Safe Intelligent Transportation In Digital Cities

Scientific Computing Department
Faculty Of Computer And Information Science
Ain Shams University

Arab Republic of Egypt
Ministry of Communications
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DELL Technologies

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Recap on the previous seminar

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01 Recap

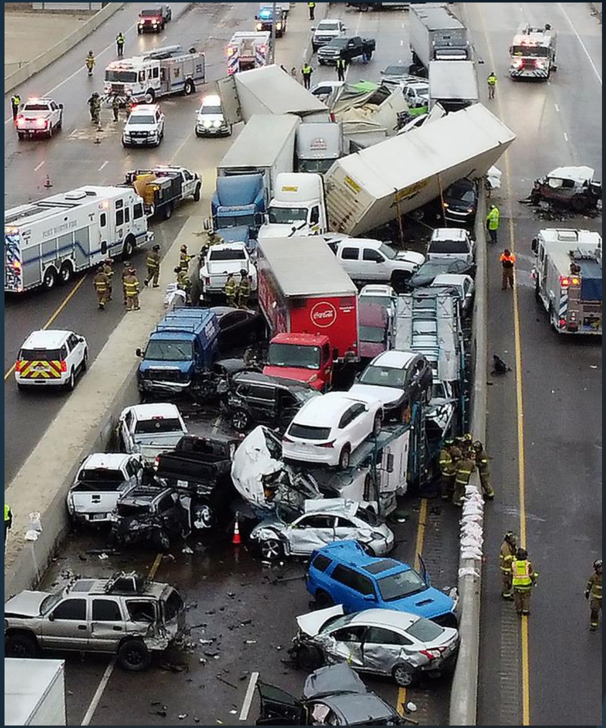
Remembering the Road: A Summary of Key Moments

INTRODUCTION

Transportation is a critical sector to any country as it acts as the vessel for all other activities including individuals, enterprises, governmental, and commercial services.

Problem Definition

- chain of accidents.
- It may cause catastrophes such as explosions.
- Time Delay in Requesting The appropriate Service.



OUR VALUES

MOTIVATION

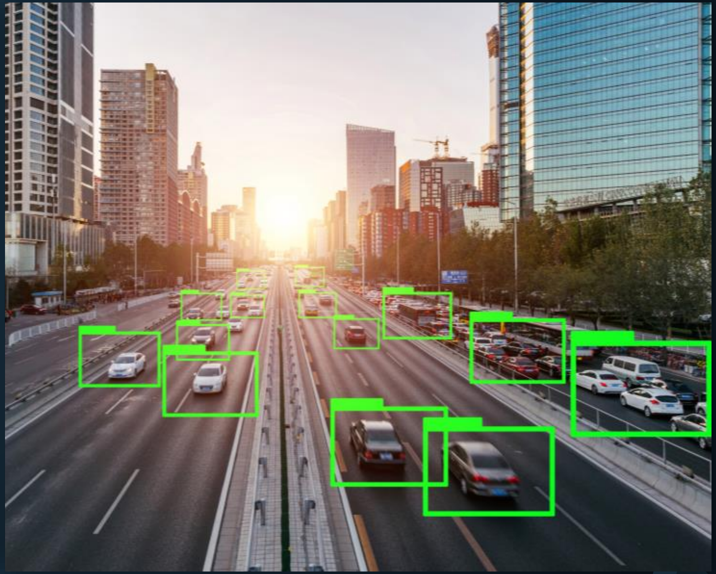
Drive and Purpose

VISION

Creating a Vision: Charting the Path Ahead

Motivation

When accidents occur on the road, their detection is often delayed saving the situation and this results in many disasters, such as additional accidents or the death of some people, traffic disruption and people's interests, and much more. And Utilizing AI methods and techniques can function computer vision, and optimization to detect, spot, and act on such incidents suggesting the best ways to handle them.



0h 0m 42s

average time difference between two accidents

2,320,637

Accidents ratio per year

38,824

Fatal Car Accident Victims

Reference: https://www.forbes.com/advisor/legal/car-accident-statistics/

Vision

- we can use this technology in smart cities and highway anywhere in the world.
- Any kind of accident detected by CCTVs is automatically sent as an alert to the required destination (ex: the nearest traffic units and inform the Civil Protection) to solve the problem as soon as possible and save people's lives and not disrupt the interests of others.

Usefulness

Save people's lives

No traffic densities due to accidents

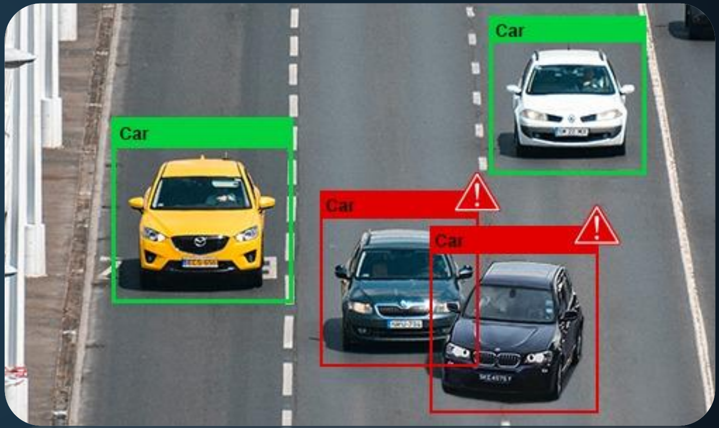
Finding an alternative to reporting road accidents

Beneficiary

- Vehicle Drivers
- Transportation Operators
- Traffic Authorities
- Gov Sectors

Objective

We want to design a model that can detect accidents using AI methods and techniques that can function computer vision, and optimization to detect, spot, and act on such incidents suggesting the best ways to handle them.



02 **Dataset** preparation

From Chaos to Structure

Structuring your dataset for success

Dataset preparation

Collecting Images

Images Annotation

Preprocessing and augmentation

Collecting Images

Download Images

Using chrome extension
"download all images"

Download videos

Choose relevant
videos from youtube

Preprocessing

Remove irrelevant
images from dataset

Generate dataset

Upload images and
videos to Roboflow

Images Annotation

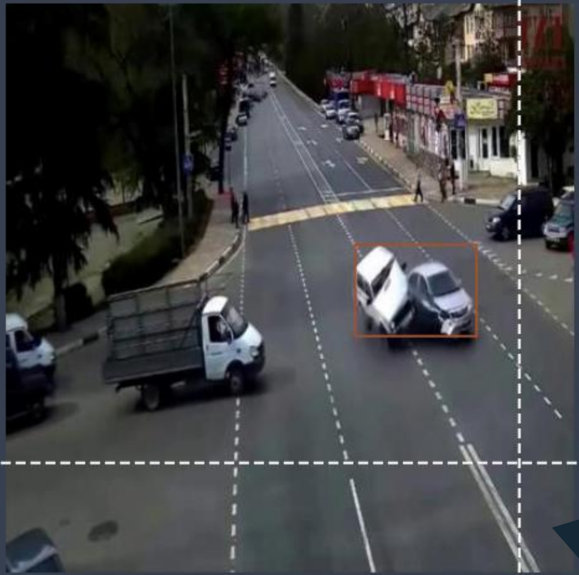
We tried annotating dataset images using two methods:

