

Robotics Laboratory 3

# FACE MASK DETECTION

Group 3



# Group Members

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Thitiphan Tangsamphan  
64011681

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Dechatorn Nubthong  
64011384

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Jiraroj Thanudchaipuen  
64011406

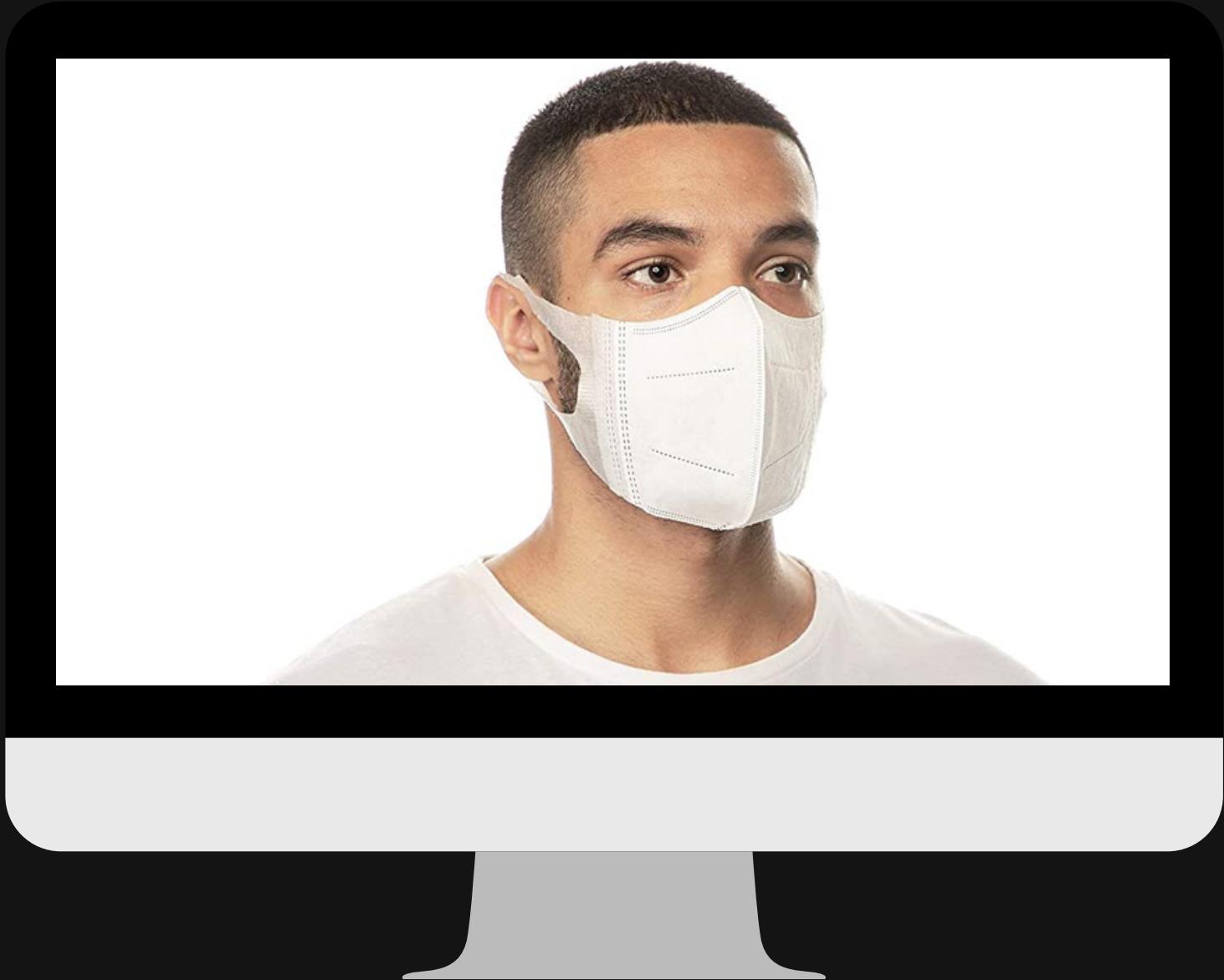
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Chinanporn Borisut  
64110093

