GROUP 5

AI เพื่อการประมวลรู้จำวัตถุและวิเคราะห์ปัญหา
งาน Construction Call

CO-NA-LY-SIS (construction + analysis)

AI for object recognition and problem analysis in Construction Call

7-11 convenience stores serve **12.6 million** daily customers

increased of **maintenance** needs.

Boonchuay (บุญช่วย) application was created

⇩

for reporting damage

⇩

Menu/Button-Based Chatbot

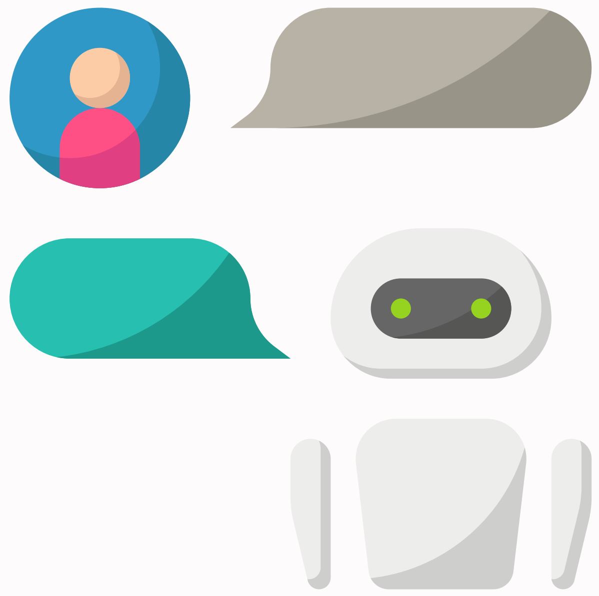
- Conducting **on-site** surveys
- to see the **actual product types**
- and observing **the actual use of the Boonchuay application** by employees

- **real footage of How 7-11's employees use 'บุญช่วย' application**

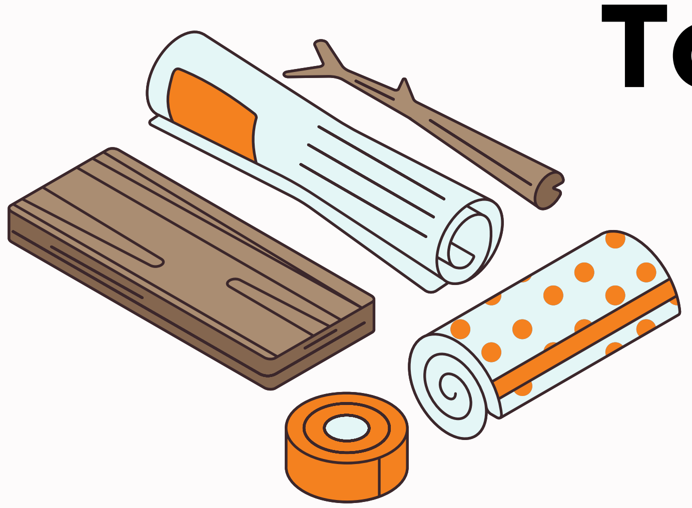
- **up to 94 product types which employees have to select**

=

confusion



PAIN POINT



Too many categories of materials and
Too many causes of damage.

confusion among the employees.

Misreported types of materials

No Automate system

Increased expenses of the salary from 25 employees

Increase travel cost almost 600,000 Baht every month

Approximately 7,000,000 Baht per year is lost due to human error

No more misreporting product types

Because we are

CO-NA-LY-SIS

with

ultralytics YOLOv8

MobileNet v2

STARTING WITH DOOR AND FLOOR

WHY WE CHOOSE DOOR AND FLOOR?

8308 misreported product types per year

+

=

723 incorrect calls from floor and door

11% from total

353 calls per year

370 calls per year

PROJECT DETAIL-TYPE FLOOR

Back Area

Selling Area

Front Area

PROJECT DETAILS- TYPES OF DOOR

Front Door

Emergency Door

Back Door

Toilet Door

OBJECTIVES

01

Reduce the cost of incorrect calls for materials by implementing an AI model

02

Automate the "Construction calling" process for every 7-Eleven branch to further reduce the monthly maintenance costs.

03

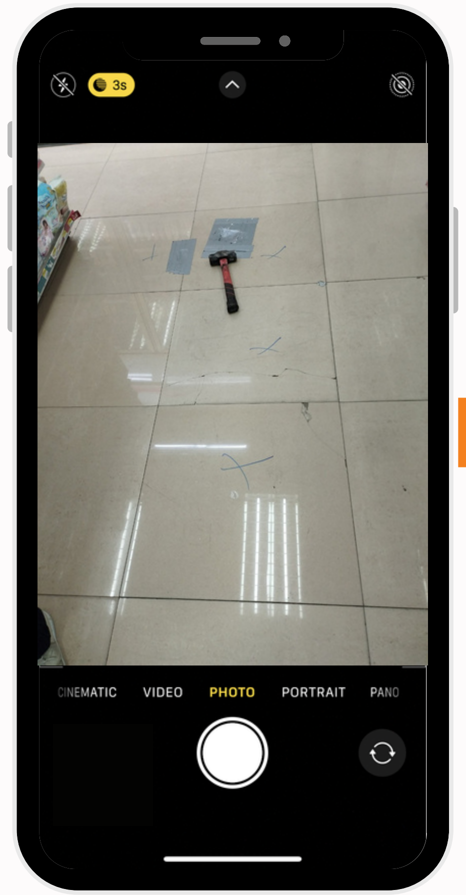
Enhancing overall job efficiency by reducing downtime caused by human errors.