labelImg

A python tool used to manually annotate images for object detection

Roboflow

Using the built-in annotating tool in Roboflow



Preprocessing & Augmentation

Resize

Resize the image to 320x320

Rotation

Rotate 20-30 degree

Blur

Smooth the images

Exposure

Apply different lights to the images

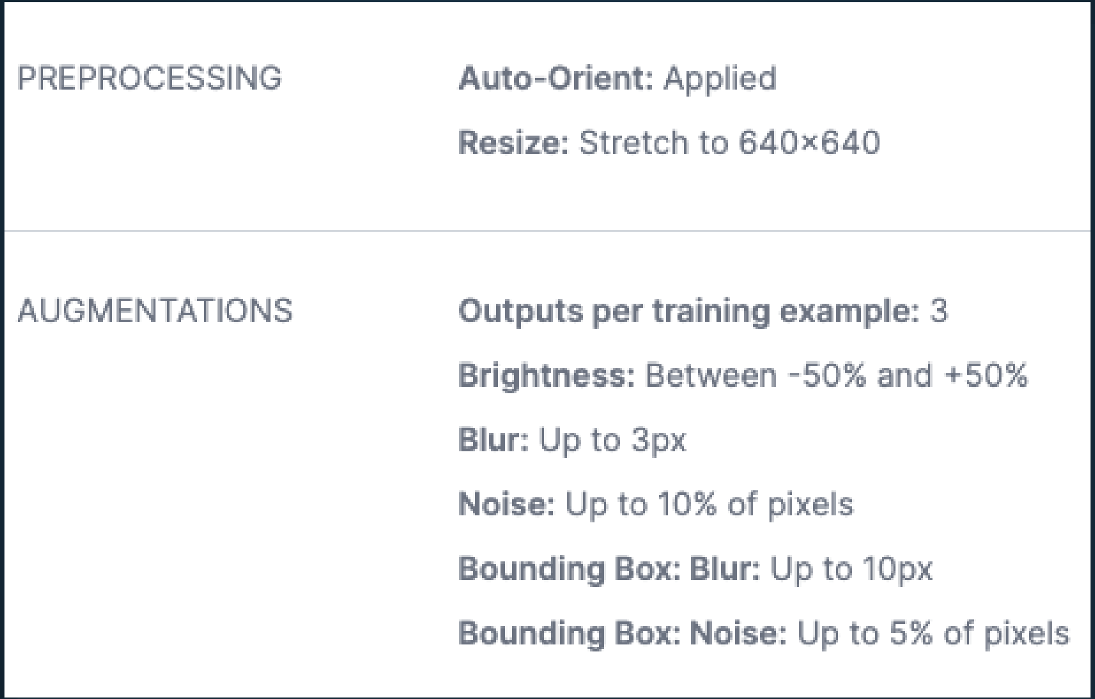
Noise

Apply random noise to the images

Crop

Randomly crop the images

Ex. Of Preprocessing & augmentation



PREPROCESSING	**Auto-Orient:** Applied **Resize:** Stretch to 640×640
AUGMENTATIONS	**Outputs per training example:** 3 **Brightness:** Between -50% and +50% **Blur:** Up to 3px **Noise:** Up to 10% of pixels **Bounding Box: Blur:** Up to 10px **Bounding Box: Noise:** Up to 5% of pixels

03 **Models** & Results

Cracking the Code: Unlocking Model Insights and Outcomes

Project progress

Step 1

Dell Dataset

High computation

Step 2

Image Recognition

Low accuracy

Step 3

YOLOv5

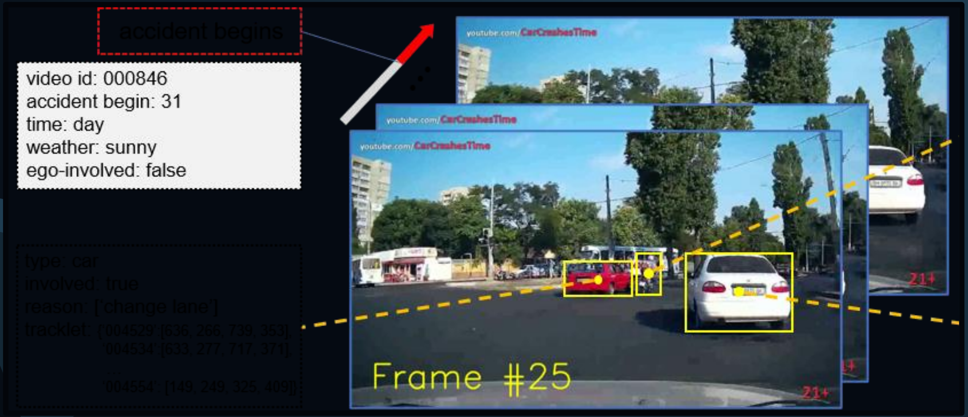
Reengaging with object detection

Step 4

YOLOv8

Highest accuracy

Dell Dataset

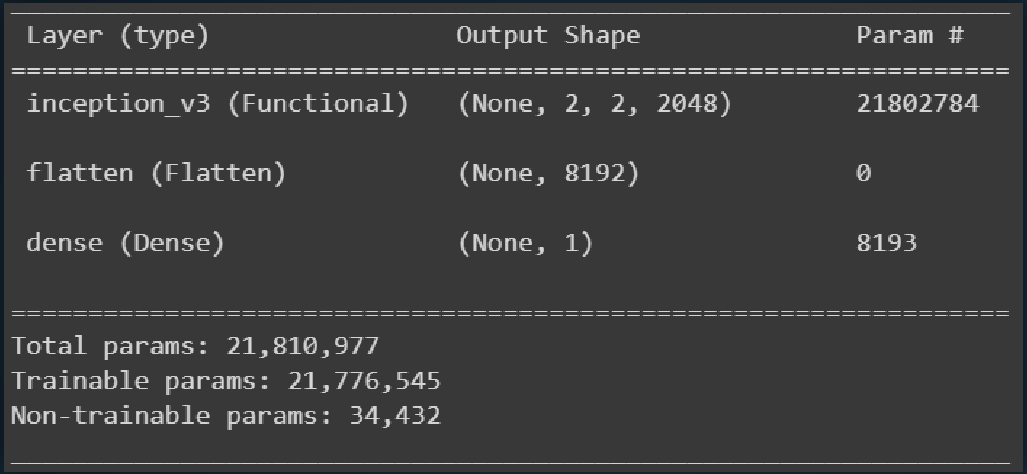


video id: 000846
accident begin: 31
time: day
weather: sunny
ego-involved: false

type: car
involved: true
reason: ['change lane']
tracklet: {'004529':[636, 266, 739, 353],
'004534':[633, 277, 717, 371],
...
'004554': [149, 249, 325, 409]}

```
CarCrash
├── codes # useful codes for analyzing
the dataset
├── vgg16_features
| ├── positive # feature files of positive
(accident) videos
| | ├── 000001.npz
| | ├── ...
| | └── 001500.npz
| ├── negative # feature files of negative
(normal) videos
| | ├── 000001.npz
| | ├── ...
| | └── 003000.npz
| ├── train.txt # list file of training split
| └── test.txt # list file of testing split
├── videos
| ├── Normal # normal driving videos
| | ├── 000001.mp4
| | ├── ...
| | └── 003000.mp4
| ├── Crash-1500 # crash accident videos
| | ├── 000001.mp4
| | ├── ...
| | └── 001500.mp4
| └── Crash-1500.txt # annotation file for
crash accident
└── README.md
```