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Kongpop Wichaidit  
64011731

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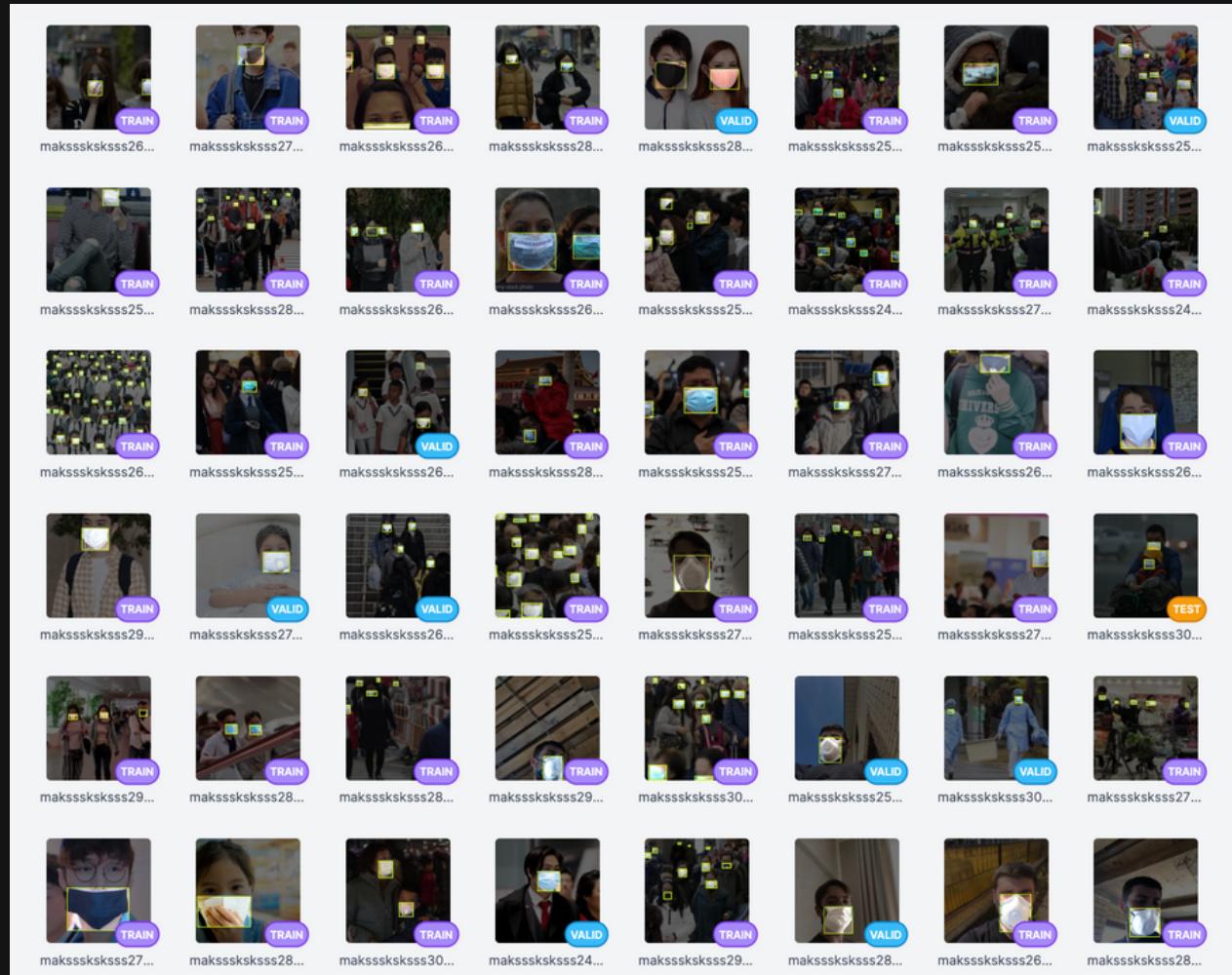
# Application

