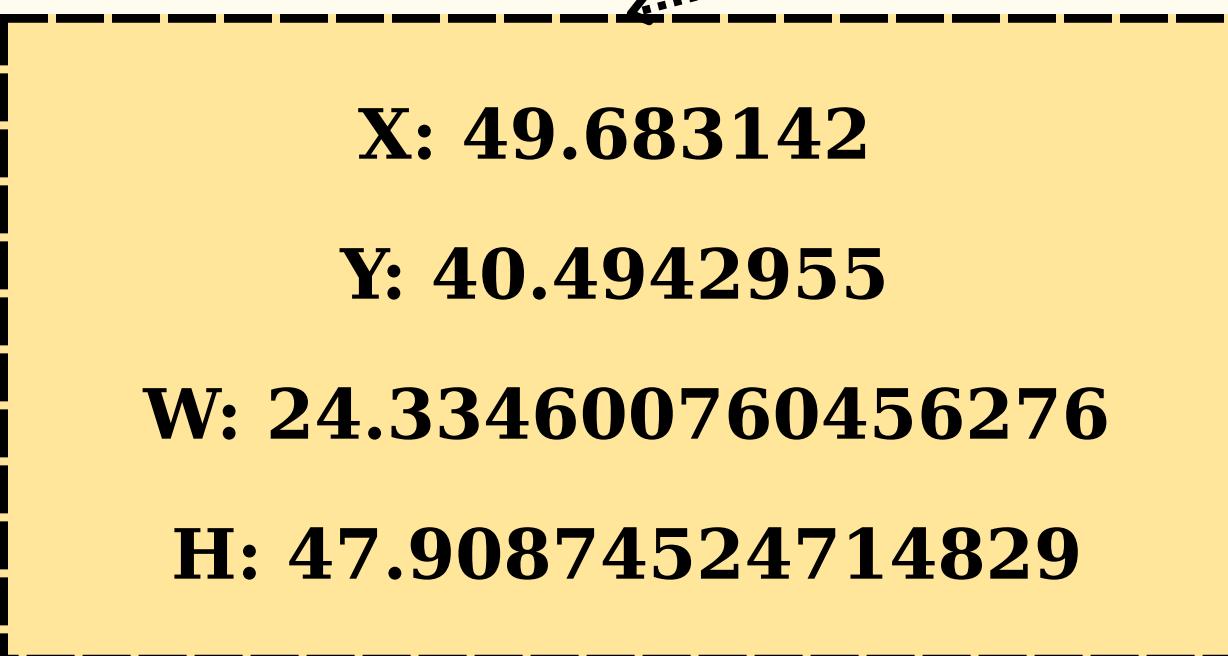


However, label_studio saves x, y, width, height as **% of image size**, so for example:

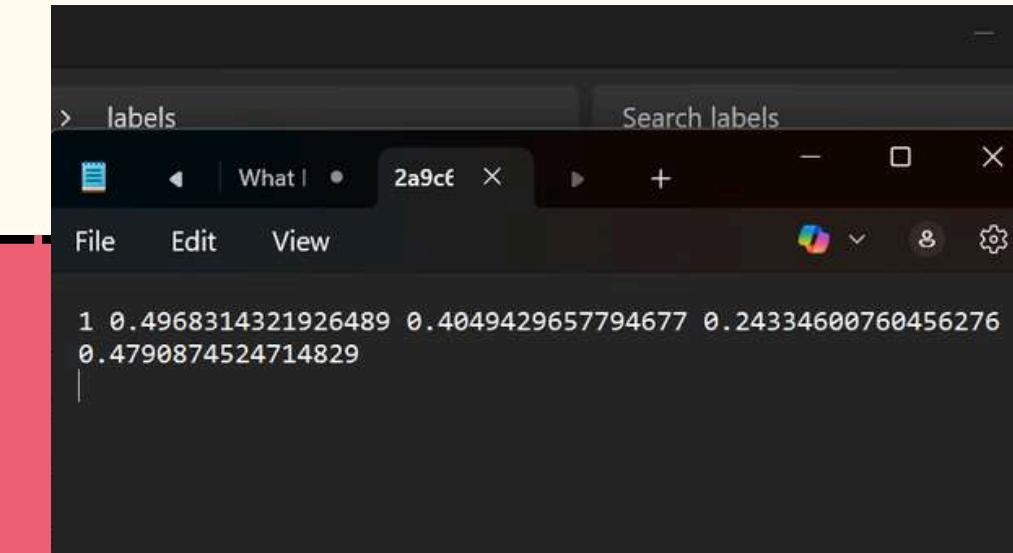
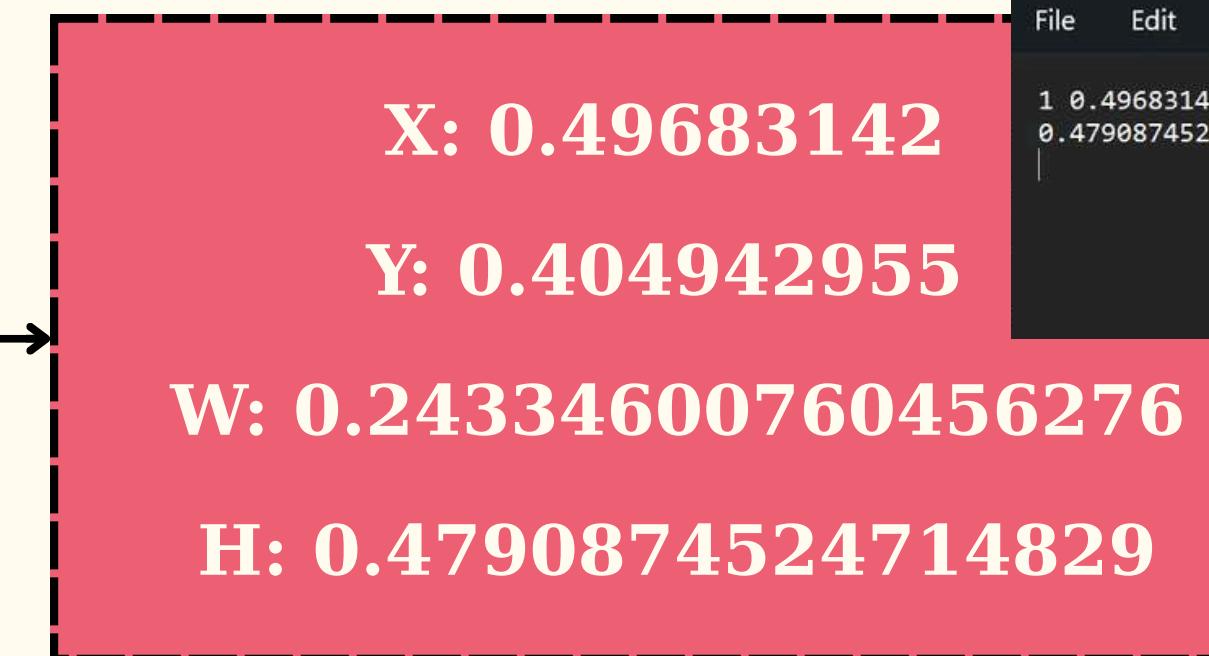
- x: 49.683142 meaning that the coordinate is at about 49.6% of the image width
- width: 24.3346 meaning that the box takes up 24% of the image width



Therefore, to get the value after normalized, we just have to **divide by 100**



Normalized →



Oh, do you forget something?

(0, 0)

2127

4284

width

2313

2737

1042



(2127, 2313)

*I will show you how
to convert later*

Pixel

Relative coordinates

height

(4284, 5712)



Selection Details

1. Milo

X: 37.51584283903676 ← x_corner

Y: 16.53992395437262 ← y_corner

W: 24.334600760456276

H: 47.90874524714829

Info

History

Selection Details



1 Milo

ID 6XLEeVxuIA

X: 37.51584283903676 Y: 16.53992395437262 W: 24.334600760456276

H: 47.90874524714829 E: 0

X: 49.683142

Y: 40.4942955

W: 24.334600760456276

H: 47.90874524714829

Since I am using relative coordinates,
I need a formula to solve this

X_pixel = x_center / 100 * image_width

Y_pixel = y_center / 100 * image_height

W_pixel = width / 100 * image_width

H_pixel = height / 100 * image_height



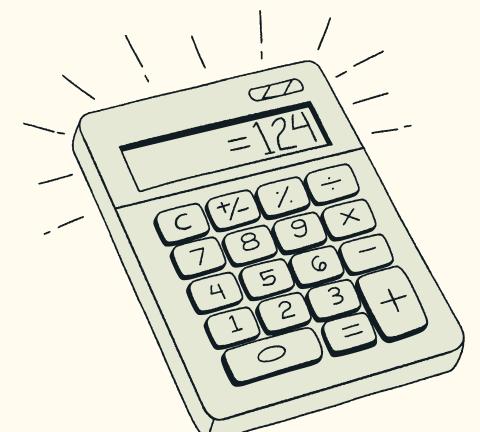
$$\text{x_pixel} = 49.6831432192659 / 100 * 4284 \approx 2127.48 \text{ px}$$