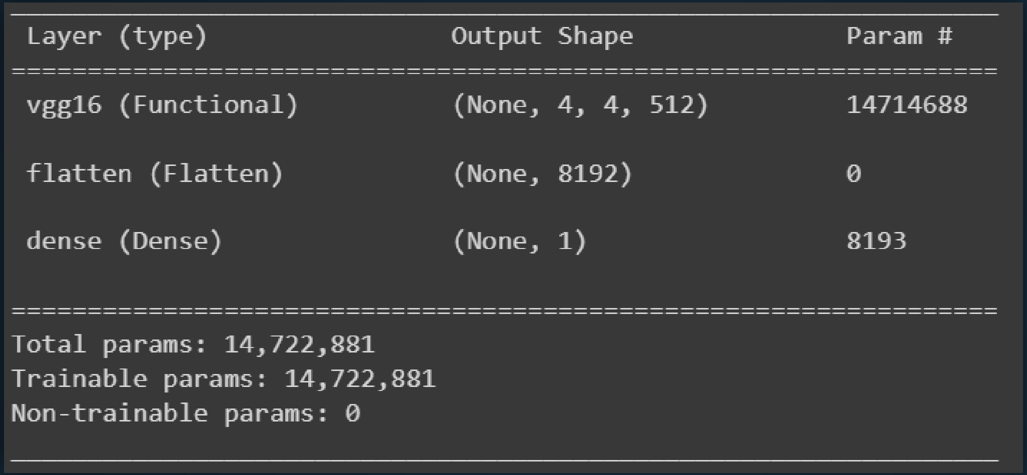
Image Recognintion – Inception



```
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 inception_v3 (Functional)   (None, 2, 2, 2048)        21802784

 flatten (Flatten)           (None, 8192)              0

 dense (Dense)               (None, 1)                 8193


=================================================================
Total params: 21,810,977
Trainable params: 21,776,545
Non-trainable params: 34,432

_________________________________________________________________
```

Pre-trained model ➔ ImageNet
Accuracy ➔ varying between 75-85%

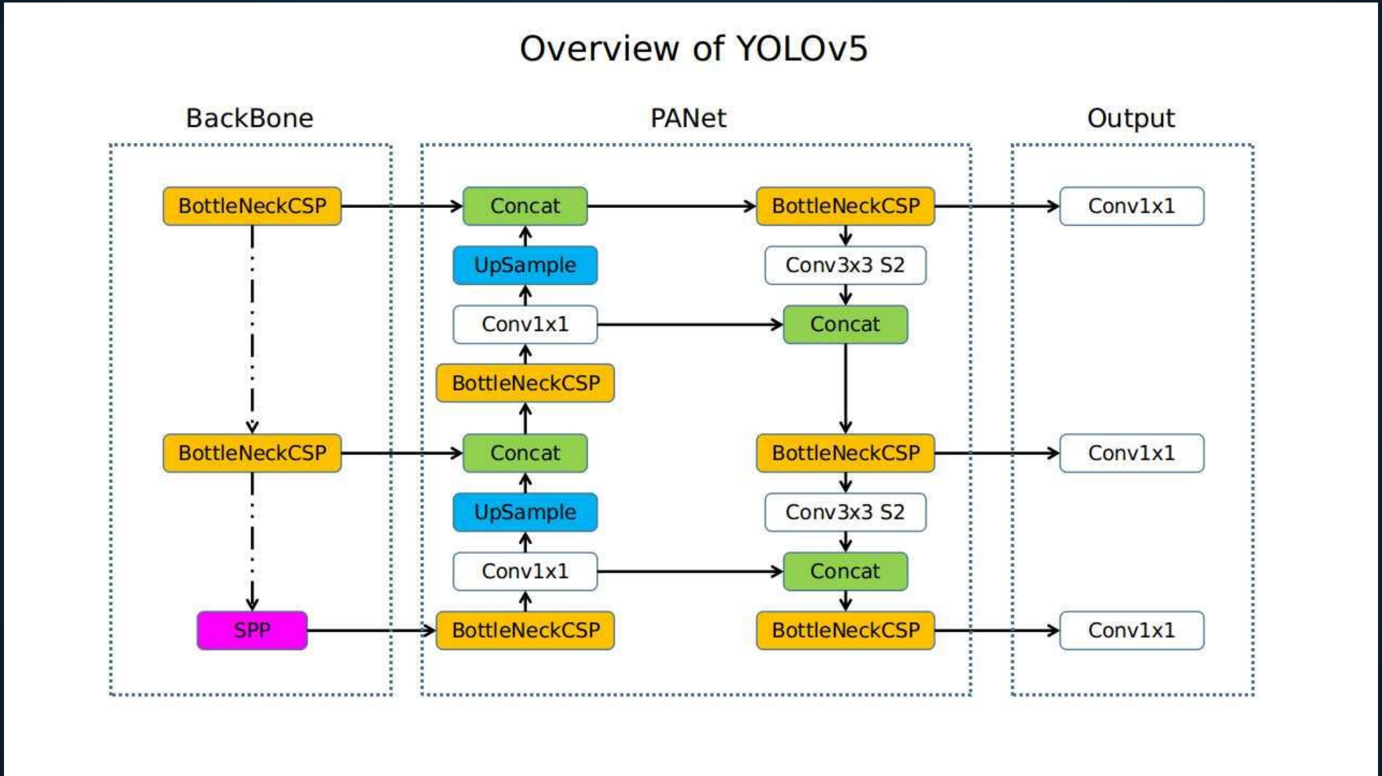
Image Recognition – VGG16



```
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 vgg16 (Functional)          (None, 4, 4, 512)         14714688

 flatten (Flatten)           (None, 8192)              0

 dense (Dense)               (None, 1)                 8193

=================================================================
Total params: 14,722,881
Trainable params: 14,722,881
Non-trainable params: 0
_________________________________________________________________
```

Pre-trained model → ImageNet
Accuracy → varying between 59-68%

YOLOv5


Overview of YOLOv5
BackBone
PANet
Output
BottleNeckCSP
BottleNeckCSP
SPP
Concat
UpSample
Conv1x1
BottleNeckCSP
Concat
UpSample
Conv1x1
BottleNeckCSP
BottleNeckCSP
Conv3x3 S2
Concat
BottleNeckCSP
Conv3x3 S2
Concat
BottleNeckCSP
Conv1x1
Conv1x1
Conv1x1

YOLOv5

Dataset preparation

1

Collecting images

Using chrome extension
“download all images”