- Detecting people wearing masks or not from the COVID-19 pandemic



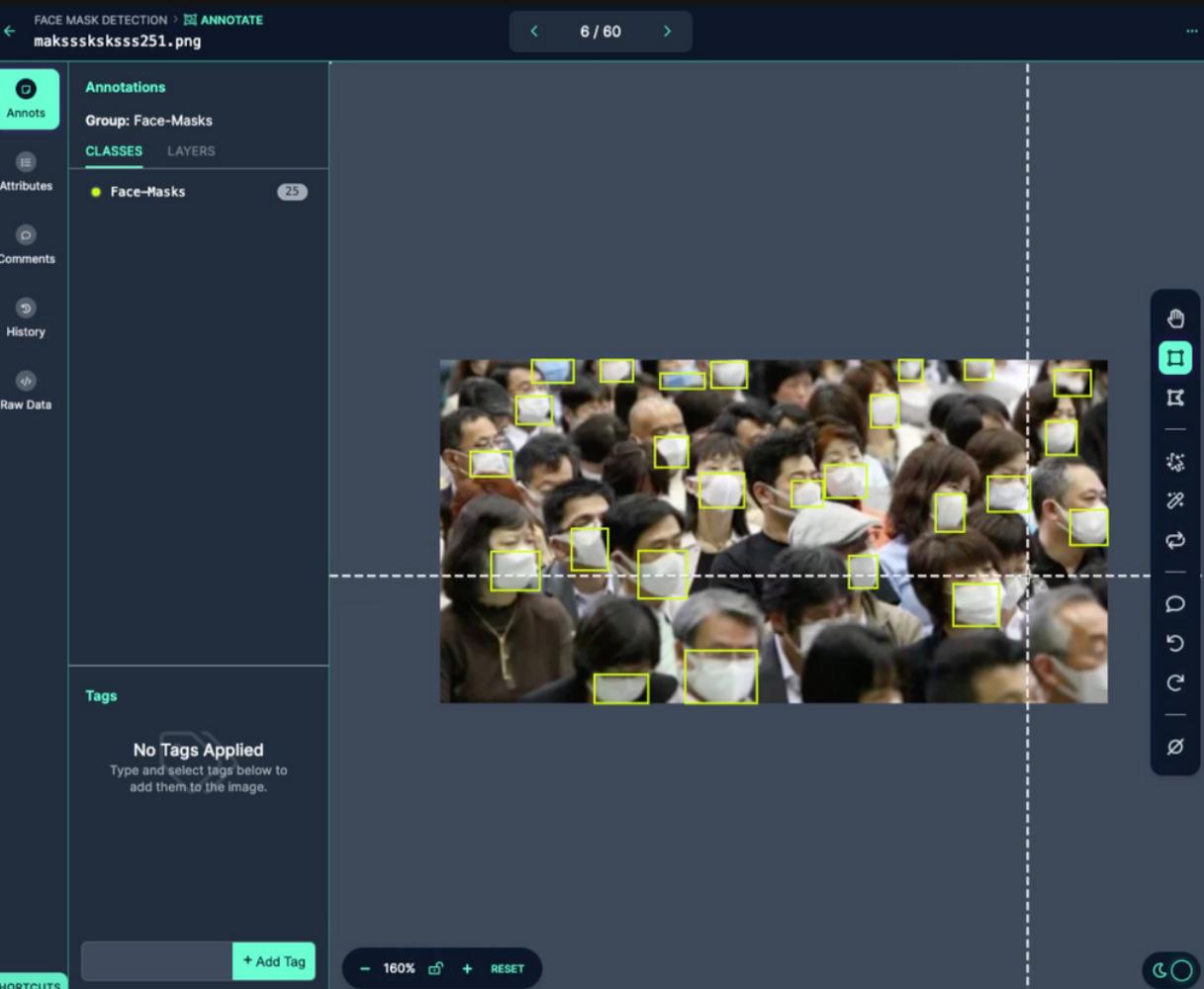
# Our Dataset

- <https://www.kaggle.com/datasets/andrewmvd/face-mask-detection>
- 60 Selected Images From Dataset



