DECEMBER 2032

VGU MACHINE LEARNING

YOUR COMPANY ⟷ CLIENT

Pitch

Team members

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Agenda —

01 Introduction

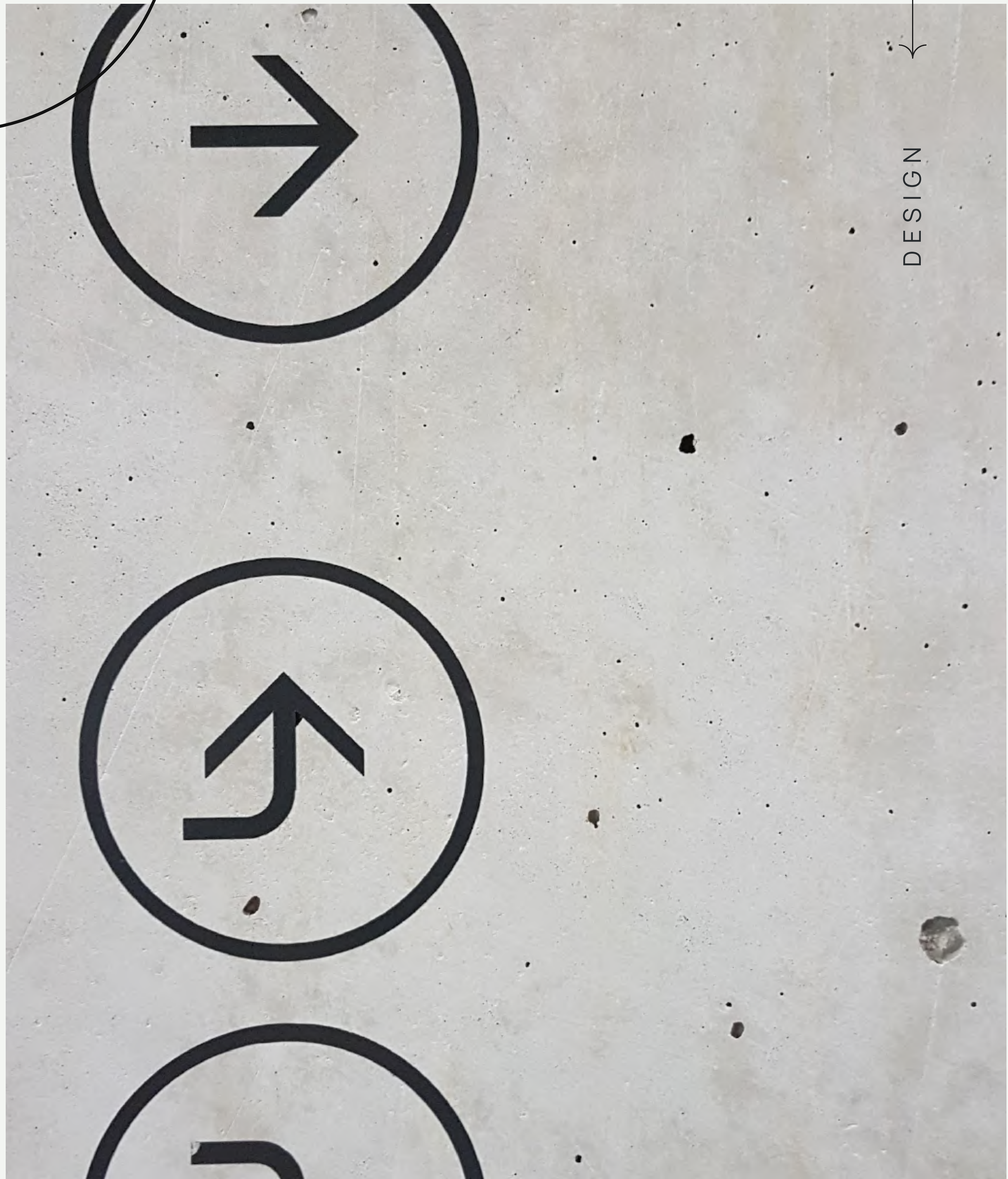
02 Methodology

03 Experiment

04 Q&A

01

Introduction



PRODUCT

DESIGN

Saigon traffic overview

Dire situation

Traffic jam in Saigon has always been a serious issue.