2

Annotating images

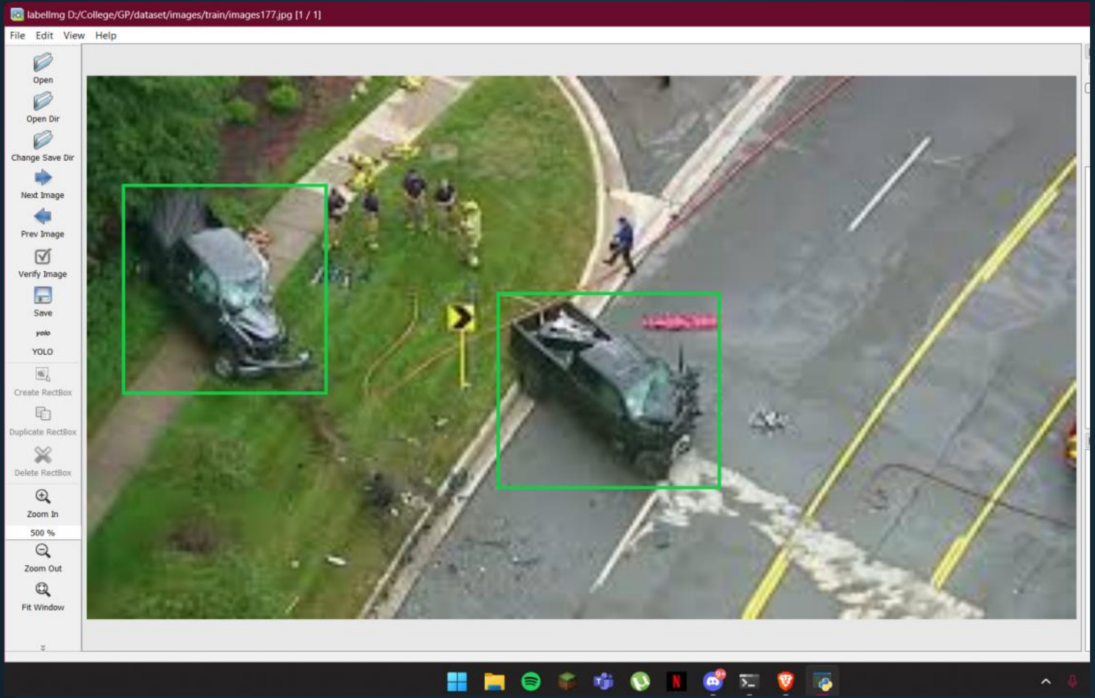
Using “**labelImg**”
App

3

Generate dataset

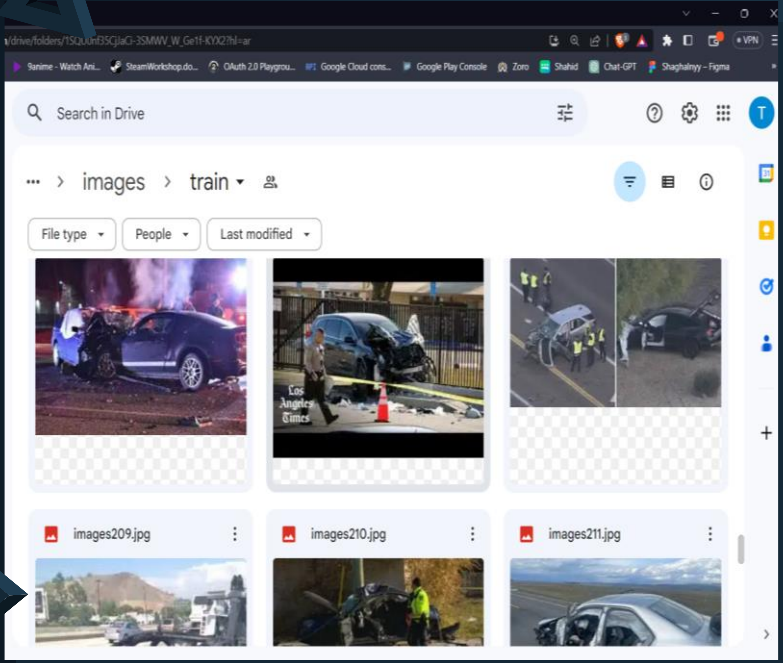
Upload images with annotation files to google drive

Ex. Of annotating image using labelImg



labelImg D:/College/GP/dataset/images/train/images177.jpg [1 / 1]

Generate dataset



Upload images

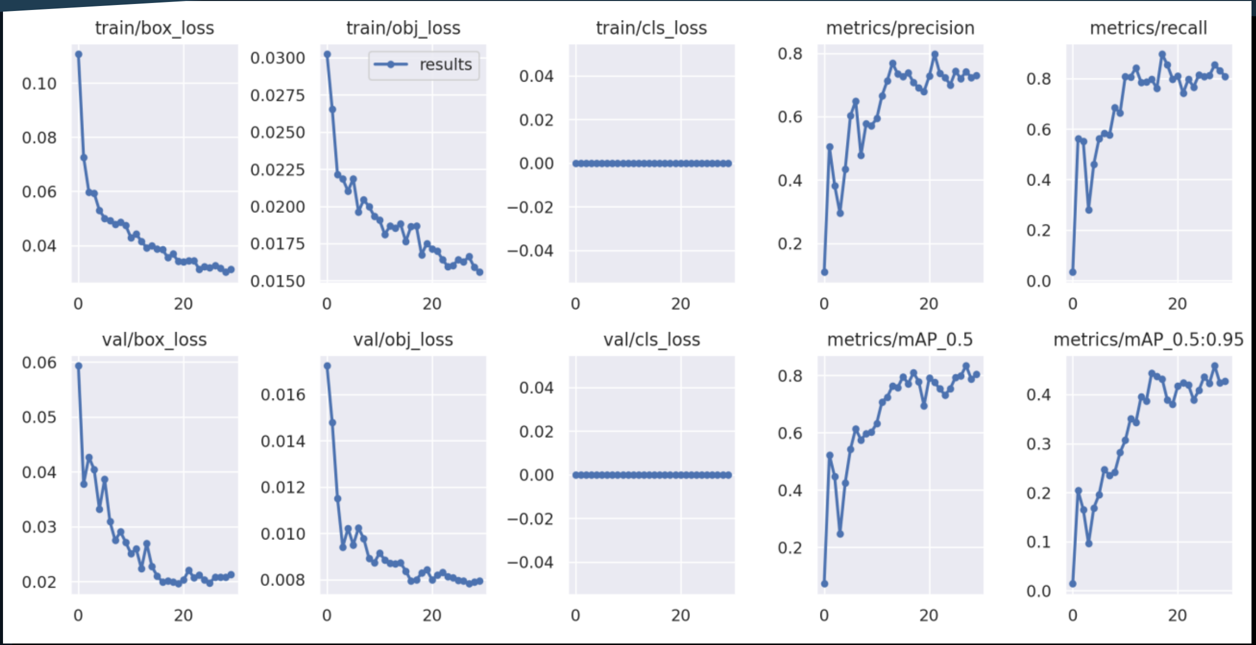
Upload images to google drive

Upload annotation file

Upload annotation files to google drive

Access using colab API

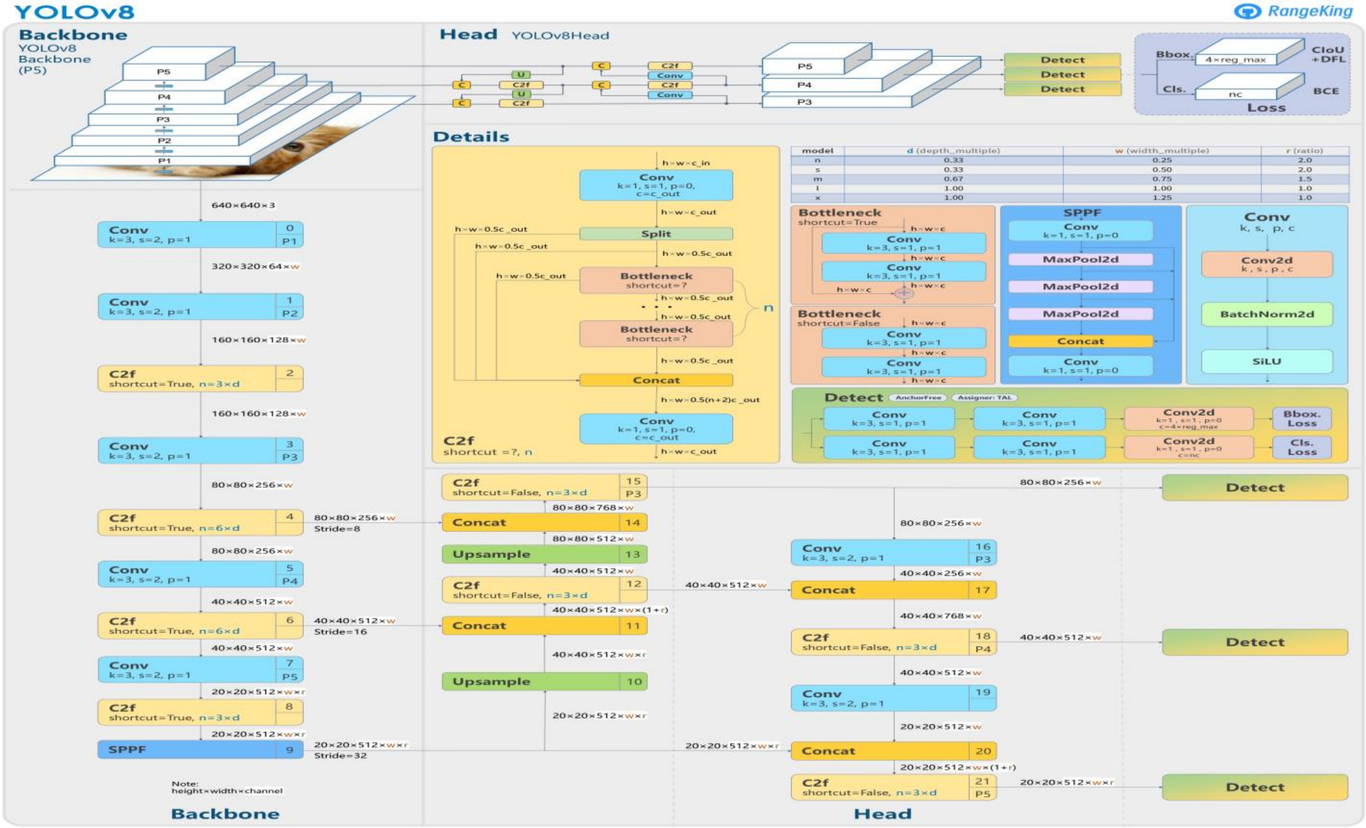
Accessing the dataset using google.colab module