# Image Annotation

roboflow

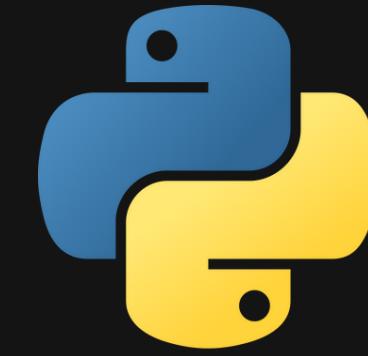


# Tools

kaggle



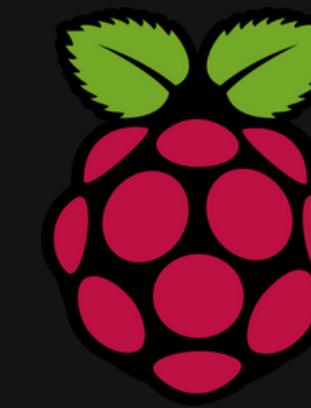
Kaggle



Python



YOLOv8



Raspberry Pi

# Hardware



- Raspberry Pi



- Webcam



- Power Supply



- SD Card

# Model Training

```
[18] # Importing Google Drive To Gain Access To Our Data
from google.colab import drive
drive.mount('/content/drive')

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
[19] # Checking GPU Status
!nvidia-smi
```

```
Fri May 26 08:40:05 2023
+-----
| NVIDIA-SMI 525.85.12      Driver Version: 525.85.12      CUDA Version: 12.0      |
+-----+-----+-----+
| GPU  Name      Persistence-M| Bus-Id      Disp.A  | Volatile Uncorr. ECC  | |
| Fan  Temp     Perf  Pwr:Usage/Cap| Memory-Usage | GPU-Util  Compute M.  |
|                               |             |            | MIG M.               |
+=====+=====+=====+=====+=====+=====+=====+=====+
|   0  Tesla T4          Off  | 00000000:00:04.0 Off |            0 | |
| N/A   38C     P8    9W / 70W |            3MiB / 15360MiB |      0%     Default |
|                           |             |            | N/A                 |
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+
| Processes:
| GPU  GI  CI      PID  Type  Process name          GPU Memory  |
|       ID  ID                  ID                 Usage        |
+=====+=====+=====+=====+=====+=====+=====+=====+
|   No running processes found
+-----+
```

# Model Training

```
[20] # Setting Our Directory
      import os
      HOME = os.getcwd()
      print(HOME)

      /content

      # Installing The YOLOv8 Training Resources
      !pip install ultralytics==8.0.20

      from IPython import display
      display.clear_output()

      import ultralytics
      ultralytics.checks()

      import torch
      from ultralytics import YOLO
      from IPython.display import display, Image, clear_output

      ↵ Ultralytics YOLOv8.0.20 🎨 Python-3.10.11 torch-2.0.1+cu118 CUDA:0 (Tesla T4, 15102MiB)
      Setup complete ✅ (2 CPUs, 12.7 GB RAM, 23.4/78.2 GB disk)
```