04

Increasing the monthly repair volume due to faster and more accurate work

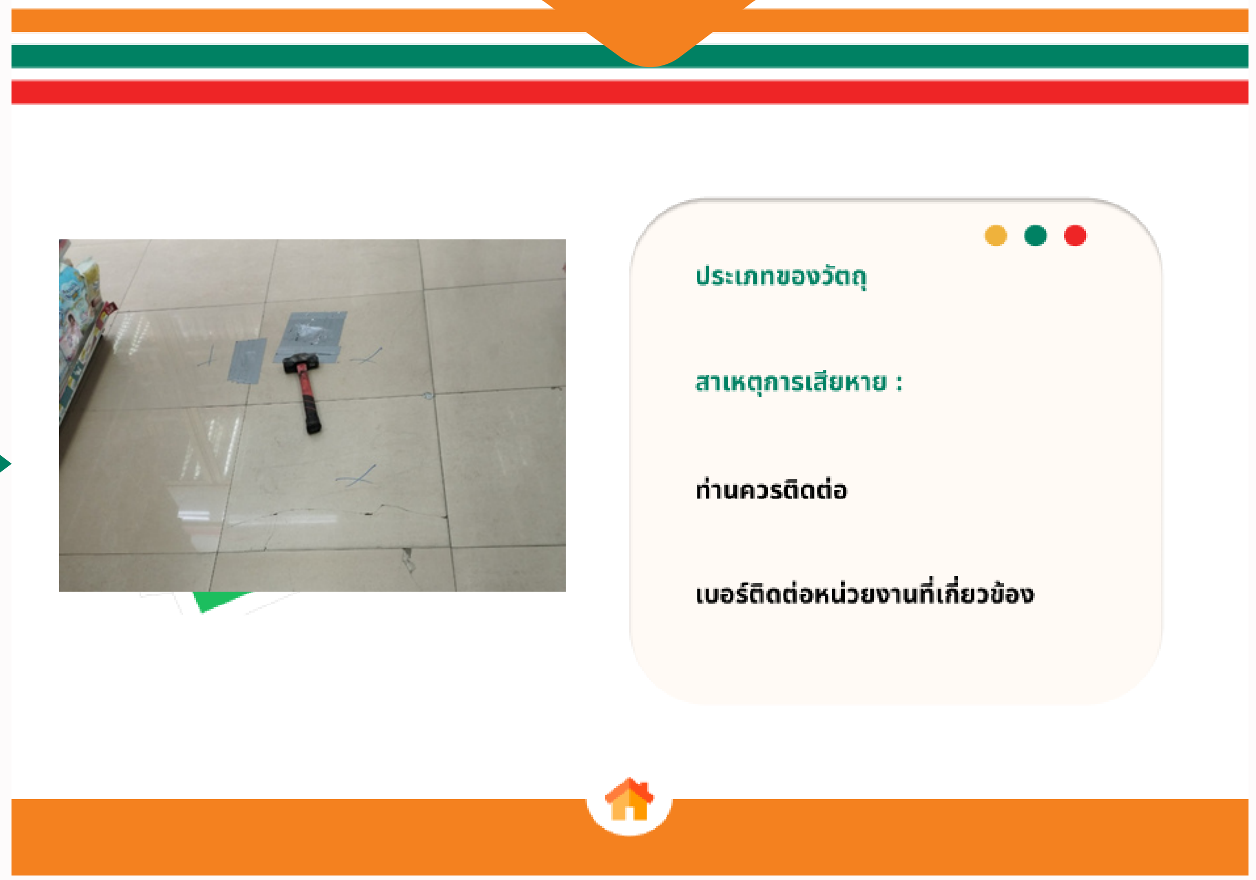
PROJECT DETAIL

Taking picture onsite or from gallery



AI system predict cracks in tiles and broken doors

Collect data and send report result to user