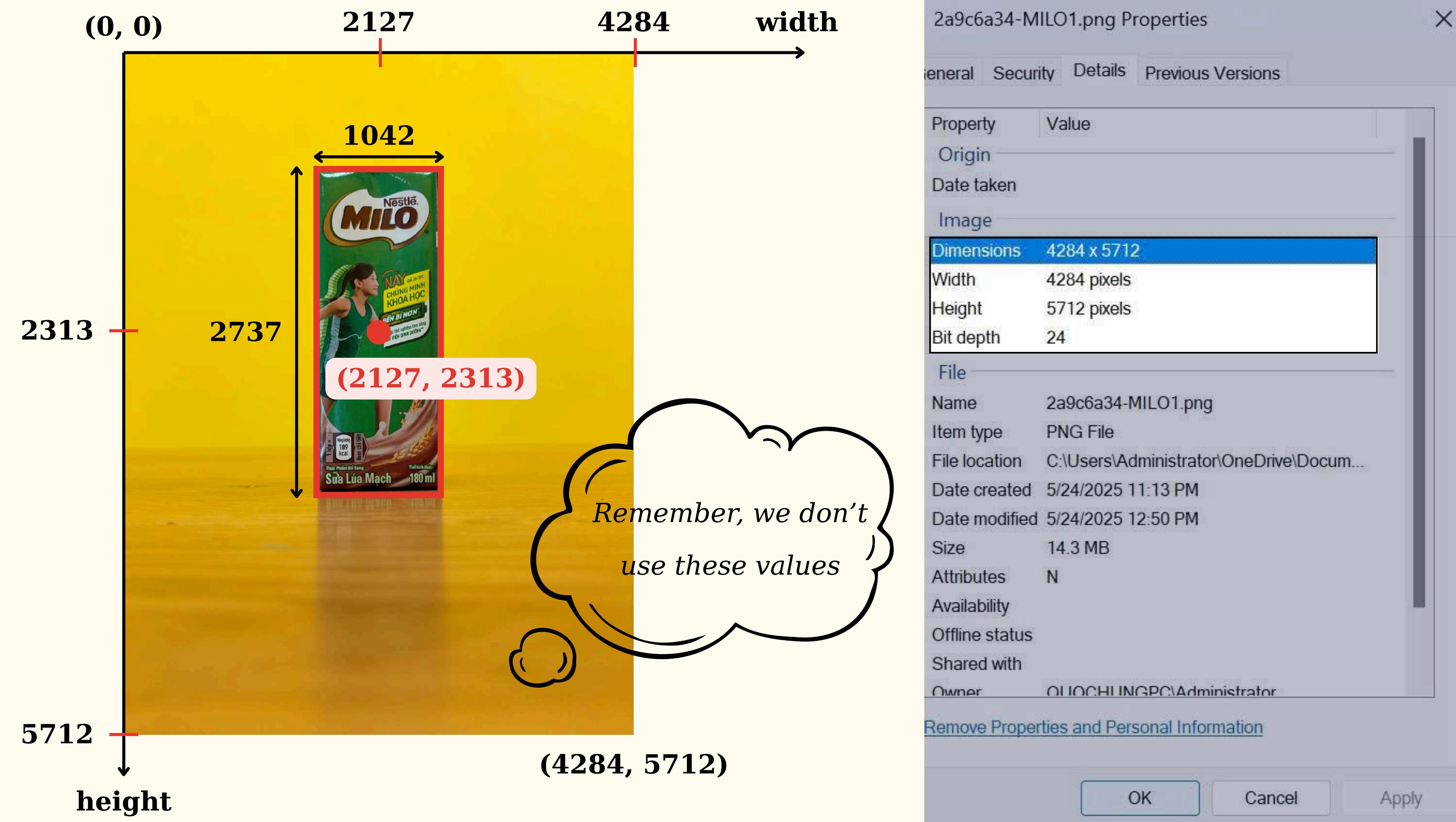
$$\text{y_pixel} = 40.494296577946765 / 100 * 5712 \approx 2313.96 \text{ px}$$

$$\text{w_pixel} = 24.334600760456276 / 100 * 4284 \approx 1042.45 \text{ px}$$

$$\text{h_pixel} = 47.90874524714829 / 100 * 5712 \approx 2737.94 \text{ px}$$

← Calculate





To understand the value, you need to understand

the platform you are using first

CONFUSION MATRIX

Predicted as TH

20 CORRECT 3 WRONG



Predicted as Milo

2 WRONG 15 CORRECT



ACCURACY

$$\frac{20 + 15}{20 + 15 + 3 + 2} = 87.5 \%$$

The accuracy is the measurement of all the correctly identified cases!

However, it has a really big drawback

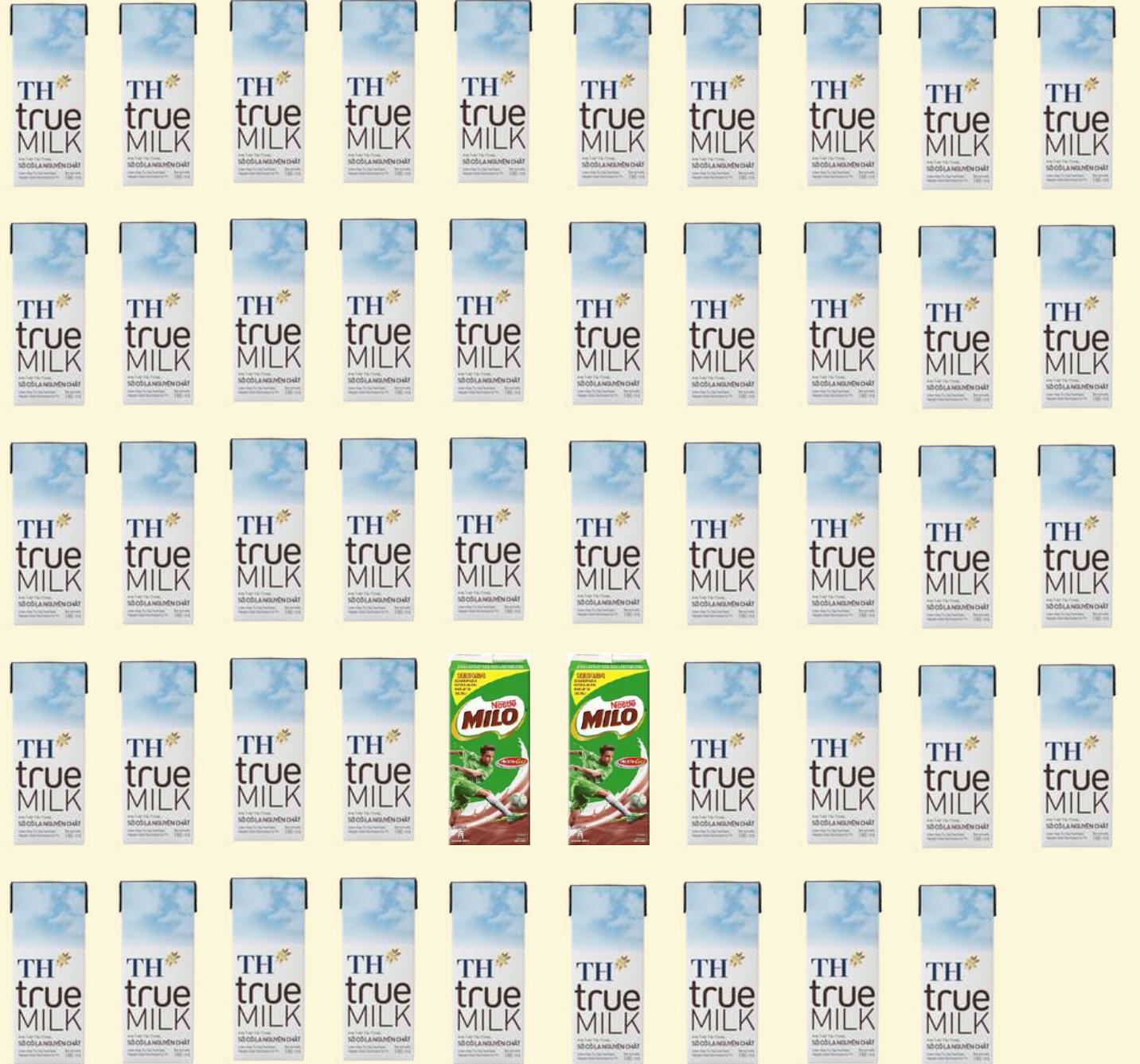


Identify the Milo box



ACCURACY

Predicted as TH



Milo

$$\frac{47 + 1}{47 + 3} = 96\%$$

The model can easily
achieve 96% overall
accuracy. Isn't it good?



CONFUSION

MATRIX

		Predicted Class		
		Milo	TH	High R = Milo's less-missing model.
Actual Class	Milo	TP (True Positive) 	FN (False Negative)  	Recall (Sensitivity) $\frac{TP}{TP + FN}$ 0.33
	TH	0 FP (False Positive)	 x47 TN (True Negative)	high accuracy is a thing
High P = less "falsely accusing" TH of being Milo	Precision $\frac{TP}{TP + FP}$ 1	high accuracy is nothing if data is unbalanced		Accuracy $\frac{TP + TN}{TP + TN + FN + FP}$

Accuracy measures the proportion of samples that the model guesses correctly. However, it is not always that accuracy is meaningful. It makes no sense when the data is so unbalanced like the previous exmaple