# Model Training

```
[22] !pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="")  
project = rf.workspace("king-mongkuts-institute-of-technology-ladkrabang-8s2t3").project("face-mask-detection-prvd3")
dataset = project.version(1).download("yolov8")

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: roboflow in /usr/local/lib/python3.10/dist-packages (1.0.9)
Requirement already satisfied: certifi==2022.12.7 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2022.12.7)
Requirement already satisfied: chardet==4.0.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.0.0)
Requirement already satisfied: cycler==0.10.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (0.10.0)
Requirement already satisfied: idna==2.10 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.10)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.4.4)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-packages (from roboflow) (3.7.1)
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.22.4)
Requirement already satisfied: opencv-python>=4.1.2 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.7.0.72)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from roboflow) (8.4.0)
Requirement already satisfied: pyparsing==2.4.7 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.4.7)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.8.2)
Requirement already satisfied: python-dotenv in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.0.0)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.27.1)
Requirement already satisfied: six in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.16.0)
Requirement already satisfied: urllib3>=1.26.6 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.26.15)
Requirement already satisfied: wget in /usr/local/lib/python3.10/dist-packages (from roboflow) (3.2)
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.65.0)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (6.0)
Requirement already satisfied: requests-toolbelt in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.0.0)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (1.0.7)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (4.39.3)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (23.1)
Requirement already satisfied: charset-normalizer~=2.0.0 in /usr/local/lib/python3.10/dist-packages (from requests->roboflow) (2.0.12)
loading Roboflow workspace...
loading Roboflow project...
Downloading Dataset Version Zip in Face-Mask-Detection-1 to yolov8: 100% [3689601 / 3689601] bytes
Extracting Dataset Version Zip to Face-Mask-Detection-1 in yolov8:: 100% |██████████| 156/156 [00:00<00:00, 2664.30it/s]
```