1000

daily registeration

source:
https://www.baogiaothong.vn/tphcm-moi-ngay-hon-1000-phuong-tien-dang-ky-moi-d568127.html

Level 6

traffic density

source:
https://tienphong.vn/qua-tai-giao-thong-o-tphcm-da-o-nguong-nguy-hiem-post1473821.tpo

207M+

sale of vehicle as of Dec 2021

source:
https://www.ceicdata.com/en/indicator/vietnam/motor-vehicle-sales-passenger-cars

Problem Statement

A way to catergorize and create quick data for surverys. Which means the following requirement

01

Cheap

The model should require little to no computational cost, so that it can reliably run on any device.

02

Ease of usage

Minimal design so that anyone can use it

Modes

The project includes different mode to handle diferrent situation.

Real time mode
Run with a phone connected via QR

Website
locally hosted

Website with Real-ESRGAN
Upscalled using Real-ESRGAN

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02

Methodology

PRODUCT

DESIGN

VGU ML

Details

How our team working to make the final system

- System design
- Challenges
- Data collection and Processing

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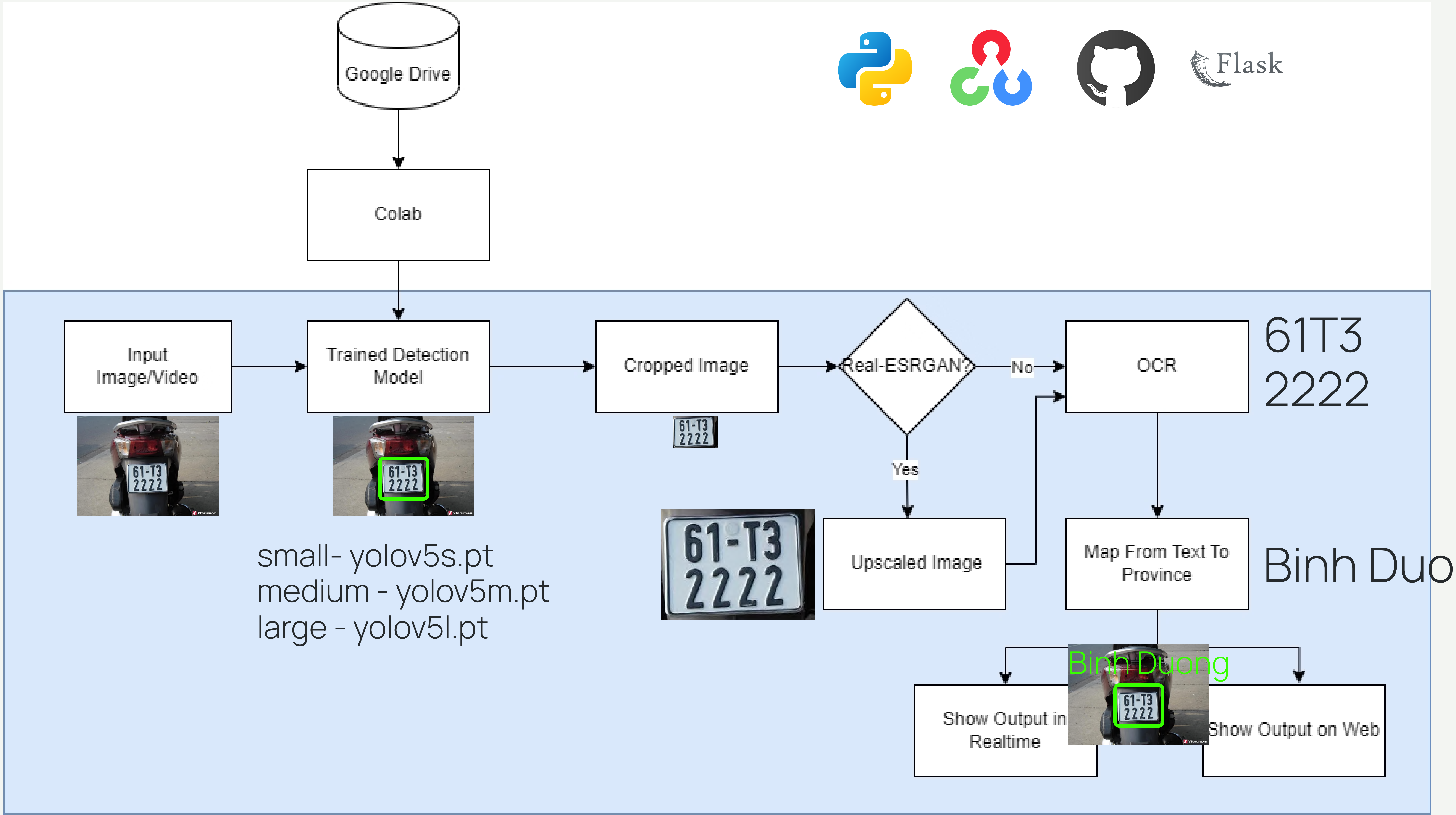
System design