$$\frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FN} + \text{FP}}$$

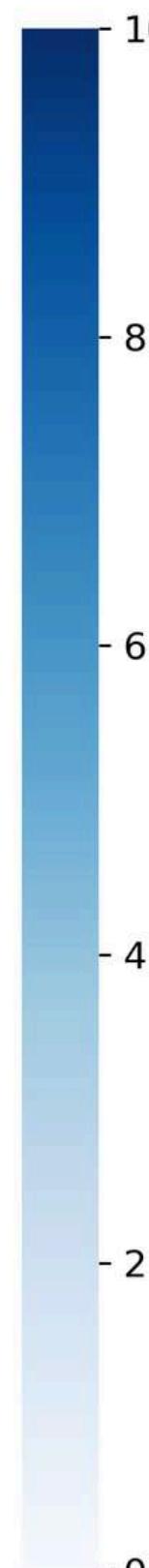
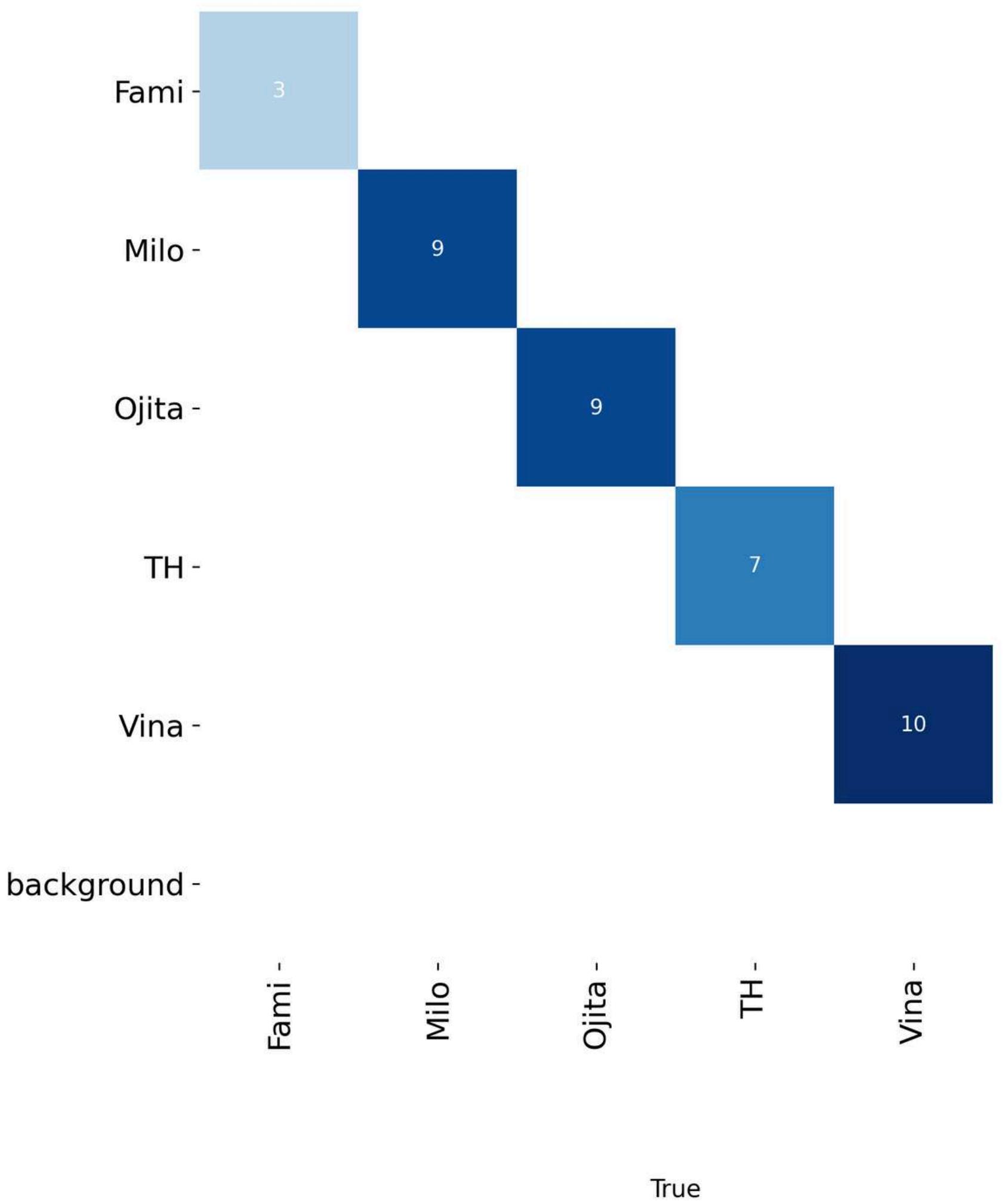
When the data is unblanced

$$\frac{2 \cdot \text{Precision} \cdot \text{Recall}}{\text{Precision} + \text{Recall}}$$

F1 only high when Precision and Recall are both high

Confusion Matrix

Predicted



Check list:



3



9



9

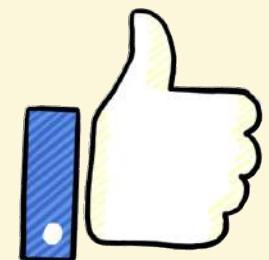


9



The model correctly predicted

all the labels, with no errors



3. Let's Demo, shall we?

Remember to install environment Anaconda, Label-
Studio and Pytorch

Collecting Dataset



image

#2

Drawing Bounding Box



Milo 1 Ojita 2 Fami 3 TH 4 Vina 5

↶ ↻ ✕ ↻

Submit

Selection Details



Regions	Relations
☰ Manual	⌚ By Time ⌚



Training



File Edit Selection View Go Run ... ← → 🔍 yolo demo [Administrator]

EXPLORER ... app.py yolo_detect.py 1 gallery.html qr_code.py

OPEN EDITORS C:\Users\Administrator\OneDrive\Tài liệu\yolo\my_model> yolo_detect.py >...

app.py yolo_detect.py 1

go qr Administrator: Anaconda Proj +

YOLO DEMO .anima static CSS # style js template gallery index.html app.py my_model qr_code qr_code requirements

(base) C:\Users\Administrator>conda activate yolo-env1

(yolo-env1) C:\Users\Administrator>cd C:\Users\Administrator\OneDrive\Tài liệu\yolo\my_model

(yolo-env1) C:\Users\Administrator\OneDrive\Tài liệu\yolo\my_model>python yolo_detect.py --model my_model.pt --source us b0 --resolution 1280x720

OUTLINE > OUTLINE
TIMELINE > TIMELINE
0 1

9:46 PM 5/28/2025

File Edit Selection View Go Run Terminal Help

Py yolo_demo [Administrator]

EXPLORER OPEN EDITORS app.py yolo_detect.py gallery.html qr_code.py

C:\Users\Administrator\OneDrive>Tài liệu>yolo>my_model>yolo>...

```
1 import os
2 import sys
3 import argparse
4 import glob
5 import time
6
7 import cv2
8 import numpy as np
9 from ultralytics import YOLO
10
11 # Define and parse user input arguments.
12
13 parser = argparse.ArgumentParser()
14 parser.add_argument('--model', help='Path to YOLO model file (example: "runs/detect/train/weights/best.pt")', required=True)
15 parser.add_argument('--source', help='Image source, can be image file ("test.jpg"), image folder ("test_dir"), video file ("testvid.mp4"), or index of USB camera ("0").', required=True)
16 parser.add_argument('--thresh', help='Minimum confidence threshold for displaying detected objects (e.g., 0.5).', default=0.5)
17 parser.add_argument('--resolution', help='Resolution in WxH to display inference results at (example: 1280x720). If not specified, match source resolution.', default=None)
18 parser.add_argument('--record', help='Record results from video or webcam and save it as "demo1.avi".', action='store_true')
19
20 args = parser.parse_args()
21
22 # Parse user inputs
23 model_path = args.model
24 img_source = args.source
25 min_thresh = args.thresh
26 user_res = args.resolution
27 record = args.record
28
29 # Check if model file exists and is valid
30 if not os.path.exists(model_path):
31     print('ERROR: Model path is invalid or model was not found. Make sure the model filename was entered correctly.')
32     exit(1)
```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\Administrator\Downloads\yolo_demo> python qr_code.py
PS C:\Users\Administrator\Downloads\yolo_demo>

File Edit View

```
conda activate yolo-env1
cd C:\Users\Administrator\OneDrive\Tài liệu\yolo\my_model
curl -o yolo_detect.py https://www.ejtech.io/code/yolo_detect.py
python yolo_detect.py --model my_model.pt --source usb0 --resolution 1280x720
python yolo_detect.py --model my_model.pt --source test.mp4
```

thi cuô... conda... classes... What's... 2a9c6a34-MF

File Explorer

yo... X +

Offline > ... Documents > yolo > Search yolo

New

Name Status Date modified Type

.animal 5/25/2025 3:56 PM File folder

data 5/24/2025 11:13 PM File folder

milk_images 5/24/2025 12:54 PM File folder

my_model 5/28/2025 9:59 PM File folder

data.zip 5/24/2025 12:52 PM Compressed

Home

Gallery

Hung - Personal

Hung - Personal

Desktop

Downloads

Documents

Pictures

Music

Videos

DATA (D:)

Screenshots

Items

Python 3.9.1 64-bit

PowerShell

10:03 PM

5/28/2025

**Do you also want to try it on your
phone now? Just scan the qr code**

Wait for me a minute to publish the qr code ...

How to push on edge device?

Since YOLO needs RESTAPI to push on egde device,
and I don't know how to do it :) So I will use Microsoft
Azure Custom Vision to push it on Counterfit



Projects

Project Name:

Search by project name

Project Type:

Any project type

Resource:

All



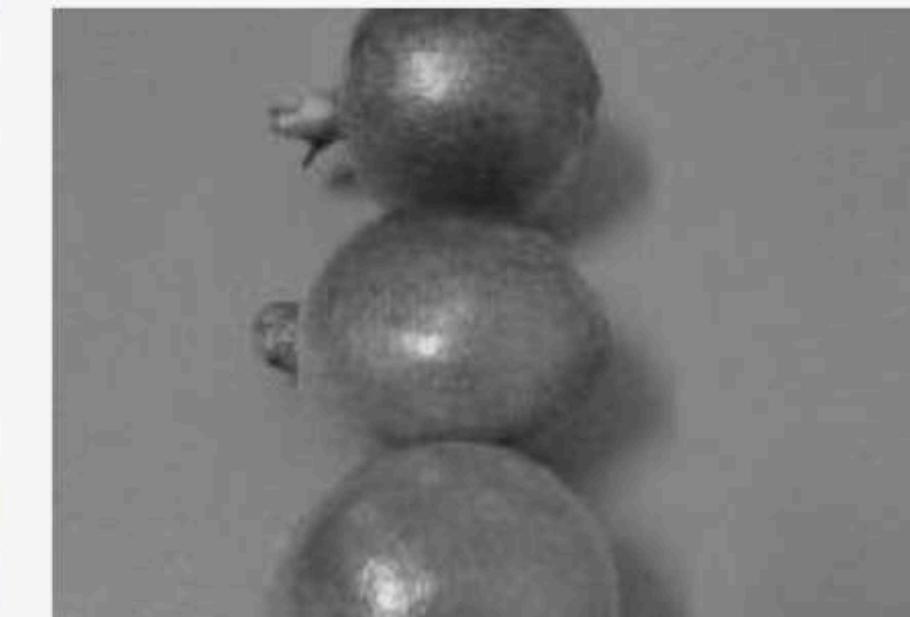
NEW PROJECT



OBJECT DETECTION

stock-detector

stock-detector-training



CLASSIFICATION

fruit-quality-detection

fruit-quality-detector-training

Login Microsoft Azure

Custom Vision

Filter

Iteration

Workspace

Tags

Tagged

Showing: all untagged

Suggested Tags

Quickly label your images with suggested objects

Get suggestions

Image Detail

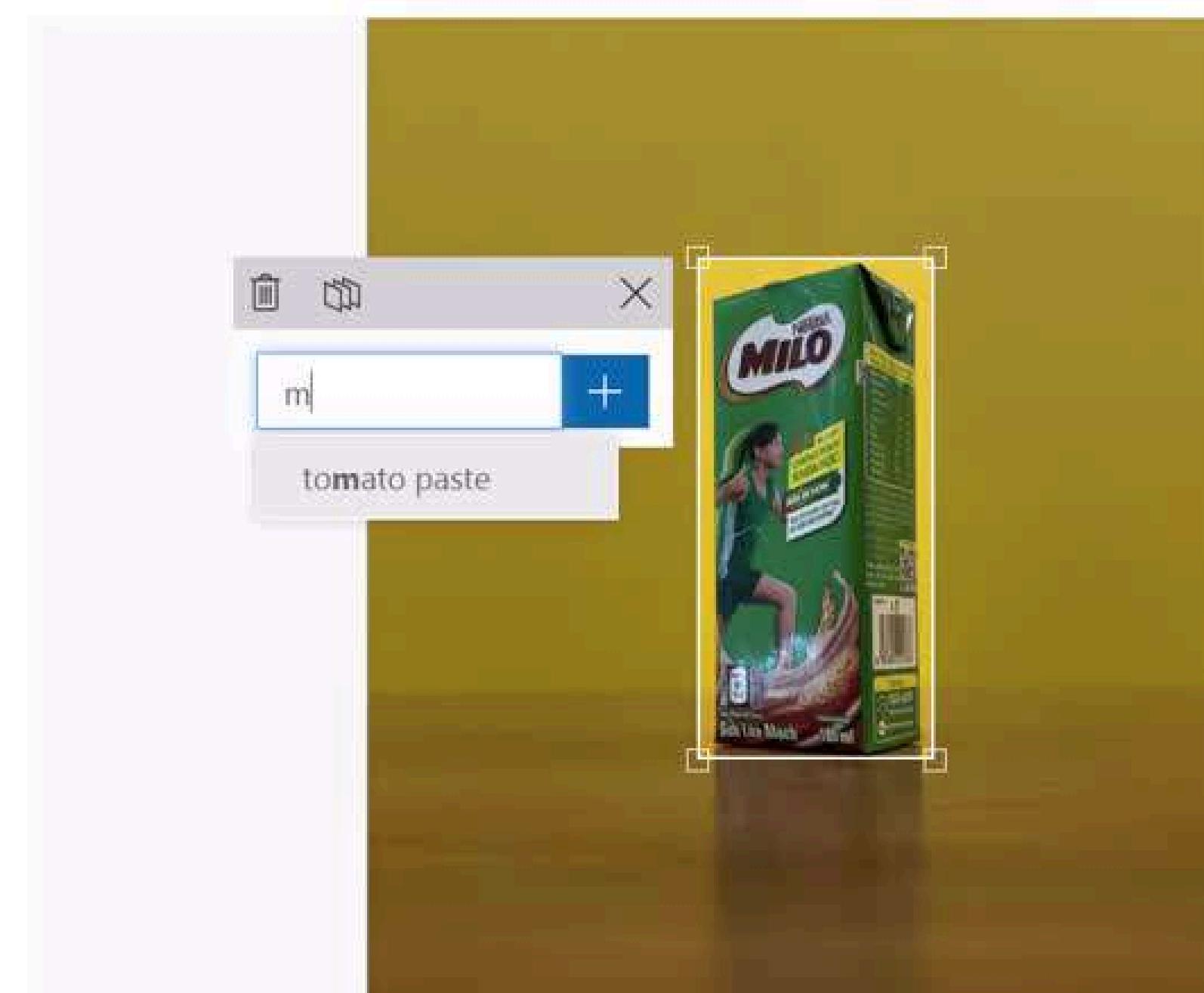
Undo Changes

Regions Shown

X

1

>



Drawing Bounding Box

Get started

Filter

Iteration

Iteration 7

Tags

Showing: all pre

Search For Tags

 [Auto-Generated] milo th

Sort

 Suggested Newest Oldest

File formats accepted: jpg, png, bmp
File size should not exceed: 4mb

Using model trained in

Iteration

Iteration 7

Predicted Object Threshold

Only show suggested objects if the probability is above the selected threshold.

Threshold Value: 15%



Predictions

Predictions are shown in red

Tag	Probability
milo	52.4%

100%

Get started

Training

Iterations

Probability Threshold: 50%

Overlap Threshold: 30%

Iteration 8

Trained : 4 minutes ago with
Products on Shelves domain

Iteration 7

Trained : 25 minutes ago with
Products on Shelves domain

Publish Prediction URL Delete Export

Iteration 8

Finished training on **5/25/2025, 8:15:05 PM** using **Products on Shelves** domainIteration id: **925b5d7d-64ec-4ff0-90ae-4a63d9df6e14**

Precision



Recall



This number will tell you: out of the tags which should be predicted correctly, what percentage did your model correctly find?

A.P.



Performance

Final Result

100%

Tag

Precision

Recall

A.P.

Image count

Get started

The screenshot shows the Microsoft Visual Studio Code (VS Code) interface. The top bar includes standard menu items like File, Edit, Selection, View, Go, Run, etc., and a search bar labeled 'IOT AN [Administrator]'. The left sidebar has icons for Explorer, Open Editors, IOT AN, and other project-related files. The main area displays three open editors: 'requirements.txt', 'app.py', and 'image.jpg'. The 'app.py' editor contains the following Python code:

```
23 # Lưu ảnh lại để xử lý tiếp
24 with open('image.jpg', 'wb') as image_file:
25     image_file.write(image.read())
26
27 # Cấu hình dịch vụ Custom Vision
28 prediction_url = 'https://southeastasia.api.cognitive.microsoft.com/customvision/v3.0/Prediction/ed052184-4478-4262-9
29 prediction_key = '2a10664ae7d944ce9cba407aa2fe7b9b'
30
31 # Phân tích URL để lấy thông tin endpoint, project ID, iteration
32 parts = prediction_url.split('/')
33 endpoint = 'https://' + parts[2]
34 project_id = parts[6]
35 iteration_name = parts[9]
```

Below the code editor are tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL, and PORTS. The TERMINAL tab is active, showing a PowerShell session with the command 'python app.py' entered. The status bar at the bottom provides information about the file ('In 55, Col 12'), encoding ('UTF-8'), line separator ('LF'), language ('Python 3.9.1 (.venv:venv)'), port ('Port : 5500'), and prettier status. The bottom right corner shows system icons for battery, signal, volume, and date/time.

Filter

Iteration

Iteration 8

Tags

Showing: all pre

Search For Tags

 [Auto-Generated] milo th

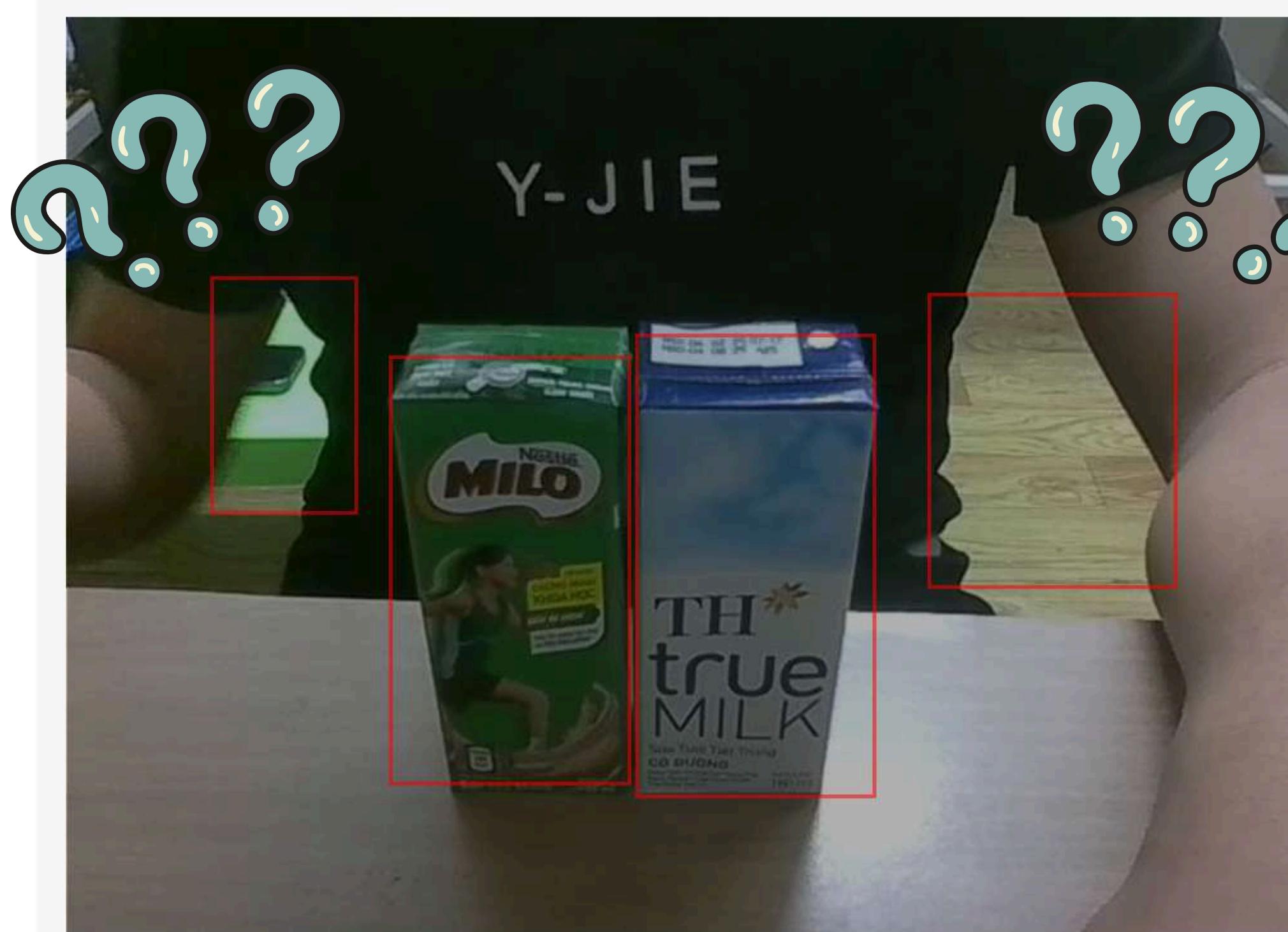
Sort

 Suggested Newest Oldest

Image Detail

Undo Changes

Regions Shown



My Objects



Only show suggested objects if the probability is above the selected threshold.