YOLOv5 Results

As shown in the figure we see the evaluation metrics of the experiment

YOLOv8



model	d (depth_multiple)	w (width_multiple)	r (ratio)
n	0.33	0.25	2.0
s	0.33	0.50	2.0
m	0.67	0.75	1.5
l	1.00	1.00	1.0
x	1.00	1.25	1.0

YOLOv8

Dataset preparation

1

Collecting images

Filtering images and videos from YouTube

2

Upload to Roboflow

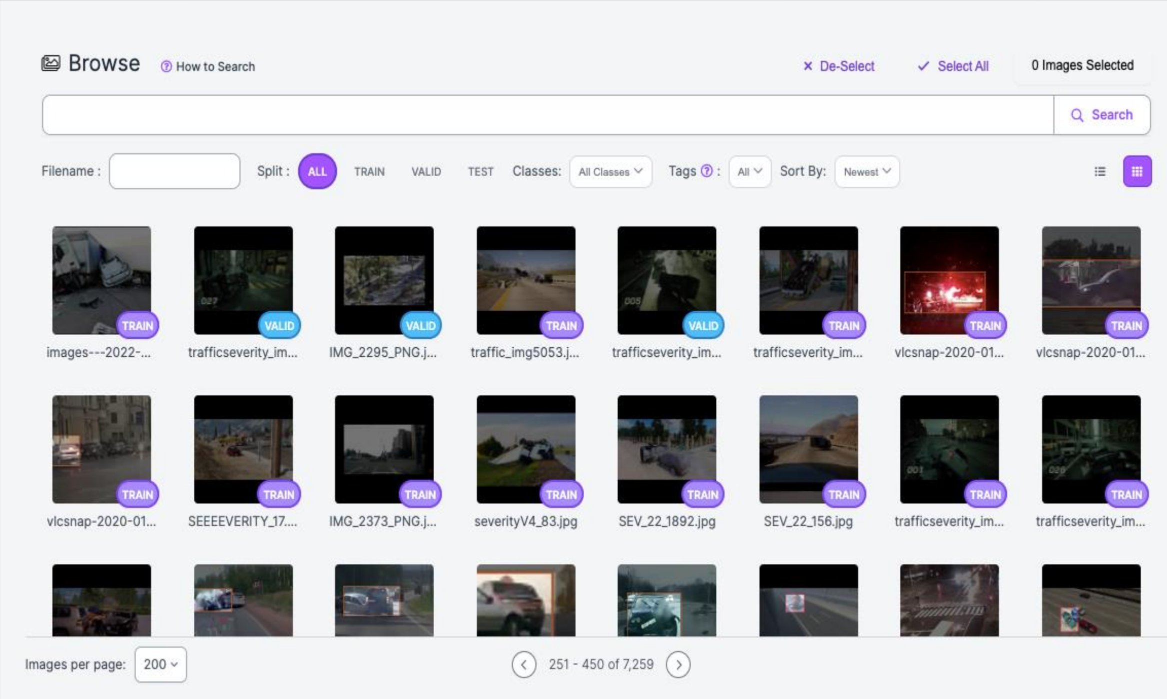
Upload images using the web interface

3

Annotate images

Annotate images using built-In tool in Roboflow

Ex. upload images using the web interface