Flask

Google Drive

Colab

Input Image/Video

Trained Detection Model

Cropped Image

Real-ESRGAN?

No

Yes

OCR

61T3
2222

Upscaled Image

Map From Text To Province

Binh Duong

Show Output in Realtime

Show Output on Web

small- yolov5s.pt
medium - yolov5m.pt
large - yolov5l.pt

Challenges

Data source

- Kaggle - 433 (images)
- Various machine learning forum - 3692
- Capture on road - 17
- From various websites - 20

Detect license

- How many images are needed
- Condition of the images

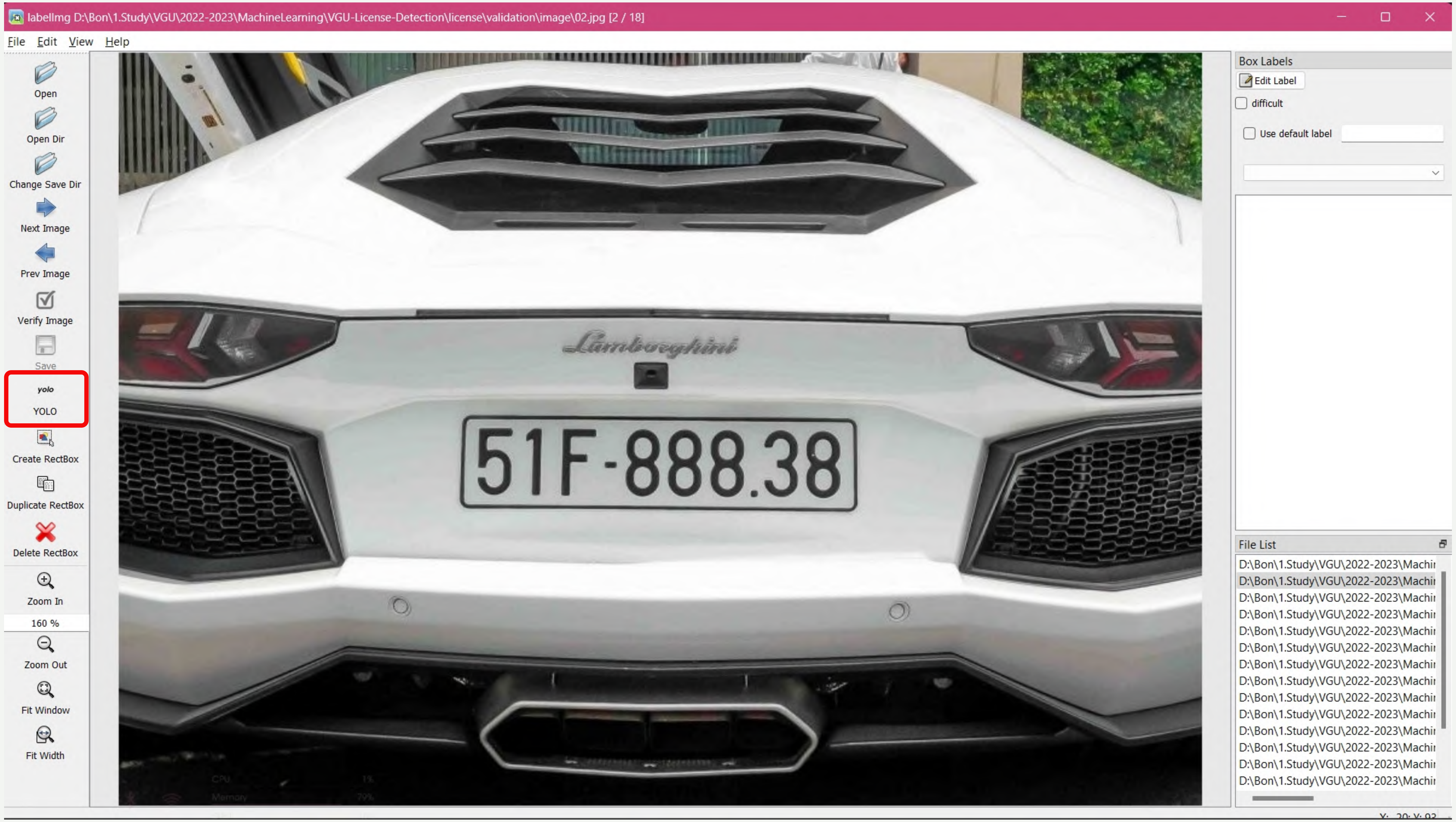
OCR

- What library to use (easyOCR vs pytesseract)

Tools

labelImg

- Use Python