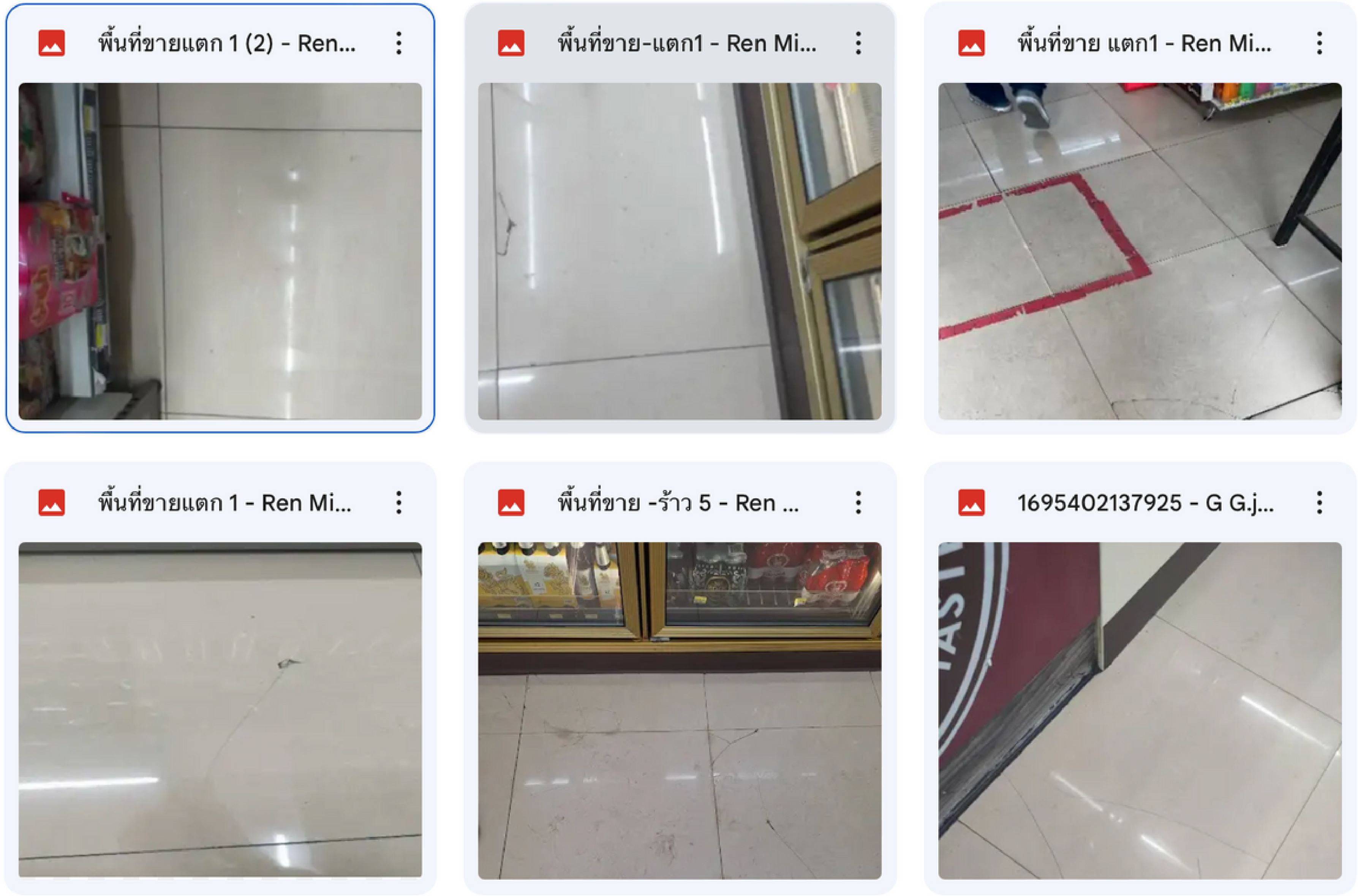


MAKING THE AI

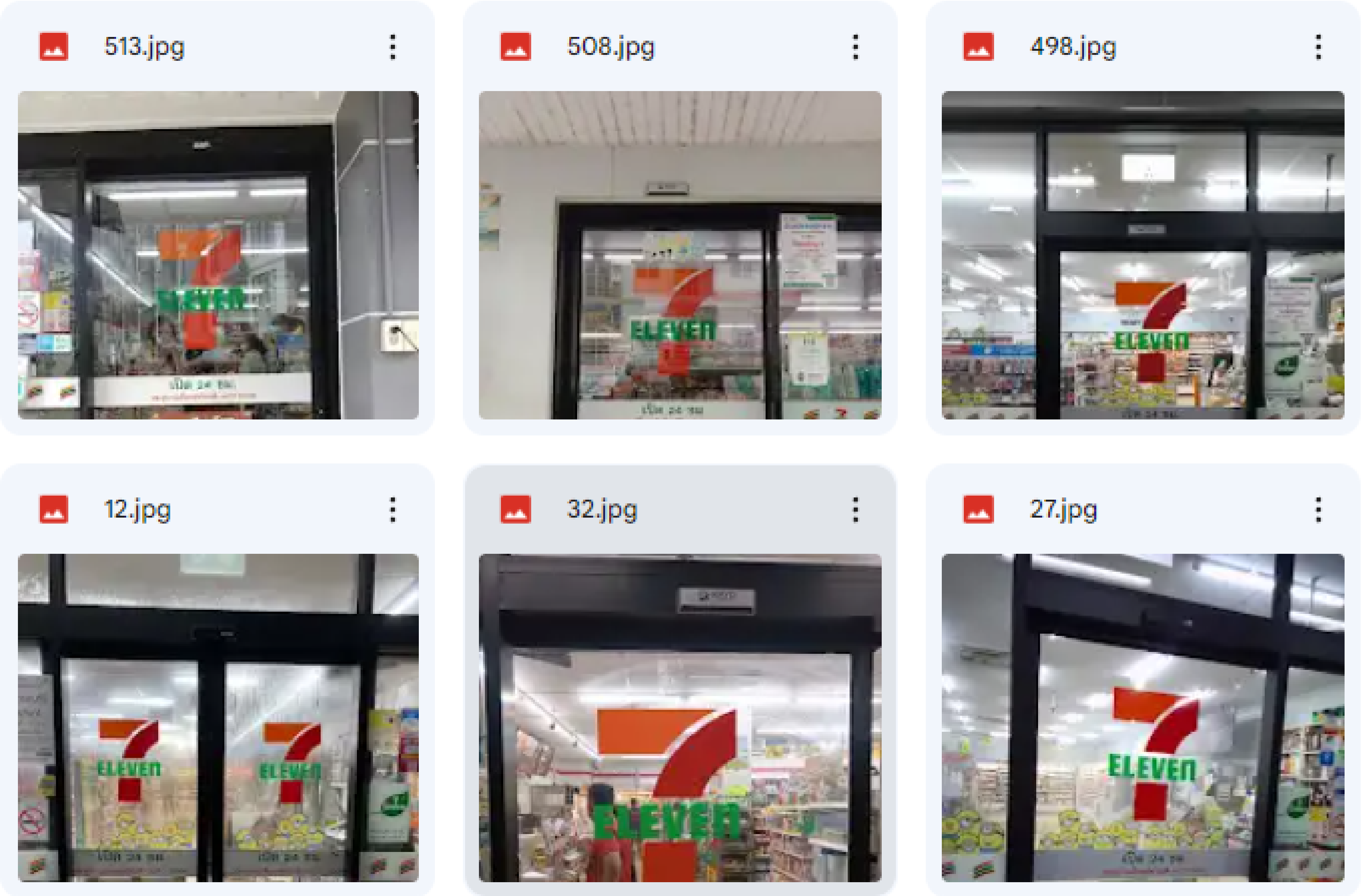
DATA COLLECTING

- **Receiving data of door and tile from BU and upload to cloud.**
- Since we have **2 different types of material**, we decided to split model in to **2 models**.