# Model Training

```
[31] !yolo task=detect mode=train model=yolov8s.pt data={dataset.location}/data.yaml imgs=640 plots=True

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
60/100    8.46G     1.06      0.5107    0.9592      95        640: 100% 4/4 [00:04<00:00,  1.09s/it]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  2.42it/s]
          all       11       24       0.917     0.916      0.96     0.597

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
61/100    8.46G     1.151     0.5641    0.9698     143        640: 100% 4/4 [00:03<00:00,  1.12it/s]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.28it/s]
          all       11       24       0.922     0.985      0.971     0.607

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
62/100    8.46G     1.064     0.5288    0.9596     100        640: 100% 4/4 [00:03<00:00,  1.22it/s]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.36it/s]
          all       11       24       0.882     1         0.969     0.669

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
63/100    8.46G     0.9996    0.5091    0.9428      84        640: 100% 4/4 [00:03<00:00,  1.15it/s]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  2.43it/s]
          all       11       24       0.958     0.955      0.968     0.653

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
64/100    8.46G     1.136     0.5523    0.9816     128        640: 100% 4/4 [00:04<00:00,  1.02s/it]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.30it/s]
          all       11       24       0.92       1         0.981     0.657

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
65/100    8.46G     1.028     0.5357    0.9611      53        640: 100% 4/4 [00:03<00:00,  1.23it/s]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.33it/s]
          all       11       24       0.958     0.955      0.987     0.619