Split : ALL

Classes: All Classes

Tags : All

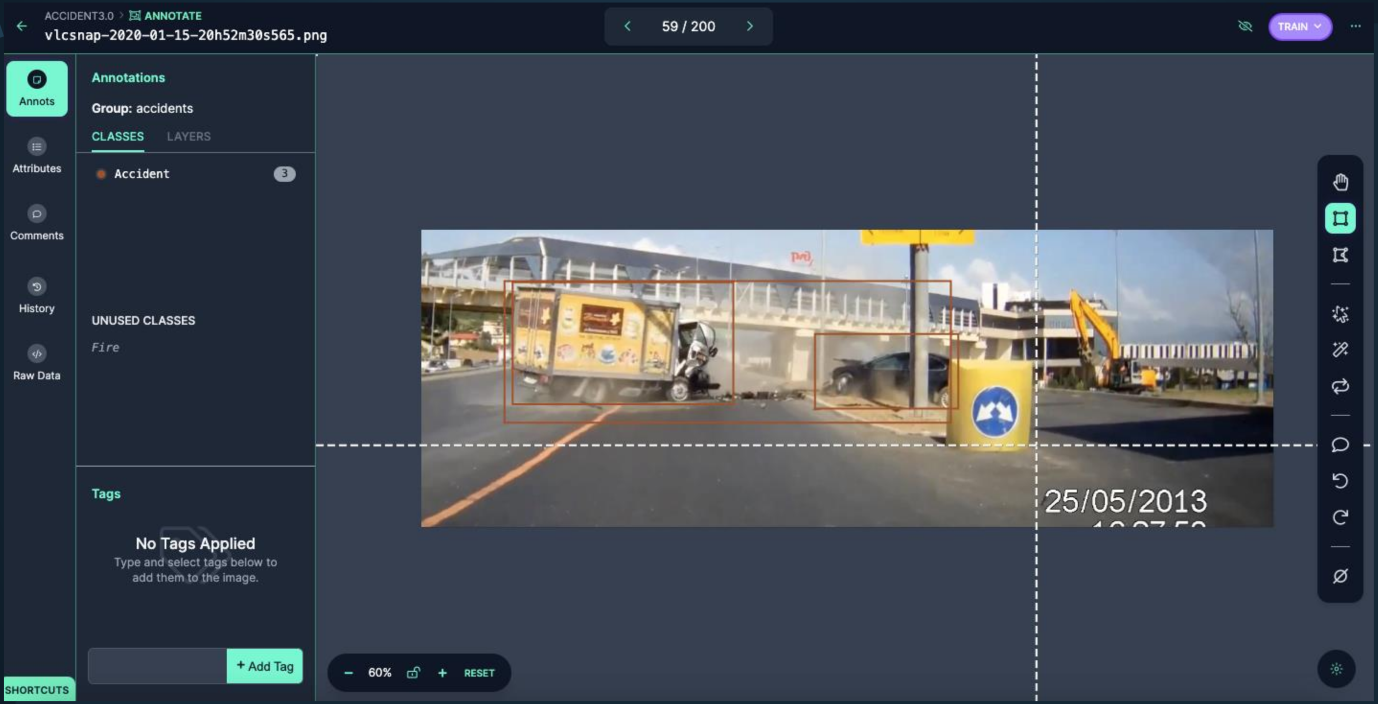
Sort By: Newest

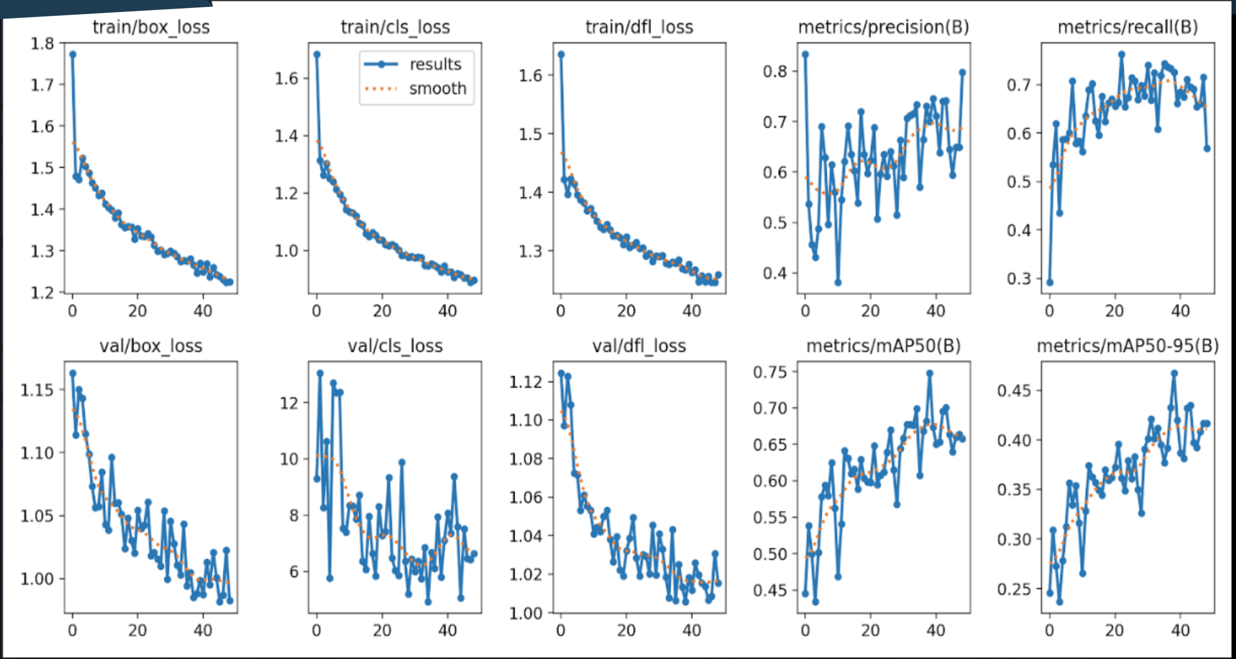
Images per page: 200

251 - 450 of 7,259

0 Images Selected

Ex. **annotating** images



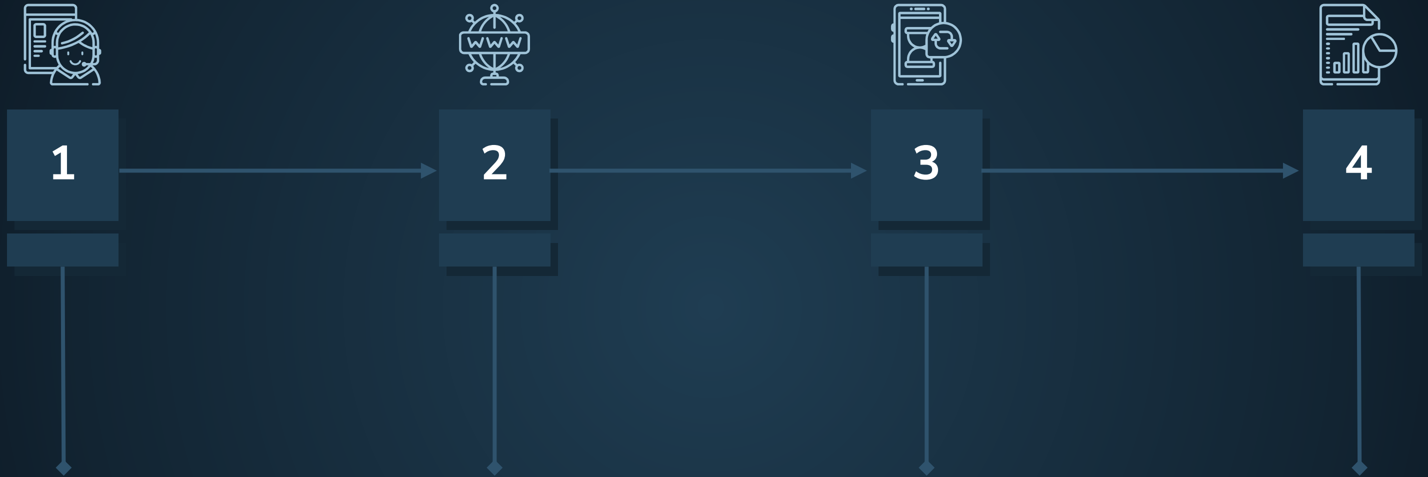


YOLOv8
Results

As shown in the figure we see the evaluation metrics of the experiment

04 Web Application

WEB PROGRESS



1. **HTML/CSS**
   To create the landing page

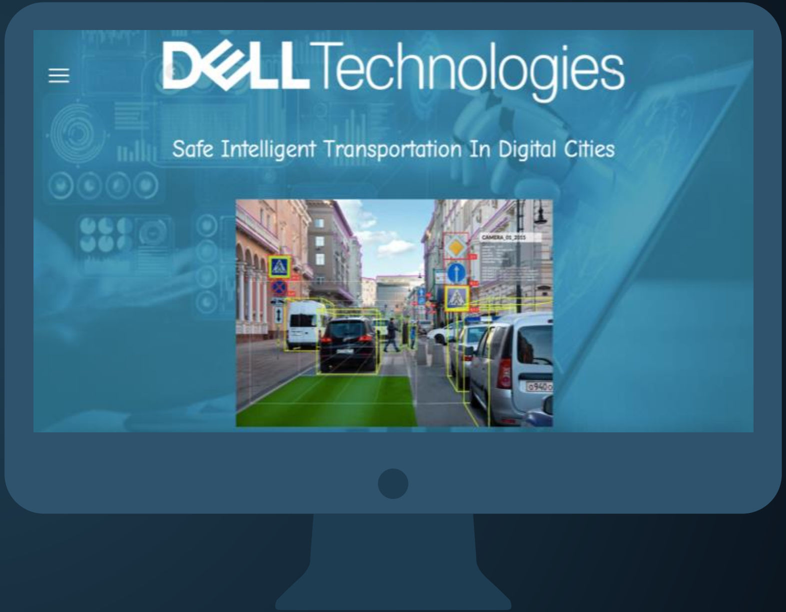
2. **FLASK**
   API – Must be running in production

