Precautionary Measures Detection System To Face The Spread Of Infectious Diseases

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Covid-19 Challenge

Abstract

Our objective to provide a solution to detect face mask to reduce COVID-19 spread ,The corona virus COVID-19 pandemic is causing a global health crisis, so the effective protection methods is wearing a face mask in public areas according to the World Health Organization (WHO). The COVID-19 pandemic forced governments across the world to impose lockdowns to prevent virus transmissions. After the quarantine, the government had to make sure that people were wearing face masks. Humans cannot participate in this process, due to the chance of getting affected by corona. Hence the need for Artificial Intelligence (AI), which is the main theme of our project.

Objective

In this approach, we aim to make use of image processing and deep learning to make sure that people follow the precautionary measures to prevent the spread of COVID-19 which is a serious and life-threatening disease for people all over the world.

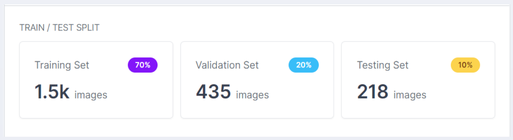
It is clear from the picture that there are people committed to the precautions of the virus and others are neglectful of these precautions, so awareness must be spread among the people in order to confront the spread of the virus and that is why we made our project.

Also, this is not accepted we want people to wear masks correctly.

Materials

Dataset:

- Number of images is (2163).
- Dataset splitting (train/valid/test) is (70%/20%/10%).



With mask

Without mask

Incorrect mask

Used tools:

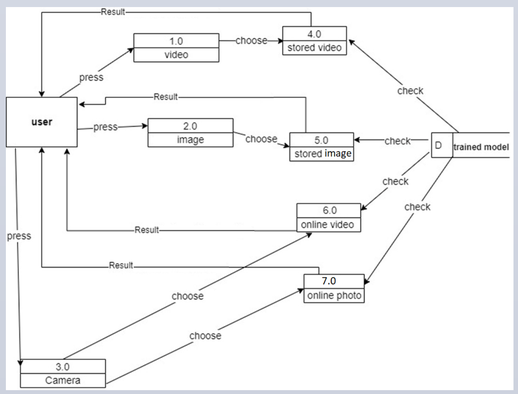
- Python 3.10
- PyCharm 2021.3
- Roboflow
- Google Colab

Methodology

Steps:

- Preparing dataset
  "Face mask detection"
- Select DL Algorithm
  "YOLOv5"
- Training the model on dataset
  -We train our model on 2163 images with validation split 0.2
- Testing and evaluating the model with rest of dataset
- Evaluation the final Model

Data Flow Diagram

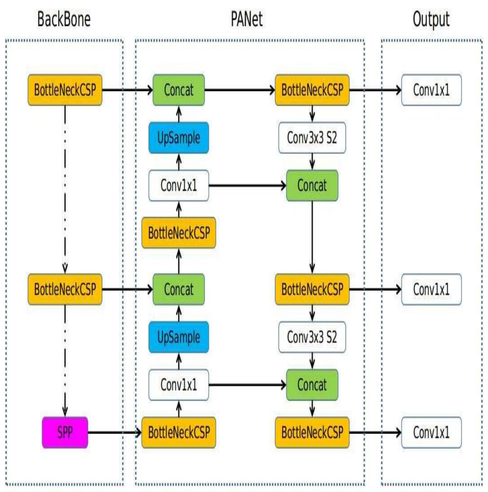


Results

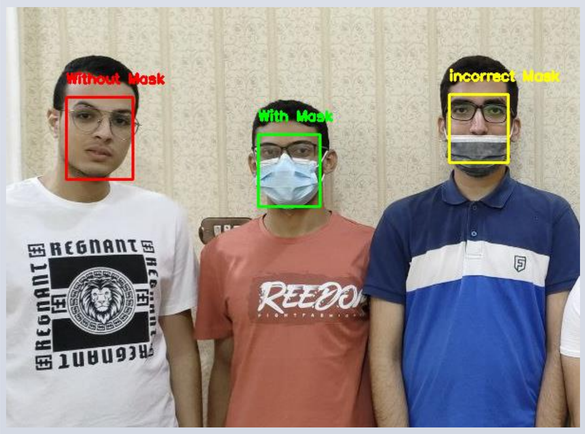
- Our model reach very high Accuracy

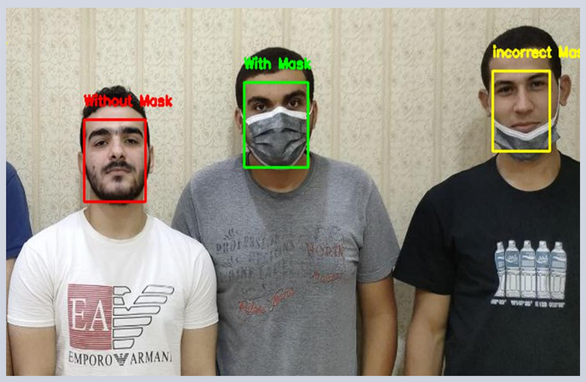
```
100 epochs completed in 0.510 hours.
Optimizer stripped from runs/train/yolov5s_results/weights/last.pt, 14.8MB
Optimizer stripped from runs/train/yolov5s_results/weights/best.pt, 14.8MB

Validating runs/train/yolov5s_results/weights/best.pt...
Fusing layers...
custom_YOLOv5s summary: 232 layers, 7251912 parameters, 0 gradients, 16.8 GFLOPs
               Class     Images     Labels          P          R     mAP@.5 mAP@.5:.95: 100% 14/14 [00:04<00:00,  3.15it/s]
                 all        435        564      0.931      0.894      0.913      0.531
   Incorrected_Mask        435        132      0.925      0.886      0.881      0.318
           With_Mask        435        211      0.912      0.888       0.91      0.598
        Without_Mask        435        221      0.956       0.91      0.947      0.677
Results saved to runs/train/yolov5s_results
CPU times: user 27.3 s, sys: 3.42 s, total: 30.7 s
Wall time: 31min 40s
```

- Model architecture



- After we have done the training correctly then matched speed, accuracy and real time
  - Our model based on object detection of face mask images
  - Our model detect images into three classes





Conclusion

In this work we have used YOLOv5 to develop an accurate deep learning model that detects people who wear face masks and who do not or improperly wear face masks to ensure precautionary measures and face the spread of infectious diseases then we deployed it in a desktop application that takes images, videos or live camera as input and perform object detection.

this application can be used in faculties and public places in which there are crowds

References

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3. github.com/ultralytics/yolov5
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