- Easy to use, download
- Can convert different label format to Yolov5



labelImg D:\Bon\1.Study\VGU\2022-2023\MachineLearning\VGU-License-Detection\license\validation\image\02.jpg [2 / 18]

File
Edit
View
Help
Open
Open Dir
Change Save Dir
Next Image
Prev Image
Verify Image
Save
yolo
YOLO
Create RectBox
Duplicate RectBox
Delete RectBox
Zoom In
160 %
Zoom Out
Fit Window
Fit Width
Lamborghini
51F-888.38
Box Labels
Edit Label
difficult
Use default label
File List
D:\Bon\1.Study\VGU\2022-2023\Machi
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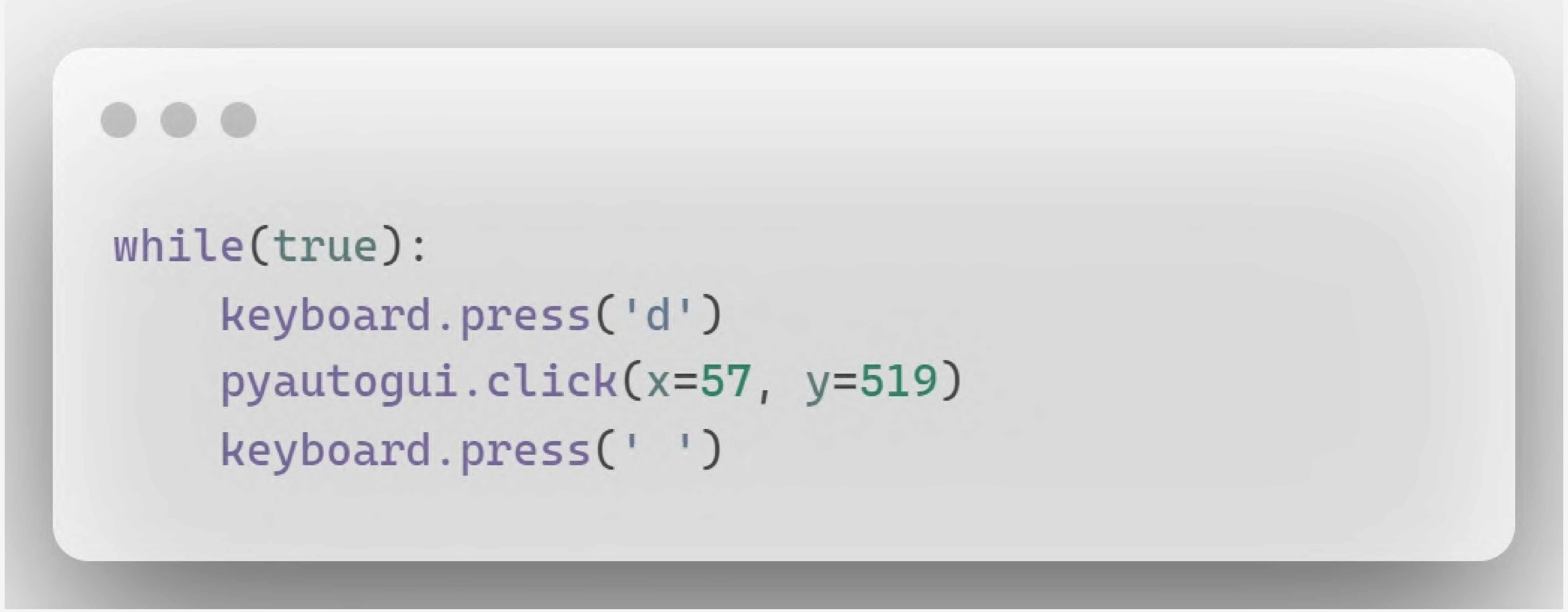
Change label format