3. **ANVIL**
   Cannot upload videos

4. **STREAMLIT**
   Used as back-end of the model

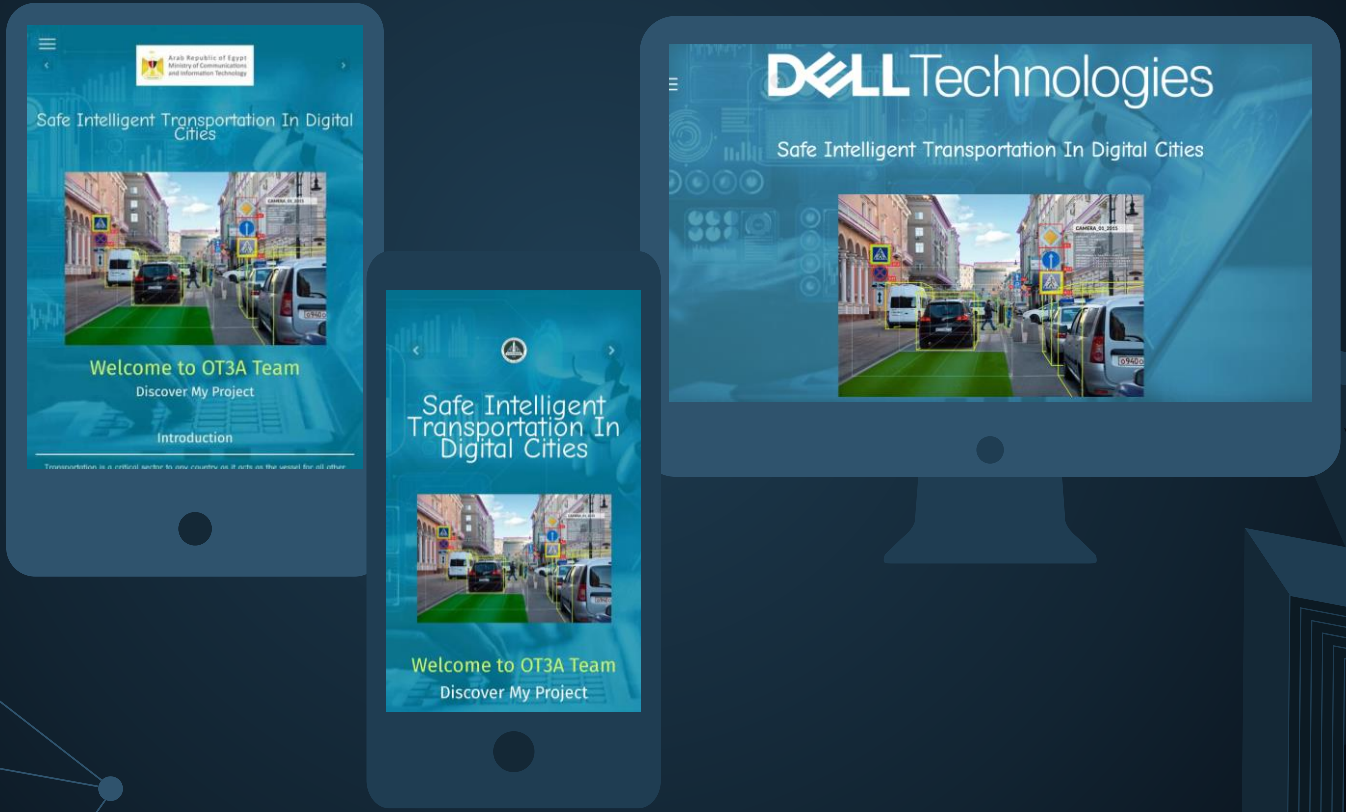
HTML/CSS landpage

A basic landpage website to facilitate user interaction with the model



Safe Intelligent Transportation In Digital Cities

Responsive web-interface



Safe Intelligent Transportation In Digital Cities

Welcome to OT3A Team

Discover My Project

Introduction

Transportation is a critical sector to any country as it acts as the vessel for all other

Safe Intelligent Transportation In Digital Cities

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Safe Intelligent Transportation In Digital Cities

Streamlit process

Streamlit

Developing

Building the web-interface with streamlit module

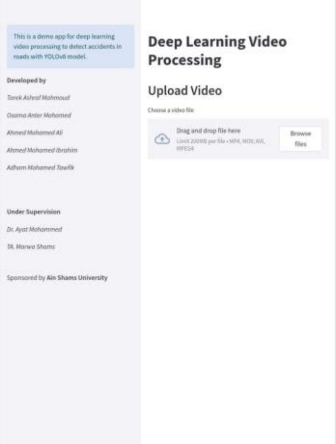
Uploading

Upload the project to github

Deploying

Connect the repo with the streamlit web app

Responsive web-interface using python



This is a demo app for deep learning video processing to detect accidents in roads with YOLOv8 model.

Developed by

Tarek Ashraf Mahmoud

Osama Anter Mohamed

Ahmed Mohamed Ali

Ahmed Mohamed Ibrahim

Adham Mohamed Tawfik

Under Supervision

Dr. Ayat Mohammed

TA. Marwa Shams

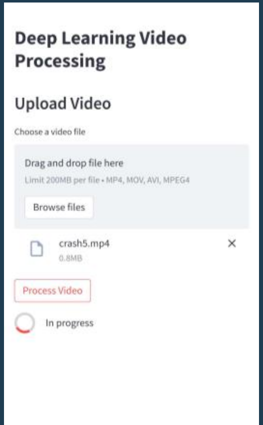
Sponsored by **Ain Shams University**

Deep Learning Video Processing

Upload Video

Choose a video file

Drag and drop file here
Limit 200MB per file • MP4, MOV, AVI, MPEG4



Deep Learning Video Processing

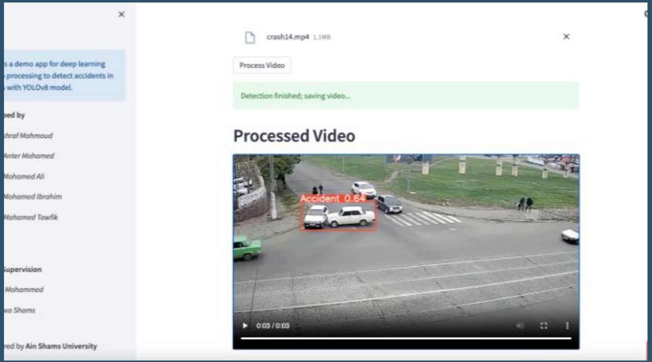
Upload Video

Choose a video file

Drag and drop file here
Limit 200MB per file • MP4, MOV, AVI, MPEG4

crash5.mp4 0.8MB

In progress



s a demo app for deep learning
processing to detect accidents in
with YOLOv8 model.