Dataset 1 - FLOOR



Dataset 2 - DOOR



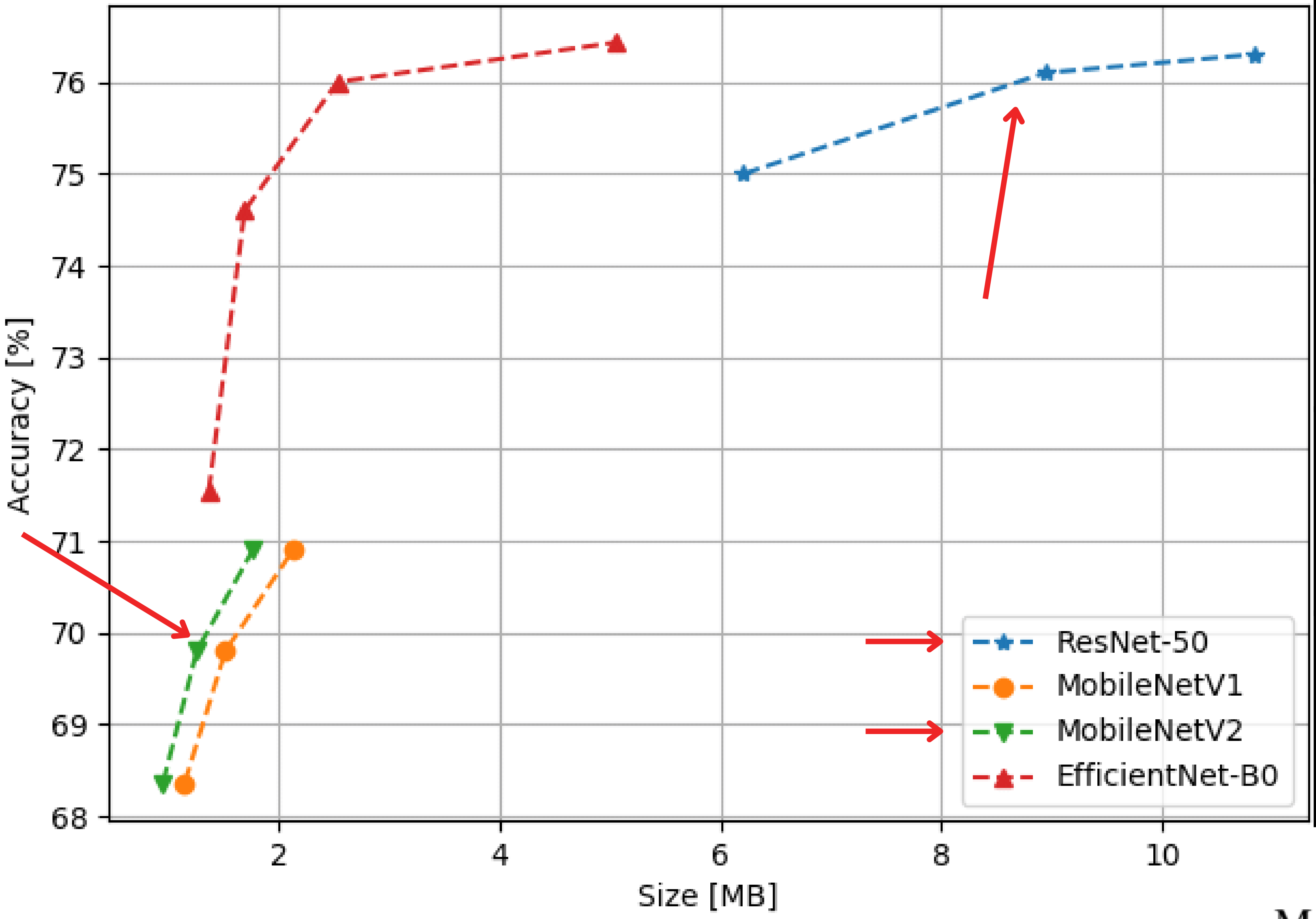
DATA COLLECTING

- Select **pictures** that Tile / Door is the **majority** in the pictures for training AI

Cleansing tile dataset

Cleansing door dataset

CHOOSING MODEL - IMAGE CLASSIFICATION



	MobileNet v2	ResNet50
Accuracy/ Performance	Lower	Higher
Speed	Faster	Slower
Dataset size	Small Dataset	Large Dataset

Network	Top 1	Params	MAdds	CPU
MobileNetV1	70.6	4.2M	575M	113ms
ShuffleNet (1.5)	71.5	**3.4M**	292M	-
ShuffleNet (x2)	73.7	5.4M	524M	-
NasNet-A	74.0	5.3M	564M	183ms
MobileNetV2	**72.0**	**3.4M**	**300M**	**75ms**
MobileNetV2 (1.4)	**74.7**	6.9M	585M	**143ms**

Model	No weight decay (%)	Weight decay (%)	Norm-bias (%)
ResNet	93.40 (±0.04)	94.76 (±0.03)	**94.99** (±0.05)
DenseNet	90.78 (±0.08)	92.26 (±0.06)	**92.46** (±0.04)
MobileNetV2	92.84 (±0.05)	**93.64** (±0.05)	**93.64** (±0.03)
ResNet Fixup	10.00 (±0.00)	91.42 (±0.04)	**91.55** (±0.07)
MLP	58.88 (±0.10)	58.95 (±0.07)	**59.13** (±0.09)

CHOOSING MODEL - OBJ. DETECT

	YOLOv5 (Y_S)	Faster R-CNN with MVGG16	YOLOR-P6
Training (batch size, epochs, learning rate)	(16, 1200, 0.0032)	(2, 100, 0.0001)	(8, 1200, 0.01)
Training Loss	0.020	0.136	0.0170
mAP@0.5-0.95	58.9%	45.4%	43.2%
Inference speed: Image resolution (1774 × 2365)	0.009 s	0.047 s	0.03 s
Inference speed: Image resolution (204 × 170)	0.009 s	0.052 s	0.03 s
Model Size (MB)	14.8	134.5	291.8

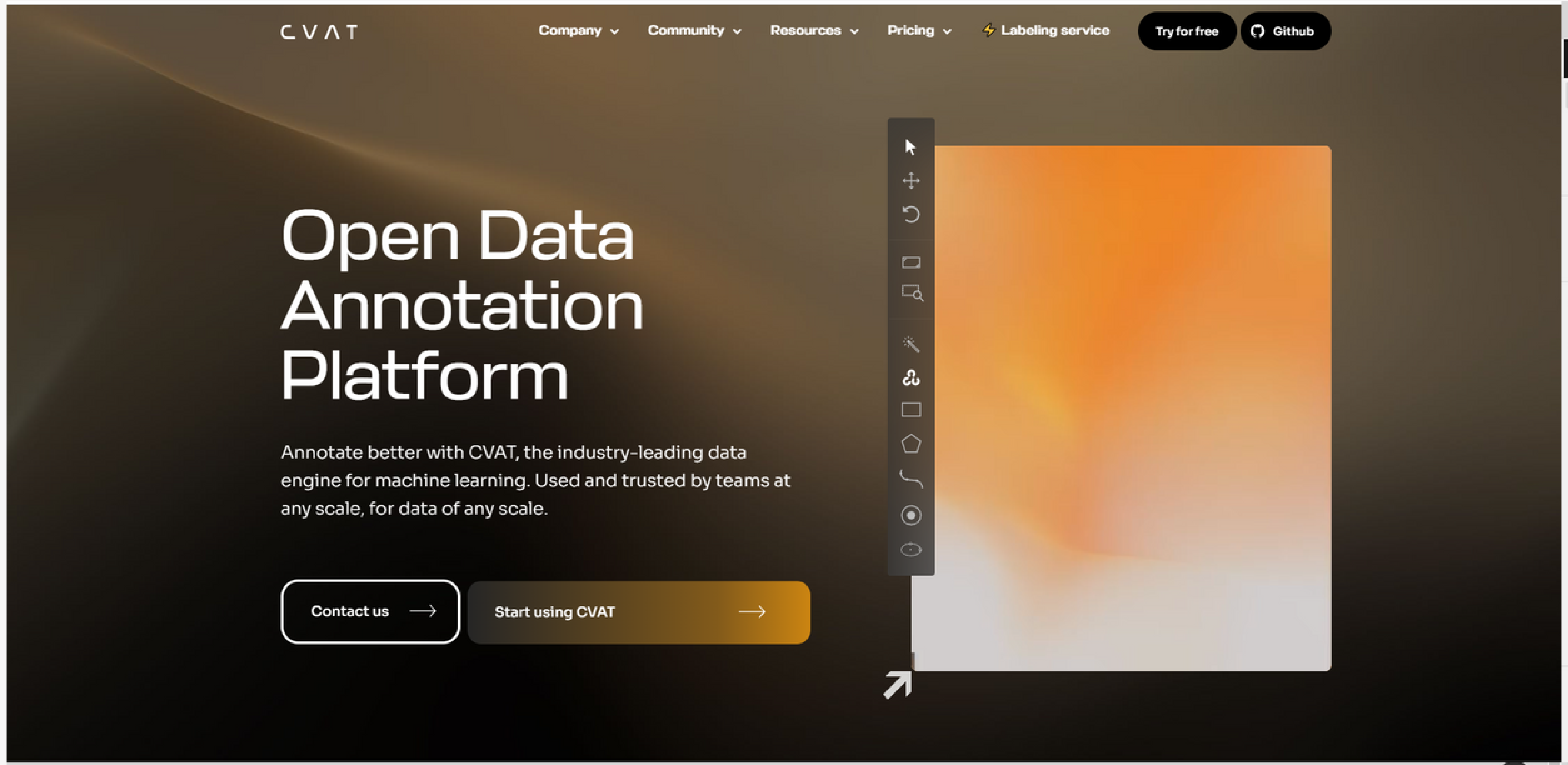
	YOLOV5	YOLOV8 (Nano)	FASTER RCNN
Performance (mAP @0.5)	0.59	0.787	0.55
Speed	Faster	Fastest	Slowest
Dataset Size	Small dataset (Require Annotation)	Small dataset (Require Annotation)	Medium - Large data