Threshold Value: 15%



Predictions

Predictions are shown in red

Tag	Probability
milo	87.9%
th	63.7%
[Auto-Generated] ...	57.1%
th	17.9%

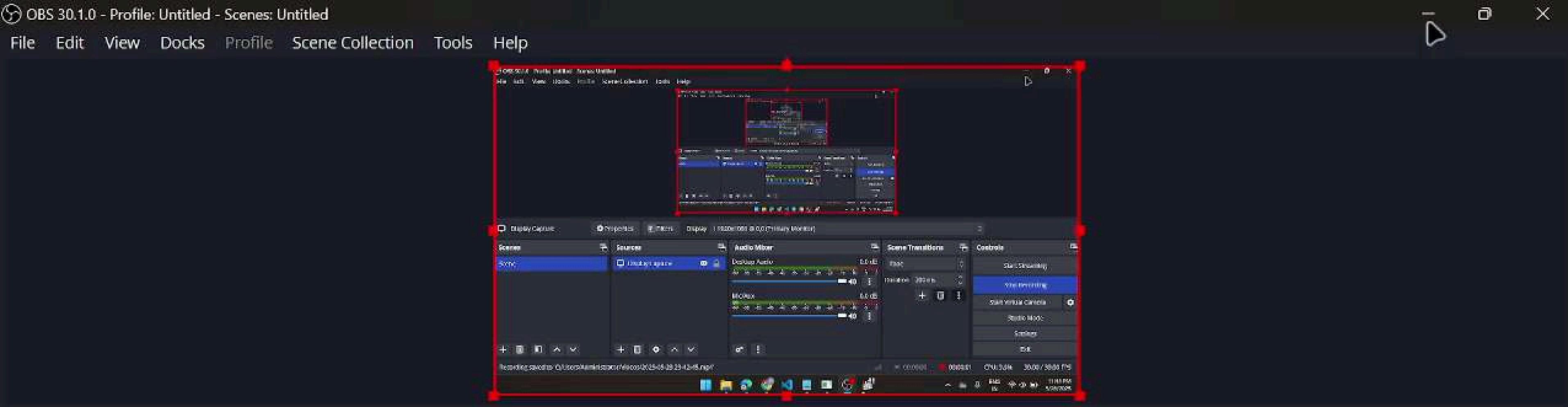
100%

Get started



Check Stock on the shelf

I will use Library Tkinter in Python to do this task



Display Capture Properties Filters Display : 1920x1080 @ 0,0 (Primary Monitor)

Scenes Sources Audio Mixer Scene Transitions Controls

Scene Display Capture Desktop Audio Mic/AUX Fade Start Streaming
Duration: 300 ms Stop Recording

Start Virtual Camera Studio Mode Settings Exit

+ - [] ^ v + - [] ^ v [] []





Features of shelf monitoring with IoT



Classification

Quantity

Price Compliance

Economical Benefits

Makes informed decision

- Check if items are **near expiration, overstocked, and understocked**

=> *Take appropriate action*

- Run promotions / Offer discounts
- Resupply stocks on time







Economical Benefits

Reduces Human Labor

- Constantly update data to a central system
- Reduce manual stocks checking by staff
- Improve work efficiency and allow staff to focus on other tasks

Project Drawbacks

Limited Item Detection

- Our system can only recognize the front row of items

=> *Proposed solutions:*

- Adjust the angle and do more data trainings
- Attach RFID tags to each item

Common Problems

- Poor lighting/bad environment
=> *Proper location and good lighting*

is recommended

- Altered/wrong results despite proper code and training

=> *Mainly due to camera alignment*

Business Drawbacks (extended)

High Initial Costs

- Budgets for IoT-enabled devices, such as **barcode** and **RFID scanner**
- Setting up and personnel training cost
=> Financial barrier for small businesses that want to implement

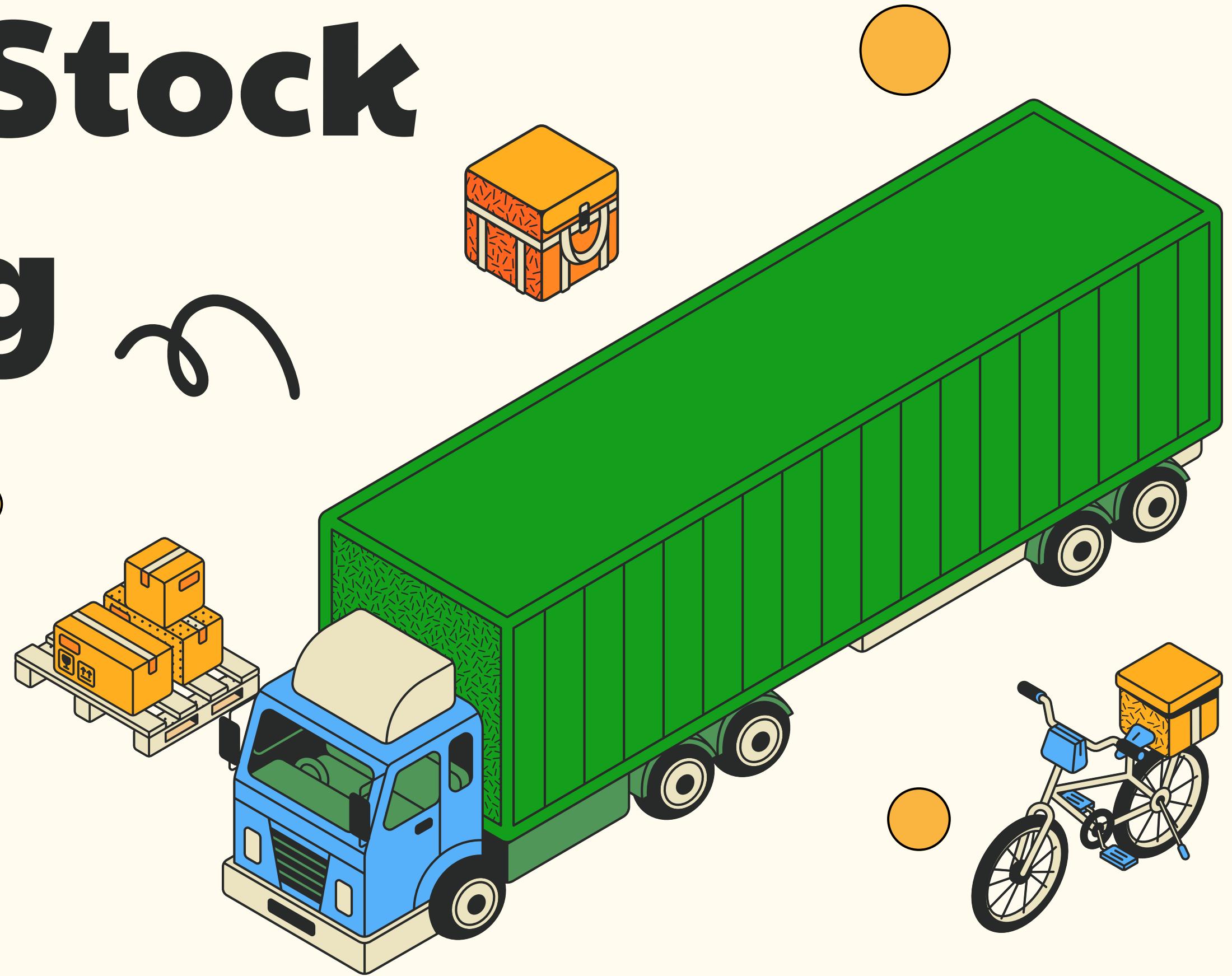
Data Security Risks

- IoT systems generate and transmit many kinds of data (sensitive business data, customer data,...)
=> Cybercriminals may take advantages of these data to exploit the businesses and the customers