labelImg + pyautogui

- Data from Kaggle is in xml format
- Yolov5 need txt format
- Pyautogui save time by clicking button



```
while(true):
    keyboard.press('d')
    pyautogui.click(x=57, y=519)
    keyboard.press(' ')
```

Next image

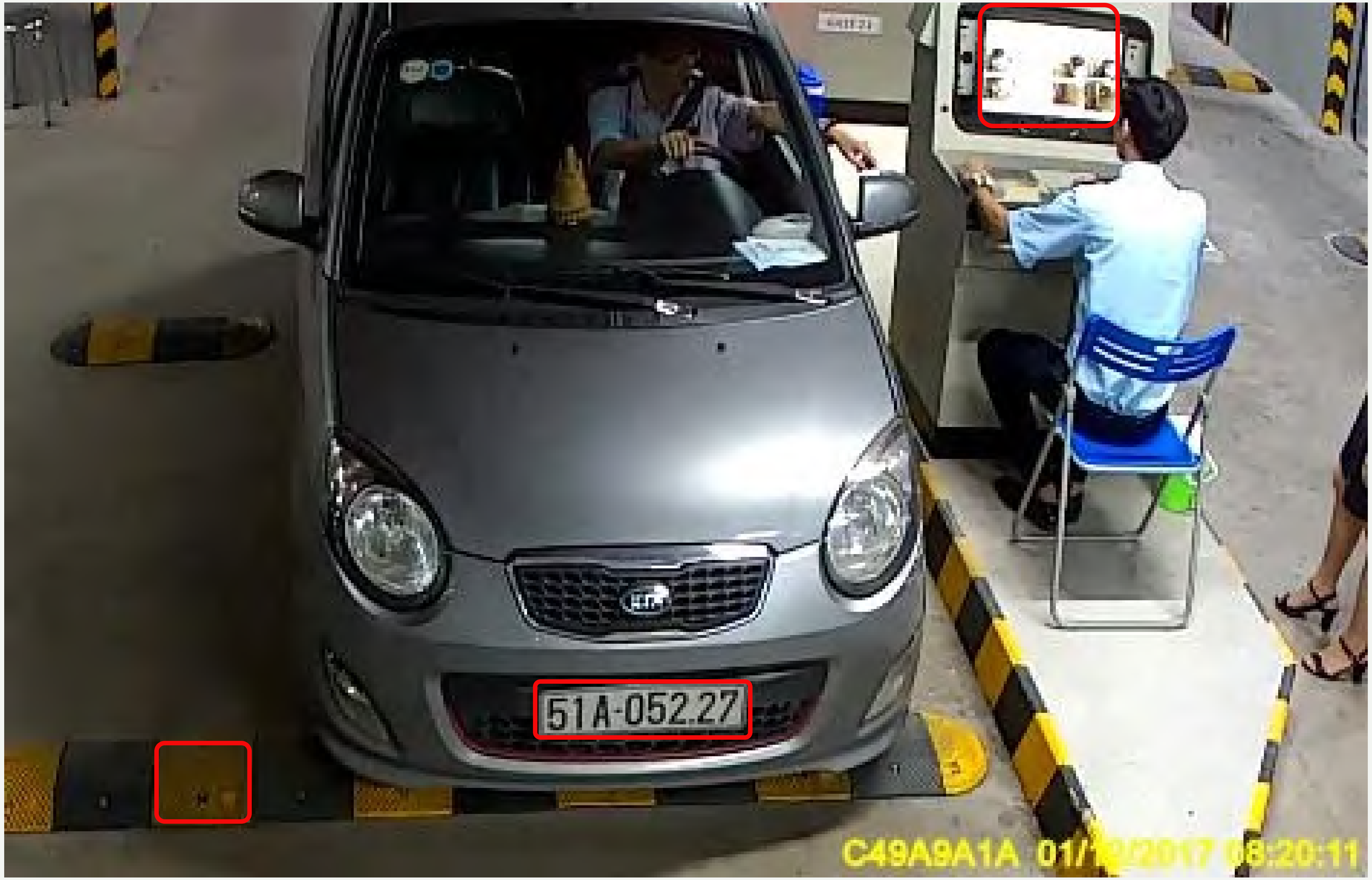
Click change format button

Save label

Auto label

labelImg + bash script

- Use model trained on 2000 images to label 2000 new images
- All new images only has one license
- Use bash script to detect label that have more than one license



03

Experiments

Benchmark

Detection Percentage

The number of license detected in an image

False Positive

The number of license falsely detected in an image

mAP (mean Average Precision)

Average Precision is calculated as the weighted mean of precisions at each threshold

Average Runtime

Average time to detect licenses in an image

mAP Benchmark

There is a total of **4000** train images and **148** validation images

	Average mAP	**Best mAP**
Small - Yolov5s	0.7452764	0.78473
Medium - Yolov5m	0.7263648	0.76881
Large - Yolov5l	0.7714684	0.80372

Two Categories of Validation Data: **Simple** & **Hard**

Simple

Easy to detect licenses

Small amount of licenses

Hard

Hard to detect licenses

Larger amount of licenses

Benchmark

There is a total of **52 license plates** in **18 simple images** and **5 hard images**

	Detected Licenses	Falsely Detected Licenses	Detection Percentage	Average Run TIme
Small - Yolov5s	42/52	4	80.77%	143.01
Medium - Yolov5m	37/52	1	71.15%	323.53
Large - Yolov5l	42/52	4	80.77%	634

Benchmark of Small and Hard Model

There is a total of **52 license plates** in **18 simple images** and **5 hard images**

	Validation Category	Detected Licenses	Falsely Detected Licenses	Detection Percentage
Small - Yolov5s	Simple	23/24	1	95.83%
	Hard	20/29	3	68.97%
Large - Yolov5l	Simple	22/24	1	91.67%
	Hard	21/29	3	72.41%

Benchmark Summary

	Conclusion from Benchmark	Application
Small - Yolov5s	stuggles with hard images	suitable for low-end hardware and detection image is simple
Medium - Yolov5m	has low false detection but also low detection percentage	suitable when false detection is not tolerable
Large - Yolov5l	sometimes struggles with simple images	suitable for high-end hardware and detection image is complex

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04

Q&A —

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