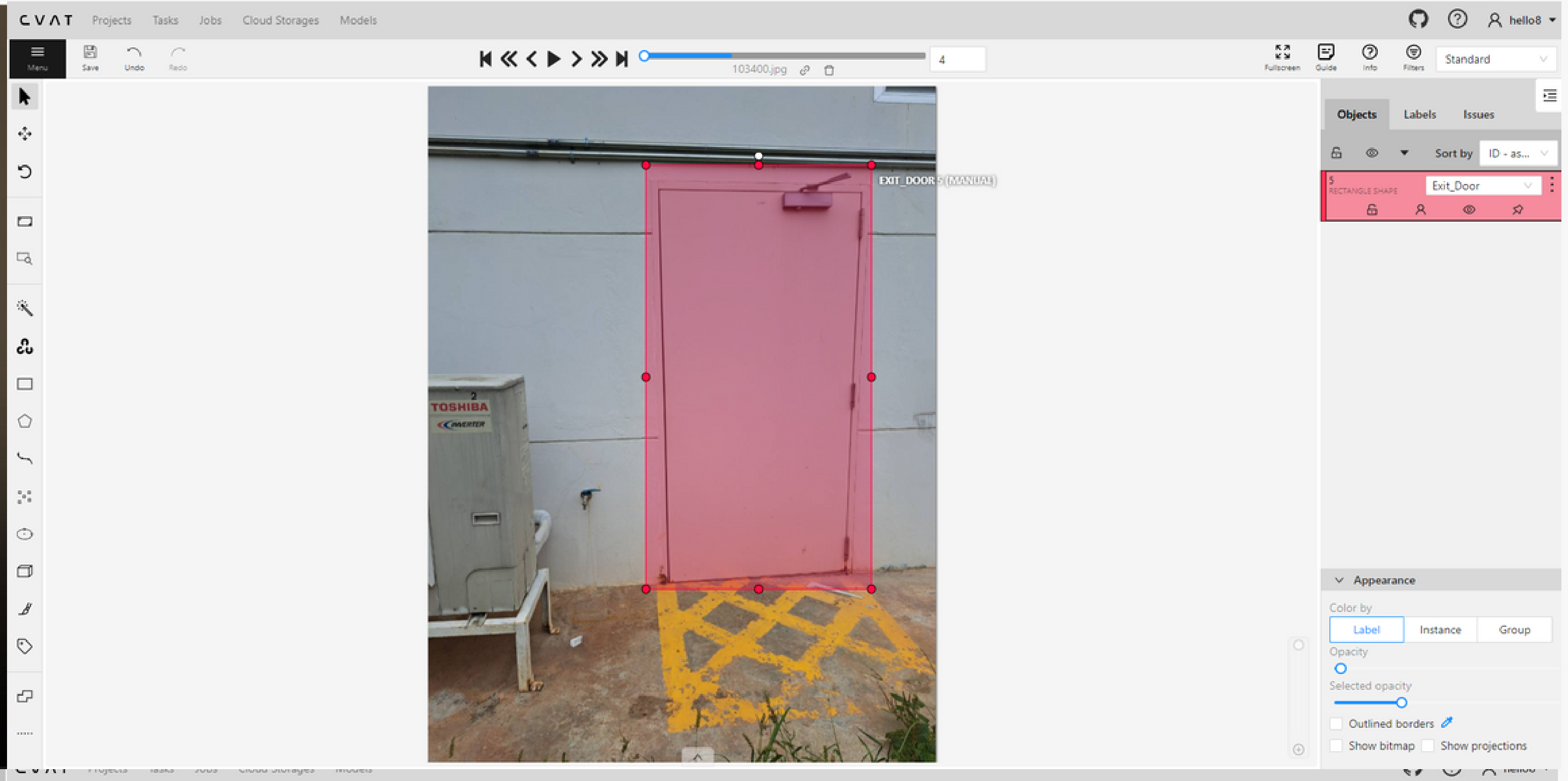
Object Detection Performance Comparison (YOLOv8 vs YOLOv5)