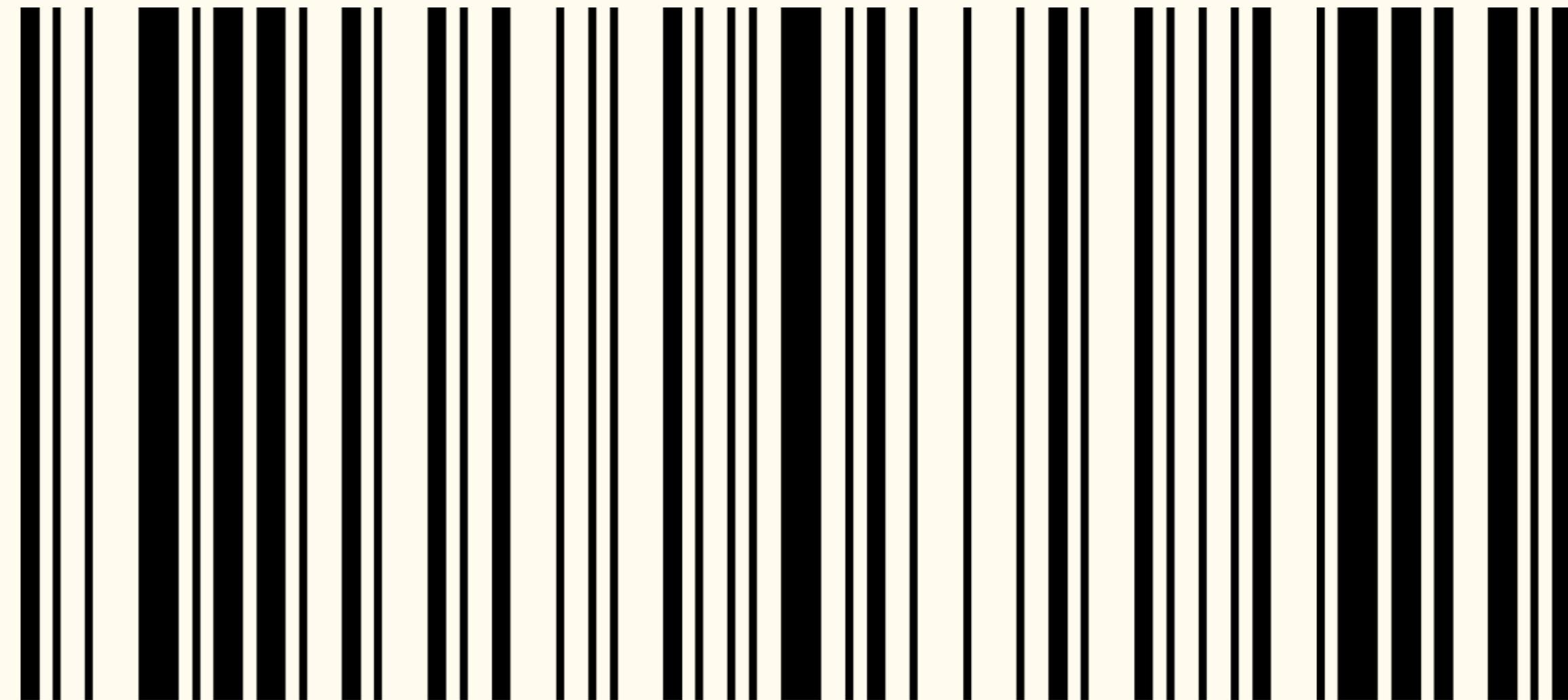
4. IoT in Stock Checking

Barcode

RFID



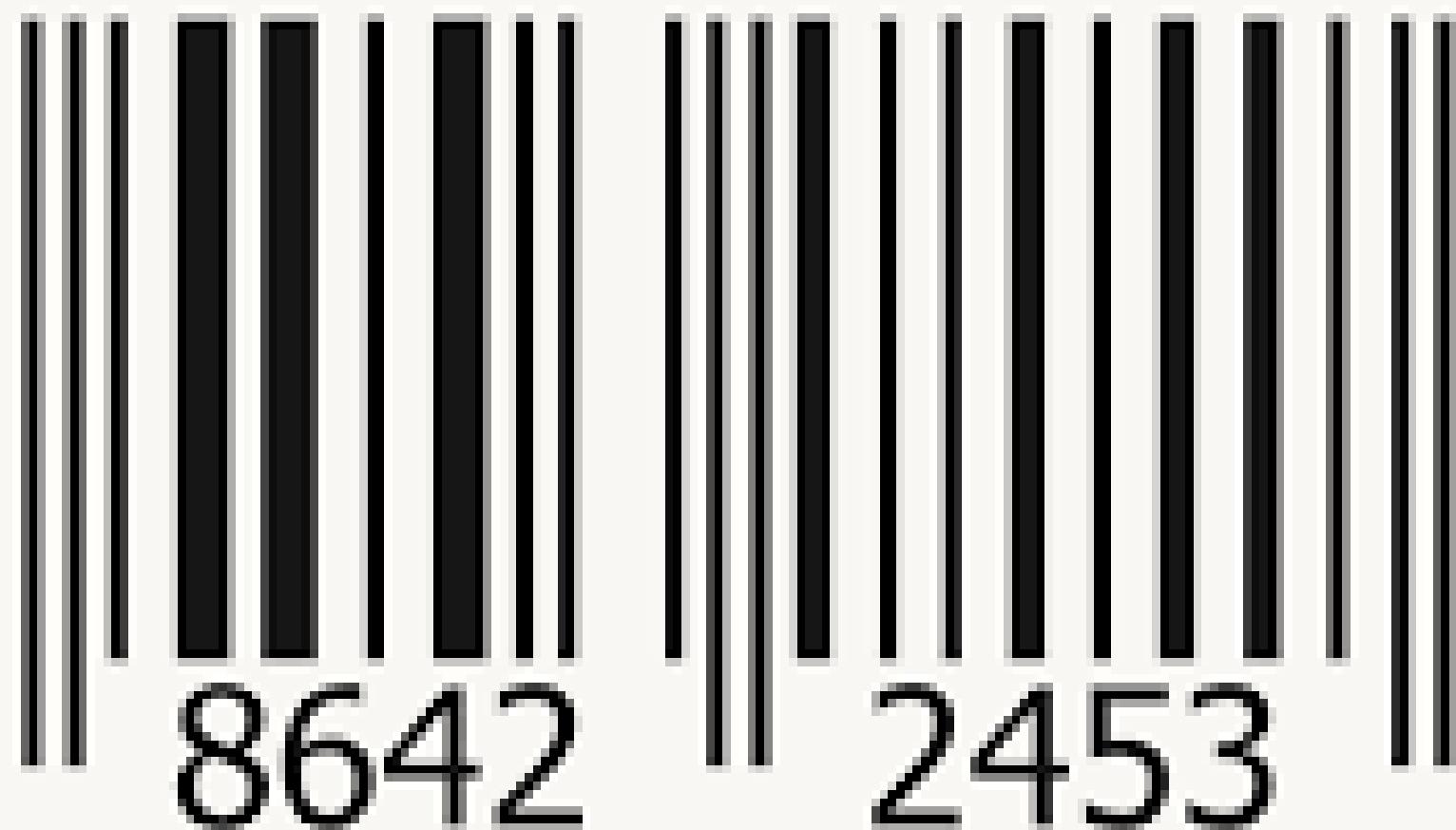
Barcode



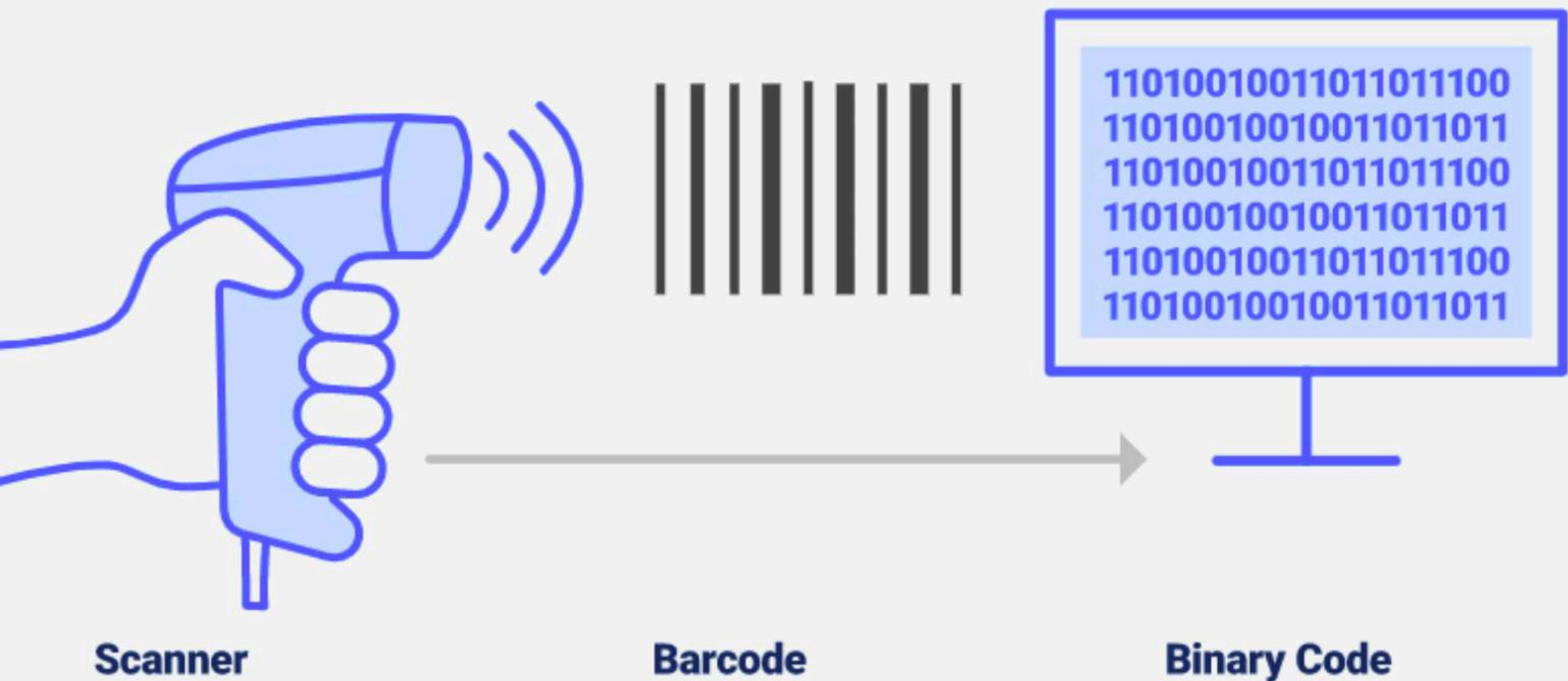
Barcodes consist of black and white lines or squares encoding data, usually a unique information such as ID or SKU.

LABEL

SCANNER



Barcode System



Bar code

Check and read product bar code one by one.

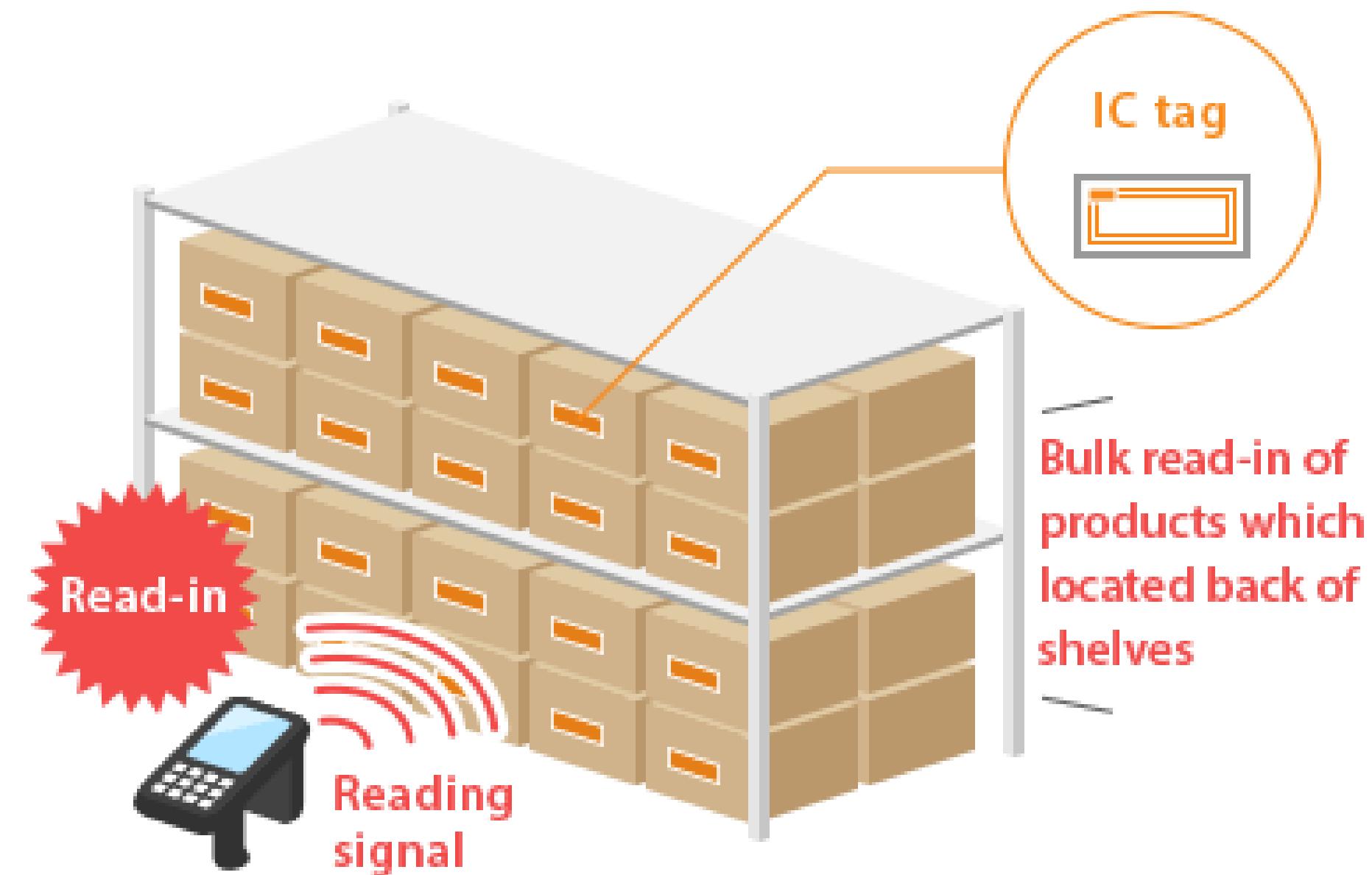


BEFORE

AFTER

RFID

Read IC tag data by one trigger by RFID reader..