ped by

hraf Mahmoud

Anter Mohamed

Mohamed Ali

Mohamed Ibrahim

Mohamed Tawfik

Supervision

Mohammed

wa Shams

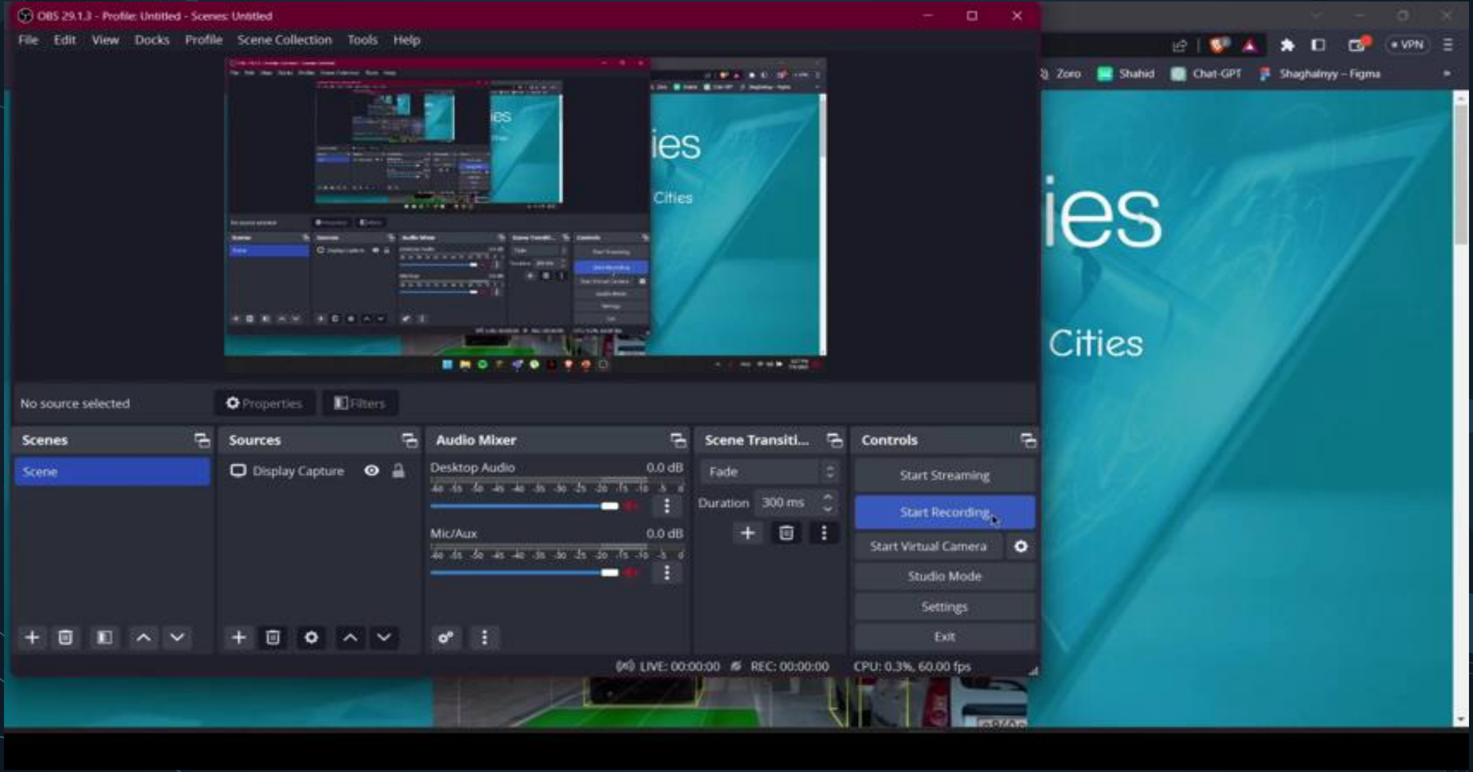
red by **Ain Shams University**

crash14.mp4 1.1MB

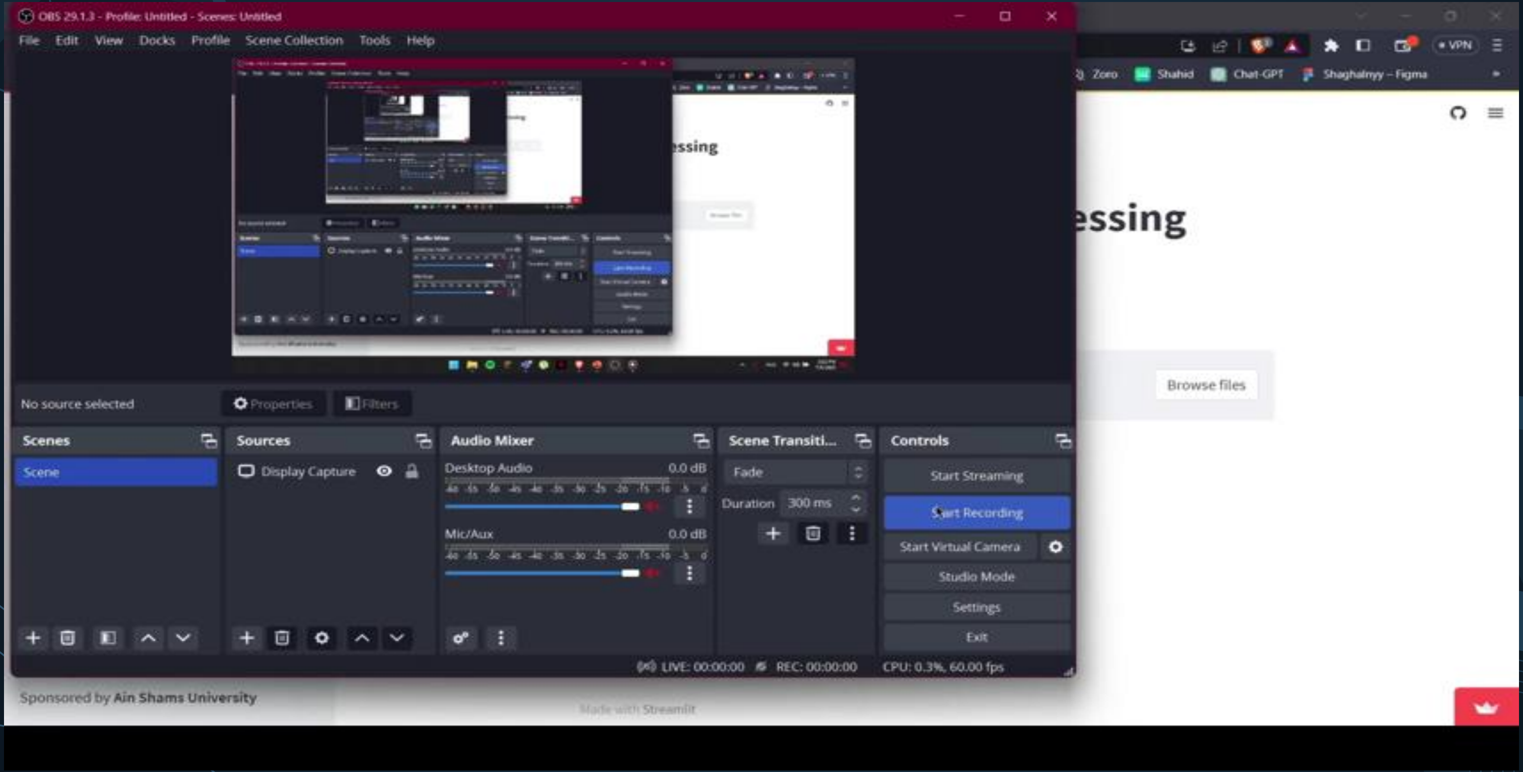
Detection finished; saving video...

Processed Video

DEMO


OBS 29.1.3 - Profile: Untitled - Scenes: Untitled
File
Edit
View
Docks
Profile
Scene Collection
Tools
Help
Zoro
Shahid
Chat-GPT
Shaghalmyy – Figma
VPN
ies
Cities
No source selected
Properties
Filters
Scenes
Scene
Sources
Display Capture
Audio Mixer
Desktop Audio
0.0 dB
Mic/Aux
0.0 dB
Scene Transiti...
Fade
Duration
300 ms
Controls
Start Streaming
Start Recording
Start Virtual Camera
Studio Mode
Settings
Exit
LIVE: 00:00:00
REC: 00:00:00
CPU: 0.3%, 60.00 fps

DEMO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File
Edit
View
Docks
Profile
Scene Collection
Tools
Help
Zoro
Shahid
Chat-GPT
Shaghalmyy – Figma
VPN
essing
Browse files
No source selected
Properties
Filters
Scenes
Scene
Sources
Display Capture
Audio Mixer
Desktop Audio
0.0 dB
Mic/Aux
0.0 dB
Scene Transiti...
Fade
Duration
300 ms
Controls
Start Streaming
Start Recording
Start Virtual Camera
Studio Mode
Settings
Exit
LIVE: 00:00:00
REC: 00:00:00
CPU: 0.3%, 60.00 fps
Sponsored by Ain Shams University
Made with Streamlit

Conclusion & future work

- Link the model to a traffic network
- In case of accidents occurrence, send signals to the corresponding authorities(e.g. police, fire fighting authorities, …etc)
- Send the current location and exact time with the SOS signal

Thank you ☺