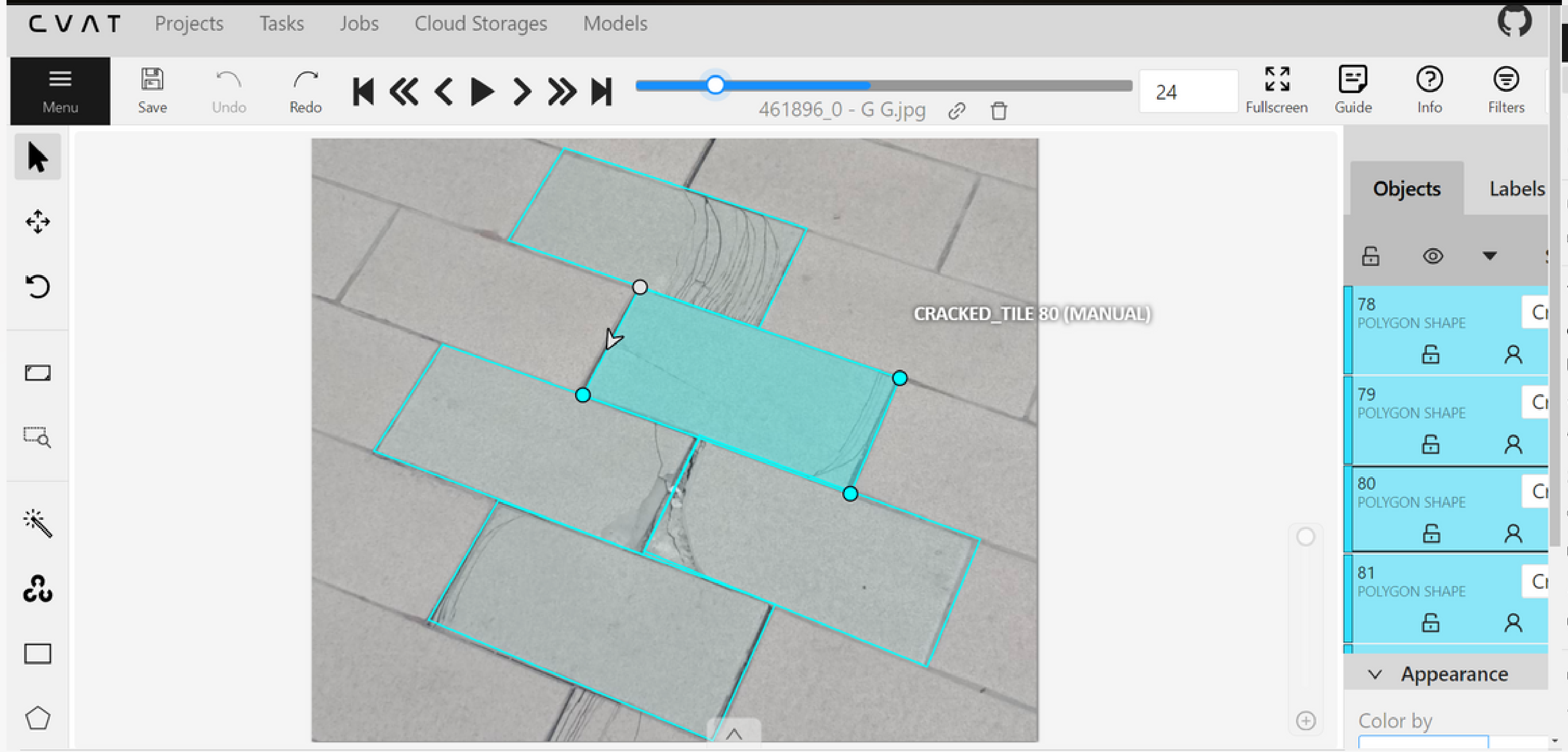
Model Size	YOLOv5	YOLOv8	Difference
Nano	28	37.3	+33.21%
Small	37.4	44.9	+20.05%
Medium	45.4	50.2	+10.57%
Large	49	52.9	+7.96%
Xtra Large	50.7	53.9	+6.31%