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
66/100    8.46G     1.022     0.5273    0.9446     100        640: 100% 4/4 [00:03<00:00,  1.26it/s]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  2.49it/s]
          all       11       24       0.914     0.958      0.977     0.622

    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
67/100    8.46G     1.004     0.5064    0.9576     132        640: 100% 4/4 [00:05<00:00,  1.27s/it]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.40it/s]
          all       11       24       0.957     0.958      0.973     0.601

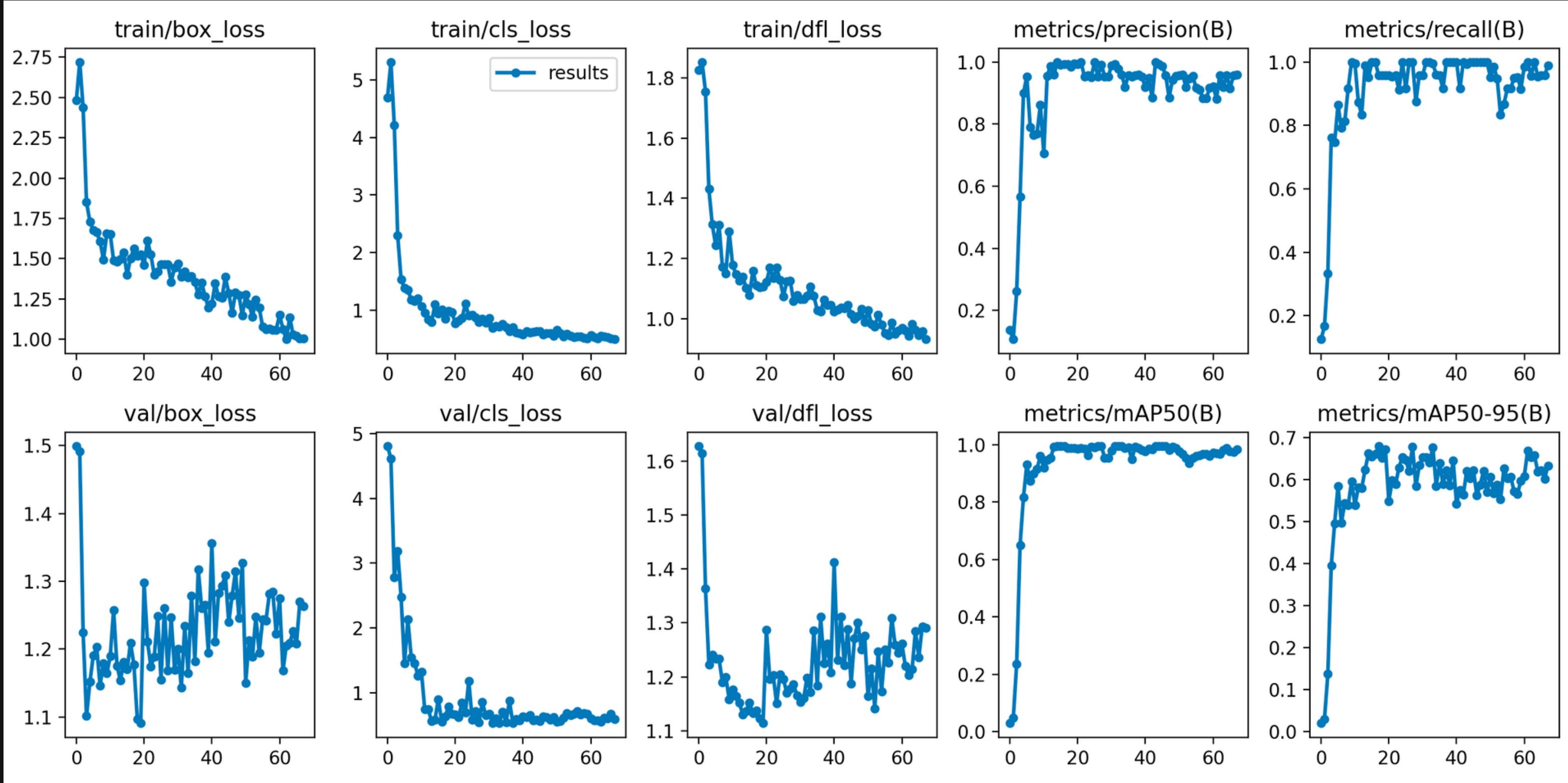
    Epoch   GPU_mem   box_loss   cls_loss   dfl_loss   Instances   Size
68/100    8.46G     1.007     0.4907    0.9307     130        640: 100% 4/4 [00:03<00:00,  1.24it/s]
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.32it/s]
          all       11       24       0.96       0.989      0.983     0.633

Stopping training early as no improvement observed in last 50 epochs. Best results observed at epoch 18, best model saved as best.pt.
To update EarlyStopping(patience=50) pass a new patience value, i.e. `patience=300` or use `patience=0` to disable EarlyStopping.

68 epochs completed in 0.091 hours.
Optimizer stripped from runs/detect/train6/weights/last.pt, 22.5MB
Optimizer stripped from runs/detect/train6/weights/best.pt, 22.5MB

Validating runs/detect/train6/weights/best.pt...
Ultralytics YOLOv8.0.20 🚀 Python-3.10.11 torch-2.0.1+cull18 CUDA:0 (Tesla T4, 15102MiB)
Model summary (fused): 168 layers, 11125971 parameters, 0 gradients, 28.4 GFLOPs
          Class    Images  Instances   Box(P)      R   mAP50  mAP50-95): 100% 1/1 [00:00<00:00,  3.24it/s]
          all       11       24       0.993     0.958     0.988     0.68
Speed: 0.2ms pre-process, 4.2ms inference, 0.0ms loss, 0.9ms post-process per image
Results saved to runs/detect/train6
```