**Scanning barcodes
(240 pairs of socks)**

000 pairs

00:02;24

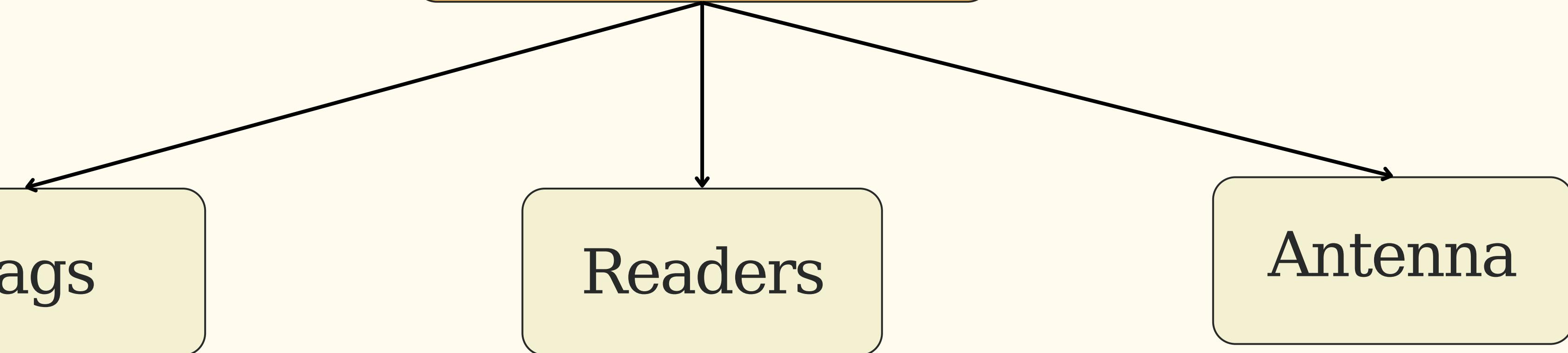
RFID Technology

COMPONENTS

Tags

Readers

Antenna



RFID Technology

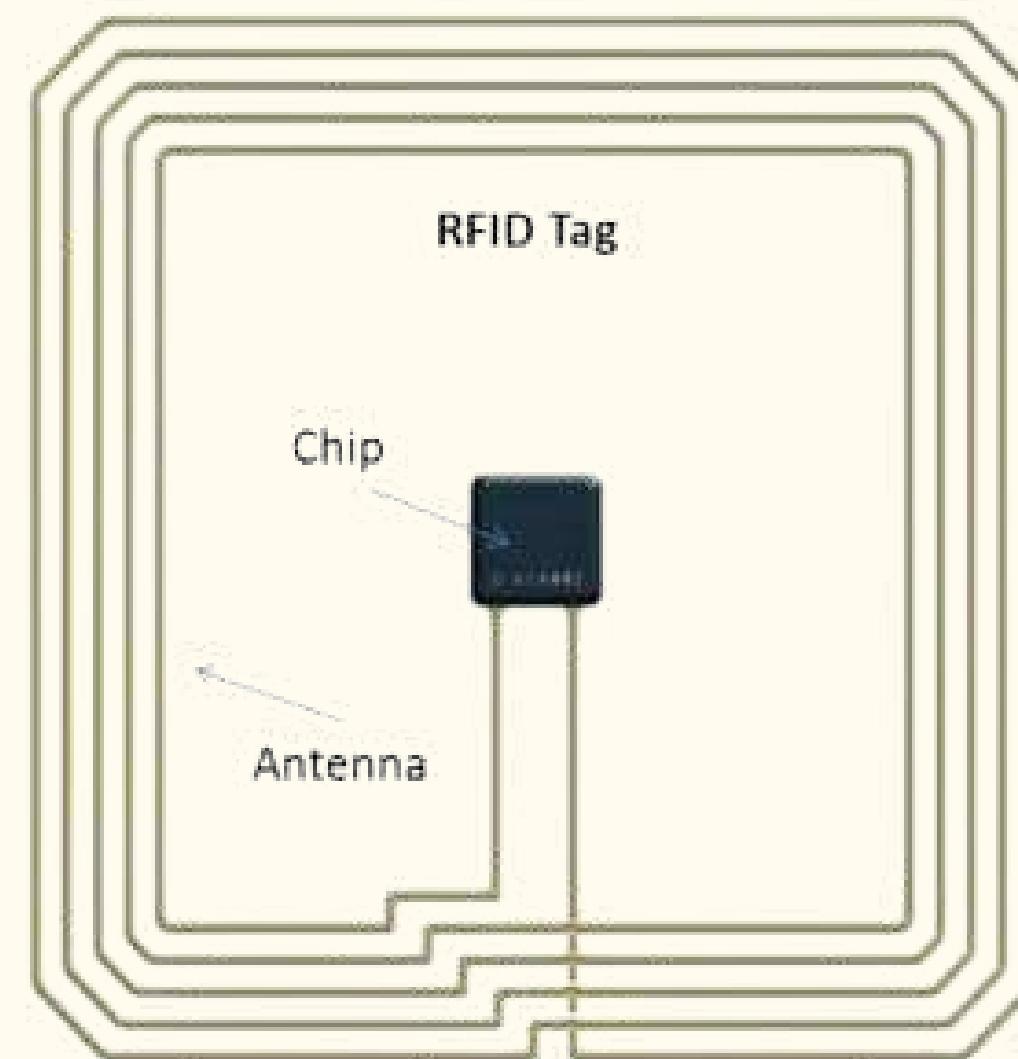
TAG

Microchip

Stores unique
identifiers or
other data

Antenna

Allow storing and
transmitting data
with **readers**





TAG

RFID Technology

READER

Fixed

- Fixed points
- Used in warehouse
- Automatically detect tags

Mobile

- Handheld devices
- Used in retail stores
- Send data to the central inventory system



FIXED READER

MOBILE READER



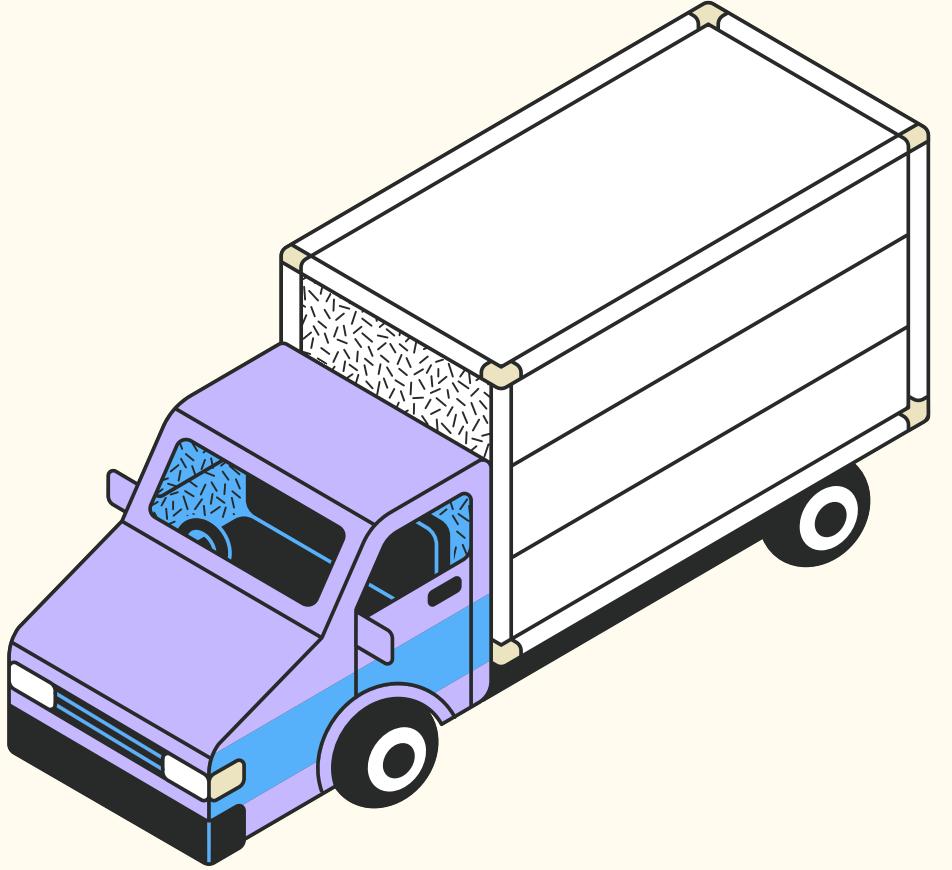
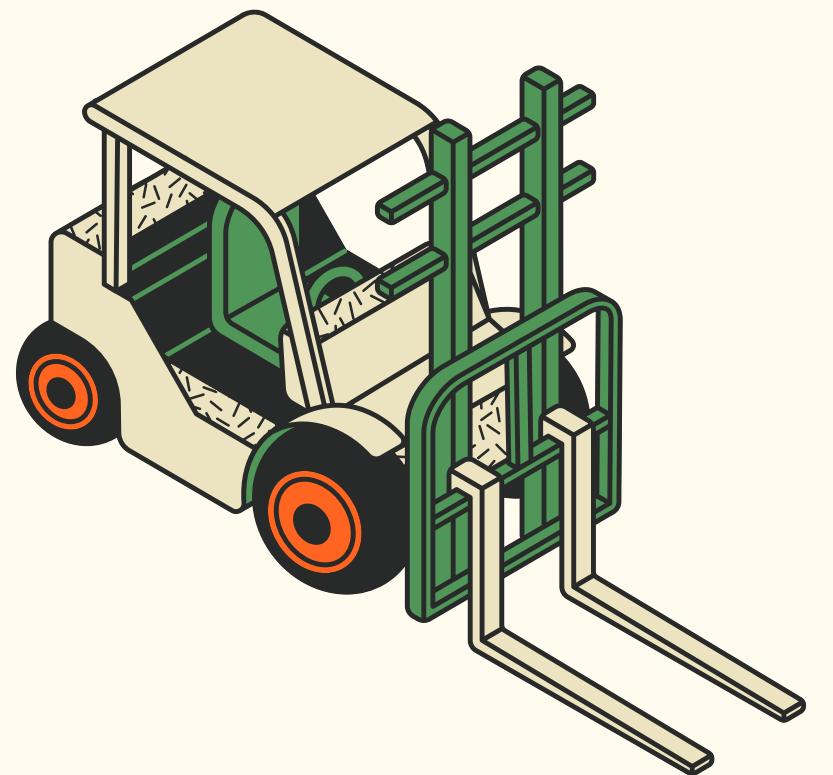
RFID Technology