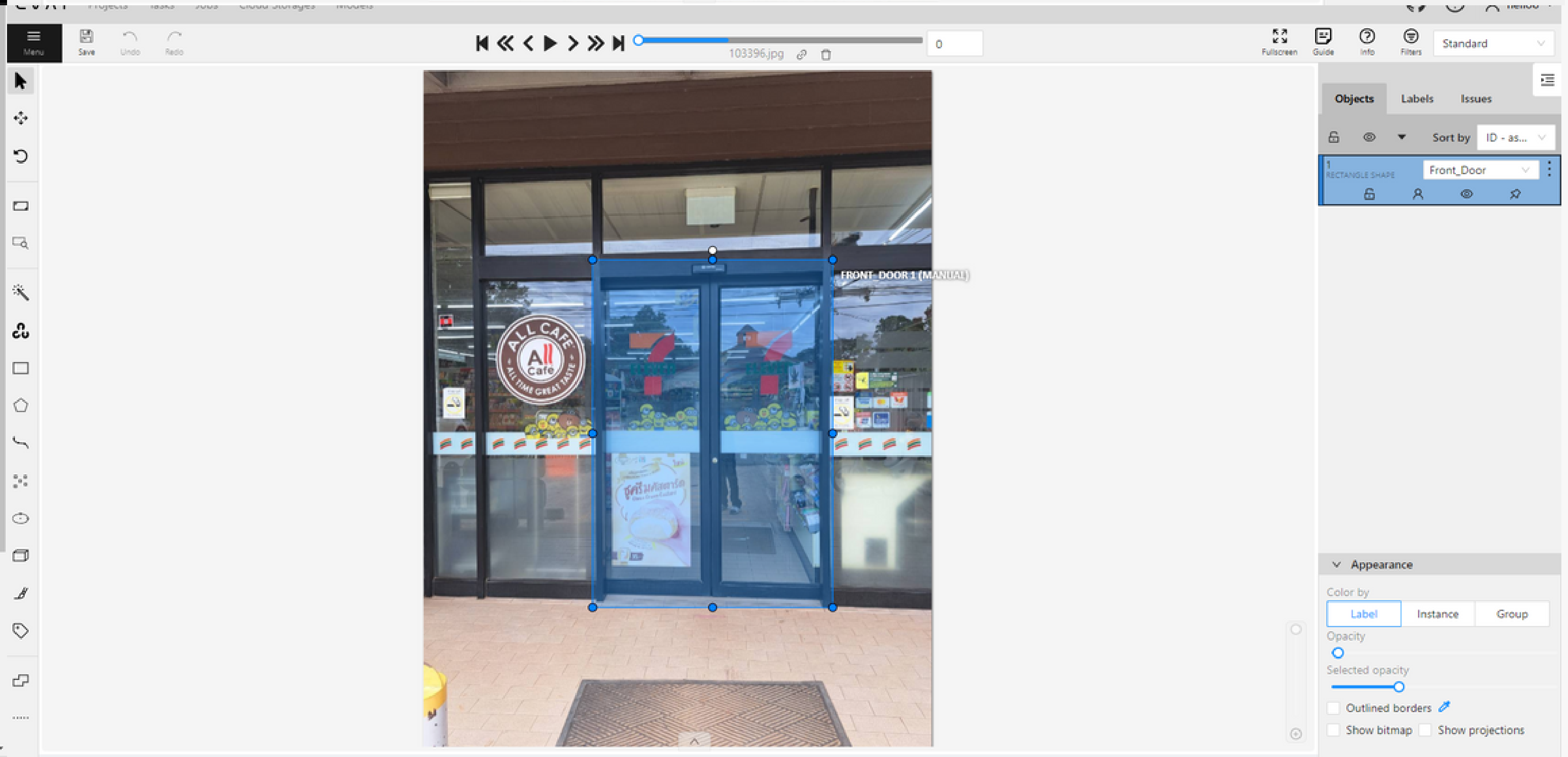
*Image Size = 640

DATA ANNOTATION FOR YOLOV8



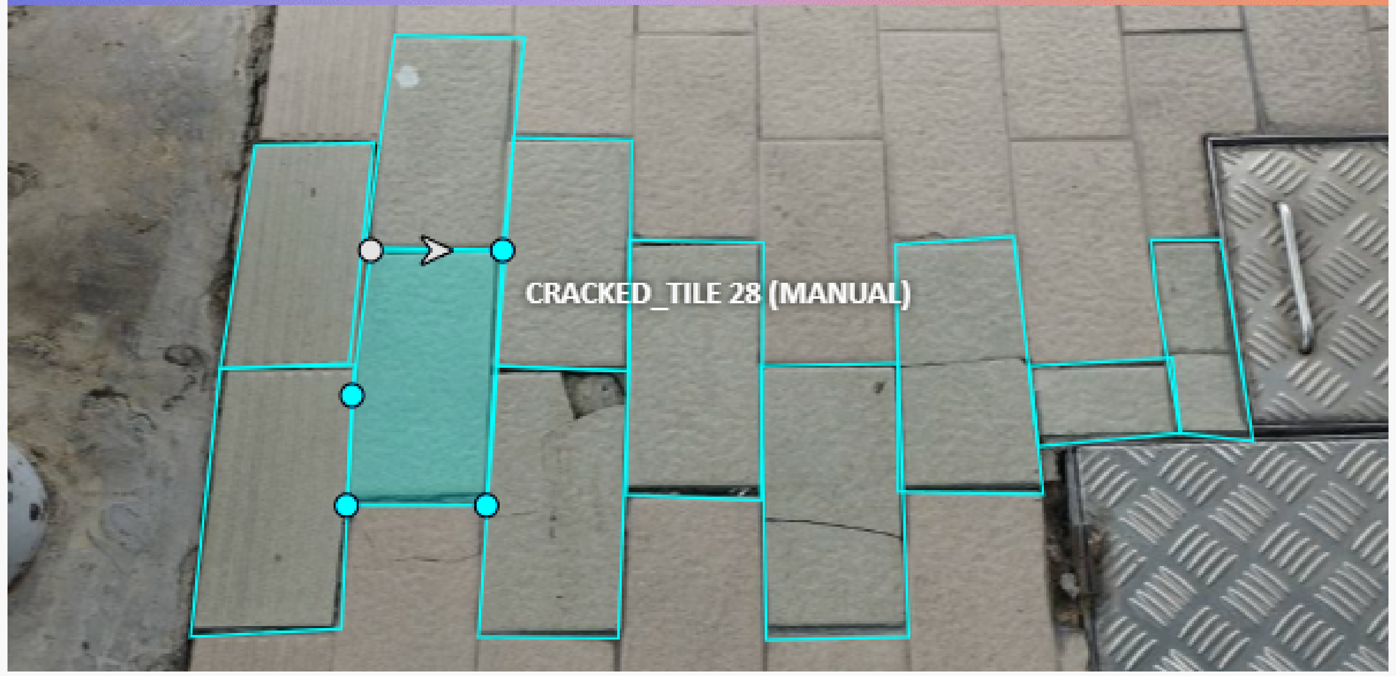




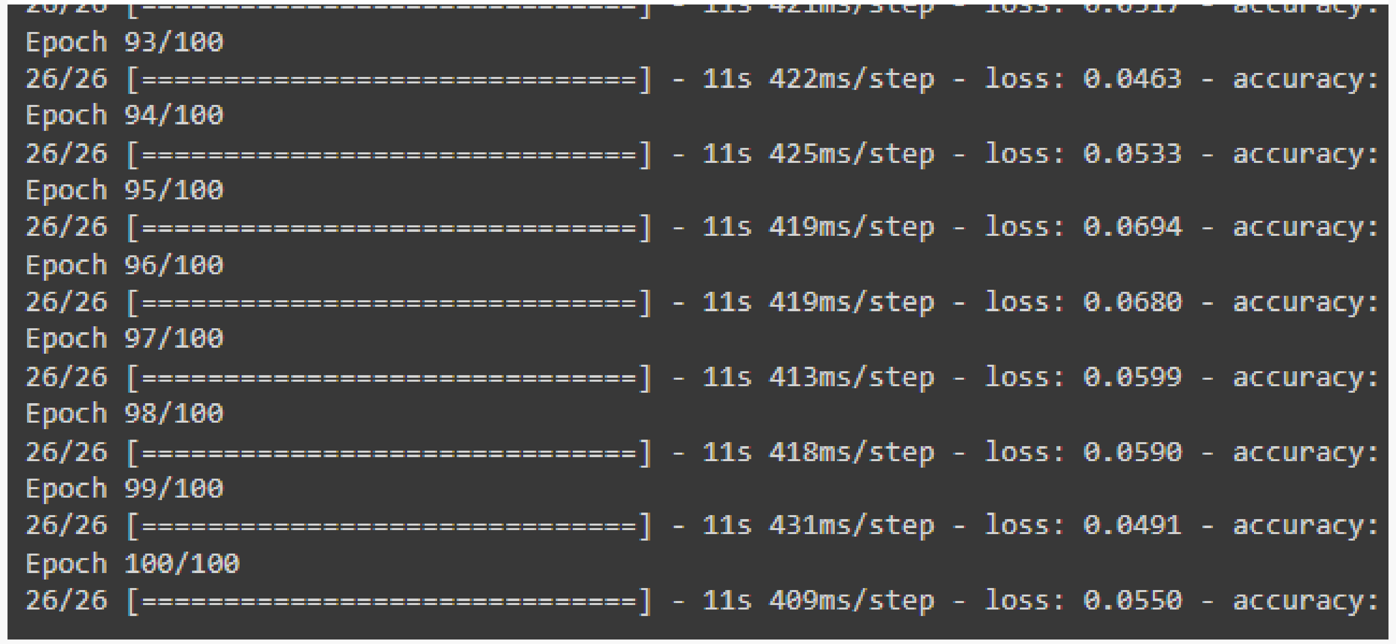


TRAINING MODEL FOR FLOOR

Train model by **YoloV8** for cracks detect



Train model **MobileNetV2** for classify location



```
Epoch 93/100
26/26 [==============================] - 11s 422ms/step - loss: 0.0463 - accuracy:
Epoch 94/100
26/26 [==============================] - 11s 425ms/step - loss: 0.0533 - accuracy:
Epoch 95/100
26/26 [==============================] - 11s 419ms/step - loss: 0.0694 - accuracy:
Epoch 96/100
26/26 [==============================] - 11s 419ms/step - loss: 0.0680 - accuracy:
Epoch 97/100
26/26 [==============================] - 11s 413ms/step - loss: 0.0599 - accuracy:
Epoch 98/100
26/26 [==============================] - 11s 418ms/step - loss: 0.0590 - accuracy:
Epoch 99/100
26/26 [==============================] - 11s 431ms/step - loss: 0.0491 - accuracy:
Epoch 100/100
26/26 [==============================] - 11s 409ms/step - loss: 0.0550 - accuracy:
```