# Our Trained Model



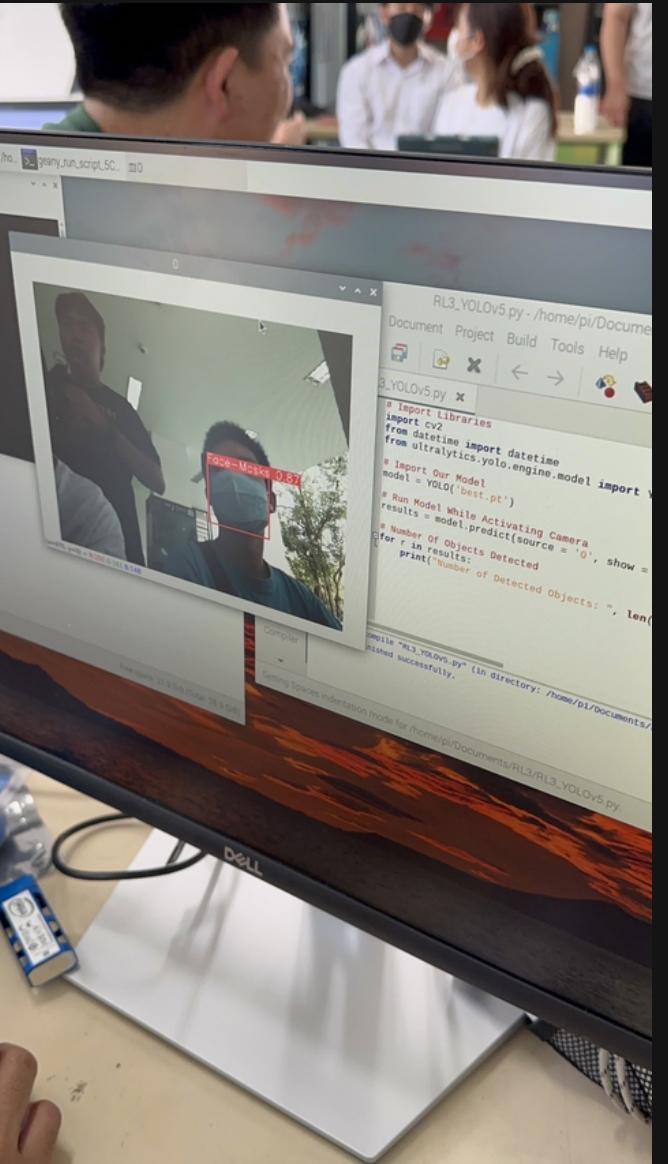
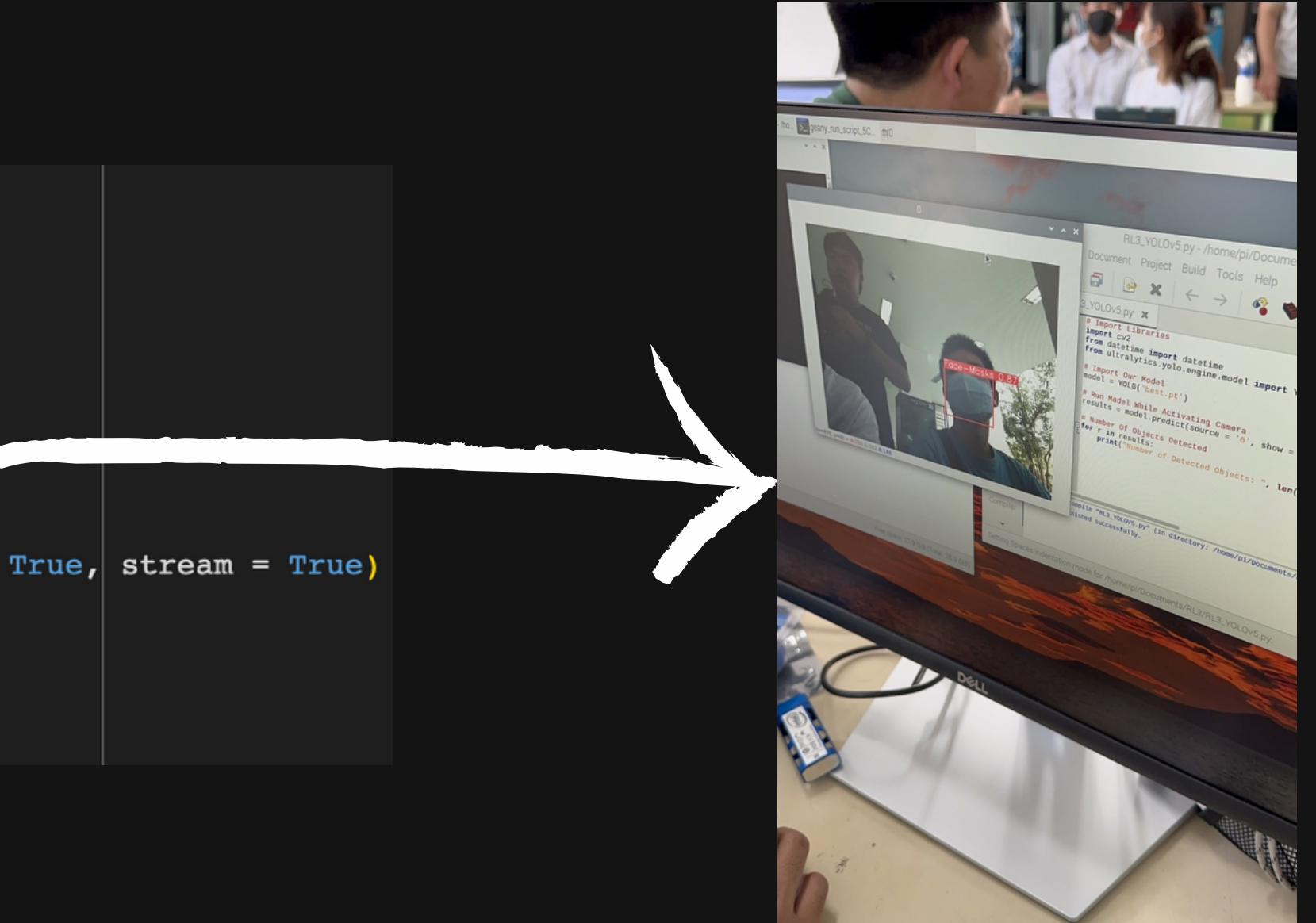
# Deploying Our Model

```
# Import Libraries
import cv2
from datetime import datetime
from ultralytics.yolo.engine.model import YOLO

# Import Our Model
model = YOLO('best.pt')

# Run Model While Activating Camera
results = model.predict(source = '0', show = True, conf = 0.5, save_conf = True, stream = True)

# Number Of Objects Detected
for r in results:
    print("Number of Detected Objects: ", len(r))
```



# Demonstration

# Benefits of Face Mask Detection

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- Public Health and Safety
- Disease Prevention
- Compliance Monitoring
- Early Warning System
- Operational Efficiency
- Data Collection and Analysis
- Personal Accountability



**THANK YOU!**