ANTENNA

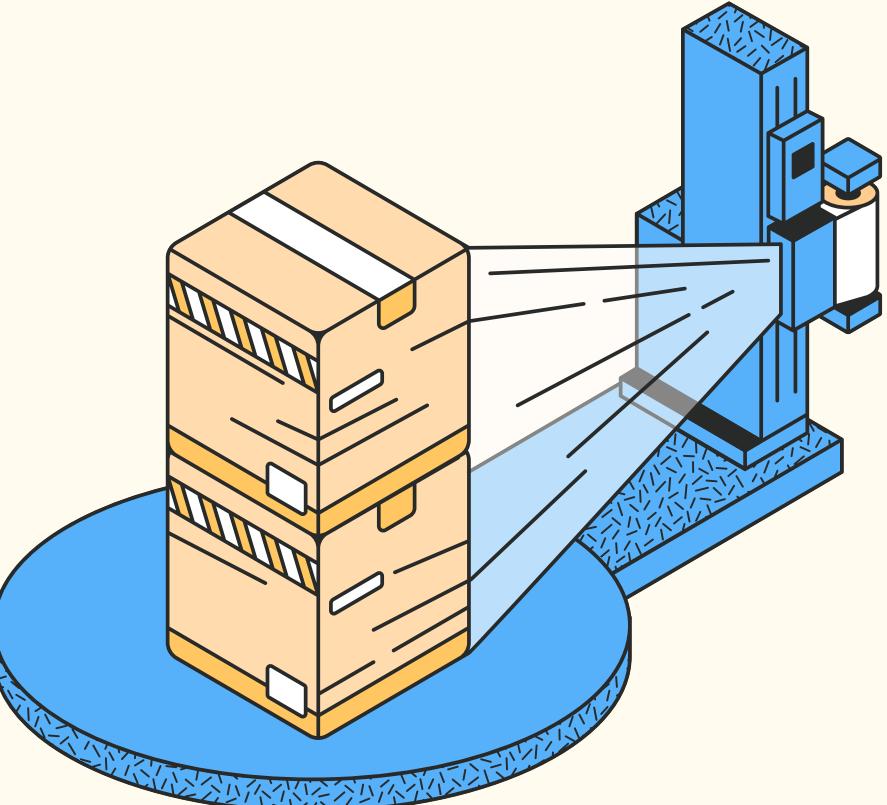
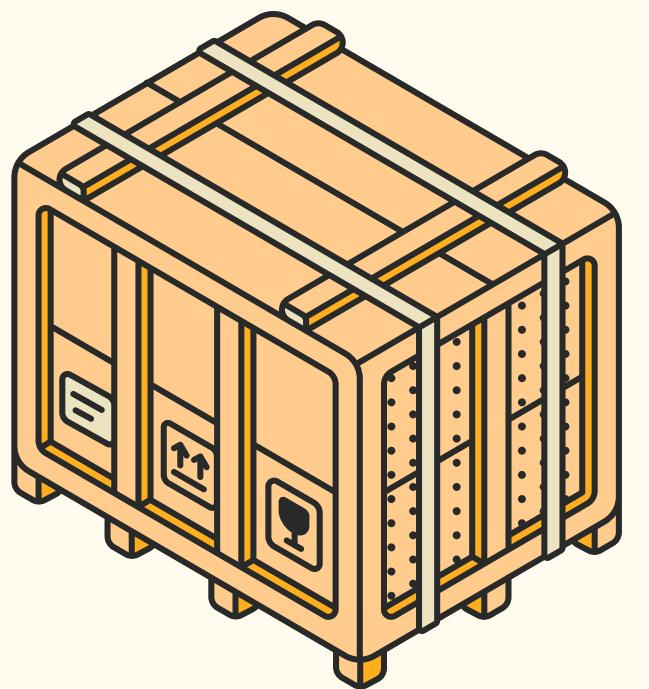
Huge impact on RFID performance

Allow communication between
readers and tags





HOW DOES IT WORK?



Reader



Computer



RFID SYSTEM



Antenna



Tag

REFERENCE

YOLO Object Detection Algorithms 101: Part 1 | BasicAI's Blog

<https://www.commport.com/rfid-technology/>

<https://chiprfid.vn/en/what-isrfid/>

<https://www.ejtech.io/learn/train-yolo-models>

<https://kili-technology.com/data-labeling/machine-learning/yolo-algorithm-real-time-object-detection-from-a-to-z>

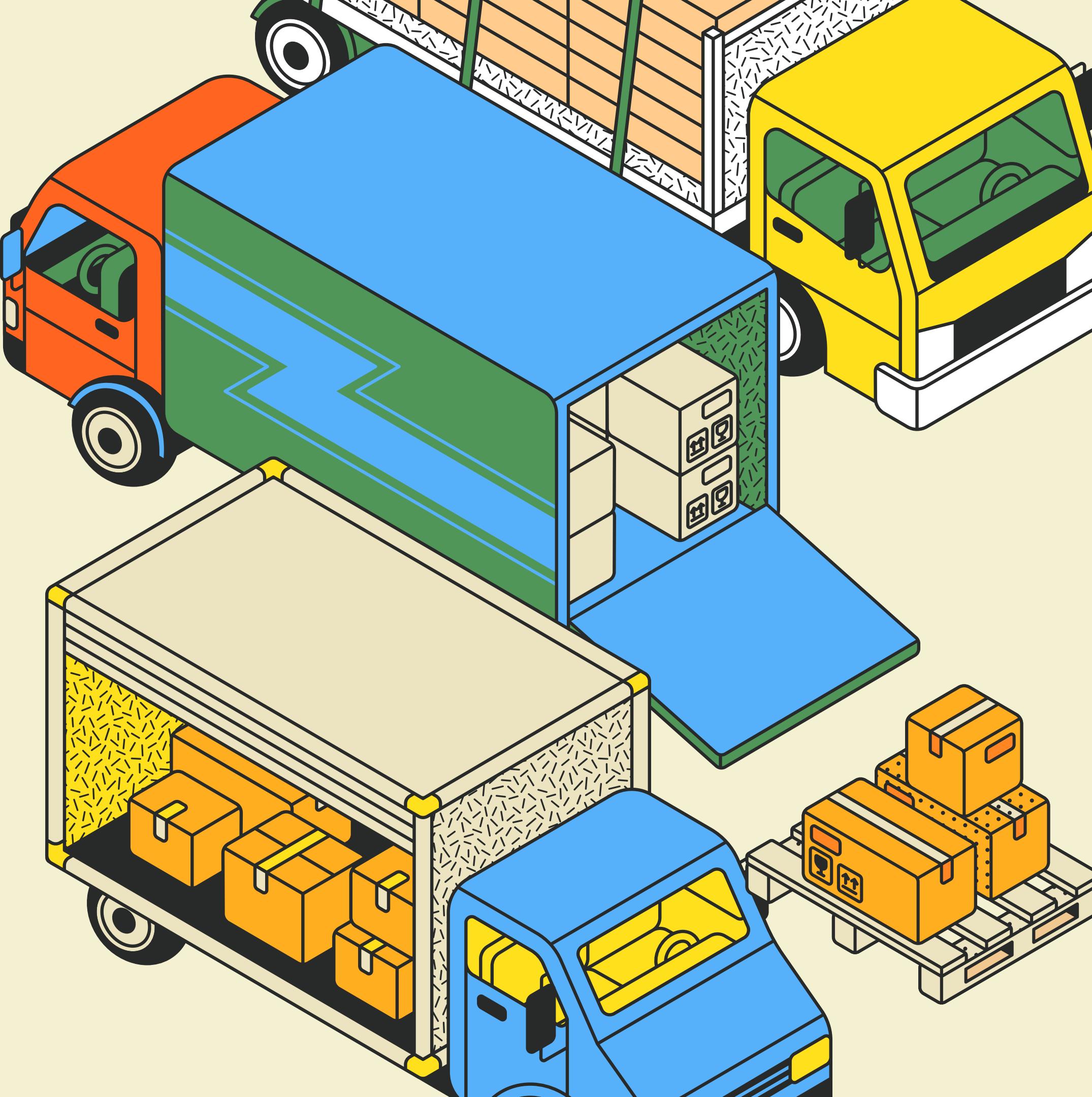
<https://www.youtube.com/watch?v=r0RspiLG260&t=1162s>

<https://blog.roboflow.com/guide-to-yolo-models/>

<https://docs.ultralytics.com/vi/modes/train/>

<https://medium.com/@a0922/confusion-matrix-of-yolov8-97fd7ff0074e>

<https://community.deeplearning.ai/t/how-to-interpret-values-of-box-xy-box-wh-in-yolo-eval/26095>



**THANK YOU
FOR
LISTENING**

-Group 19-