RESULT FLOOR

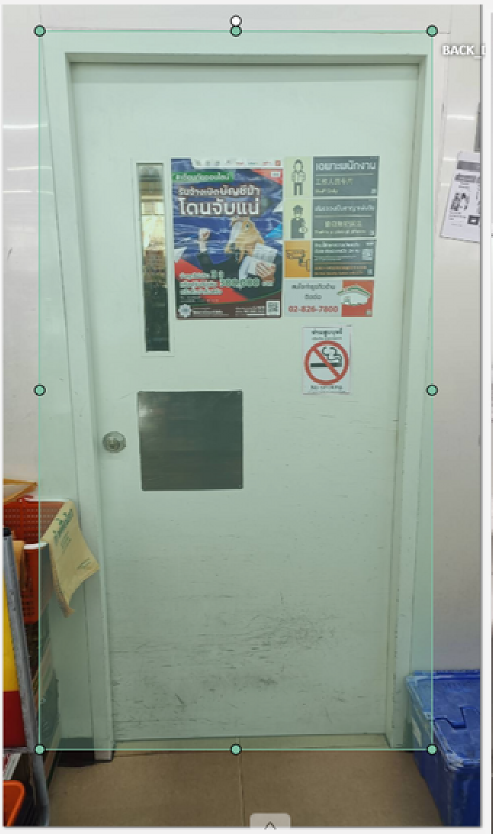
Correct Accuracy

98.33%

TRAINING MODEL FOR DOOR

Train model by **Yolov8n** -

200 epoch

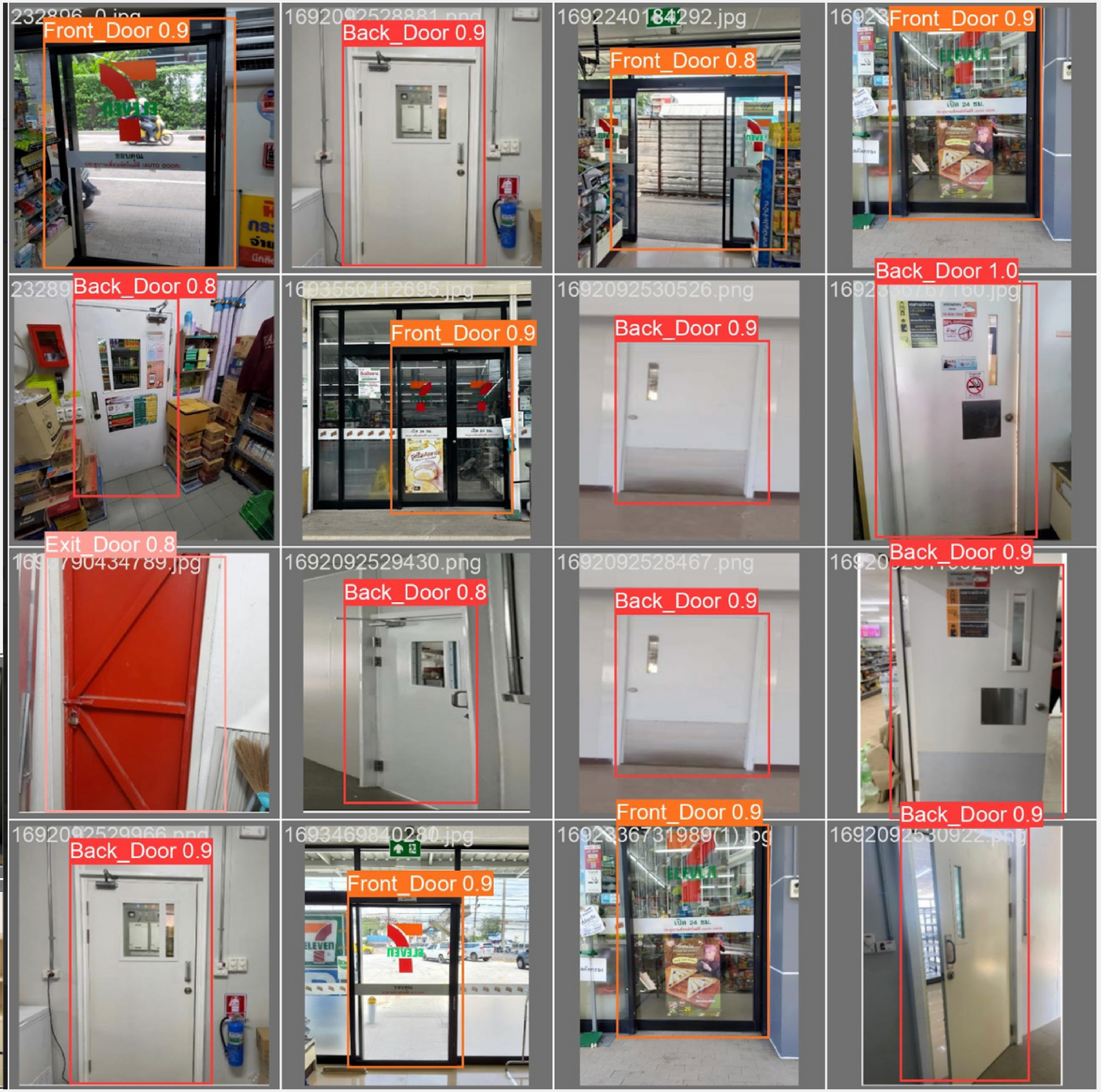


```
import os

from ultralytics import YOLO


# Load a model
model = YOLO("yolov8n.yaml")  # build a new model from scratch

# Use the model
results = model.train(data=os.path.join(ROOT_DIR, "scratch.yml"), epochs=200,pretrained = Tr
```

RESULT DOOR

Correct Accuracy

98.83%



Impacts / Gain Point

types of Construction call	Amount of Calls	Correct calls	Incorrect calls	Cost for closed/opened calls	Traveling cost (Baht)	**Total** (Baht)
Floor	4,410	4,057	**353**	24,710	353,000	**377,710**
Door	4,621	4,251	**370**	25,900	370,000	**395,900**

- **Reduce** cost more than **700,000** **Baht per year**
- **Reduce** the incorrect calls more than **700** **calls per year**

Future goals

types of Construction call	Amount of Calls	Correct calls	Incorrect calls	Cost for closed/opened calls	Traveling cost (Baht)	**Total** (Baht)
94 types	81,752	75,212	6,540	457,800	6,540,000	**6,997,800**

- **More Type** **2 Types** ⟶ **94 Types**
- **Reduce cost** **6,997,80 Baht** ⟶ **By 98%**
- **Develope model to handle other type of material**
- **Integrade** the AI with **BoonChuay** (Application chatbot)

Our Team

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THANK YOU