Face Mask Detection Model

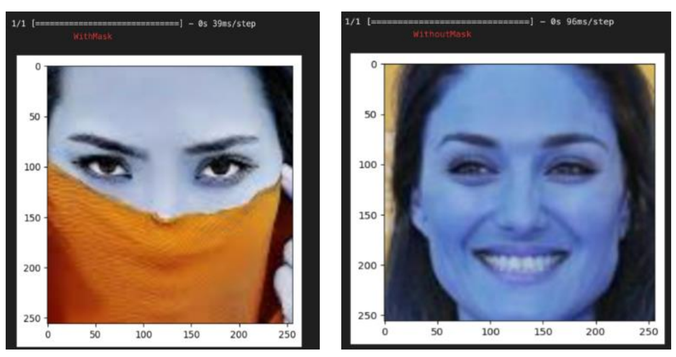
Submitted for
Clinical Decision Support System project
Submitted to :
Dr. Eman Ayman

Problem Definition

The widespread use of face masks has become a crucial measure in preventing the spread of infectious diseases, including respiratory viruses like influenza and COVID-19.

Objectives

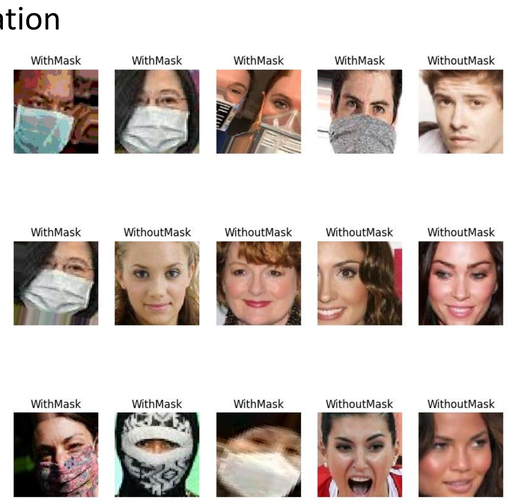
The objective is to develop an efficient and reliable face mask detection system for healthcare settings. To automatically identify whether individuals within the healthcare facility are wearing face masks correctly.



Dataset

This dataset is used for Face Mask Detection Classification with images. The dataset consists of almost 12K images.
This dataset is already divided into three chunks (train, test, validation).
Data preparation:

- Normalization
- Balance
- Shuffle
- Resizing
- split



Literature Review

Paper 1: Real-time Detection with Transfer Learning.

- Detect non-masked faces in public spaces using a combination of detectors.

Paper 2: Efficient Mobile-based Detection with DWS-Based MobileNet.

- Develop an accurate model for quick face mask identification.

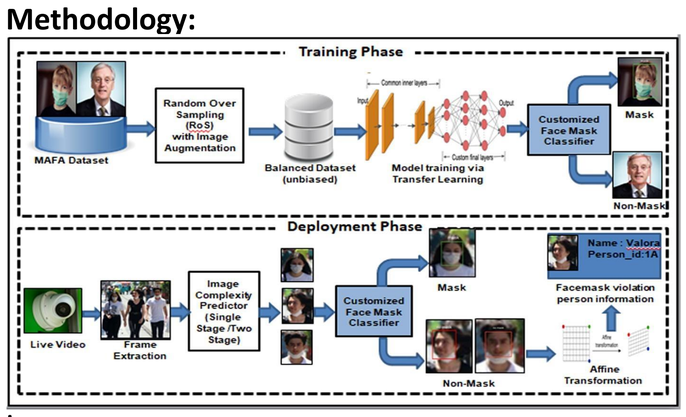
Paper 1

Title: Face mask detection using deep learning an approach to reduce risk of Coronavirus spread.

Objective:

- Combat COVID-19 by emphasizing non-pharmaceutical interventions like mask-wearing.

Methodology:



Results:

- Image Complexity Predictor: Correlation coefficient (τ) of 0.741, demonstrating efficacy in capturing visual difficulty.
- Outperformed Retina Facemask with ResNet50, showing significant accuracy improvements (precision and recall) for both face and mask detection.

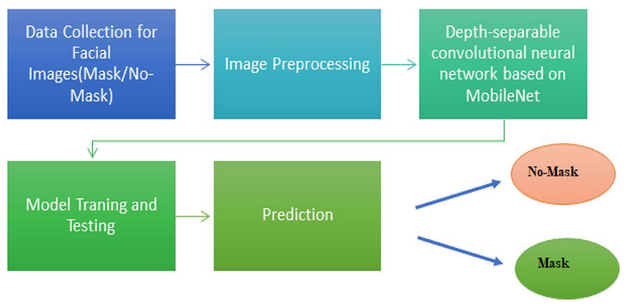
Paper 2

Title: Facial Mask Detection Using DWS-Based MobileNet During COVID-19 Pandemic.

Objectives:

- Develop an efficient face mask detection model during the COVID-19 pandemic.

Methodology:



Results:

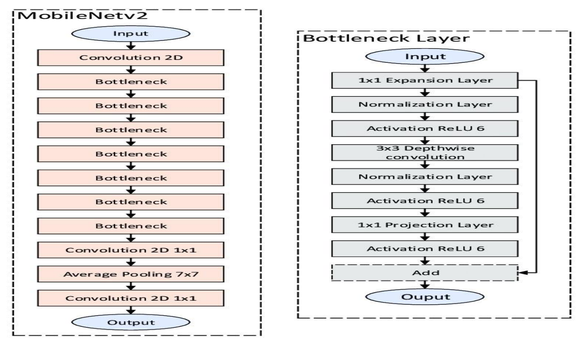
- Performance metrics: Accuracy 93.14%, Precision 92%, Recall 92%, F-score 92%.
- Comparison with other methods highlights significant improvement in face mask detection using Depthwise Separable Convolution-based MobileNet.

Deep learning Model

1- MobileNet

Architecture:

- Sequential API for simplicity.
- MobileNetV2 as base for feature extraction.
- Flatten layer for one-dimensional output.



Dense Layers:

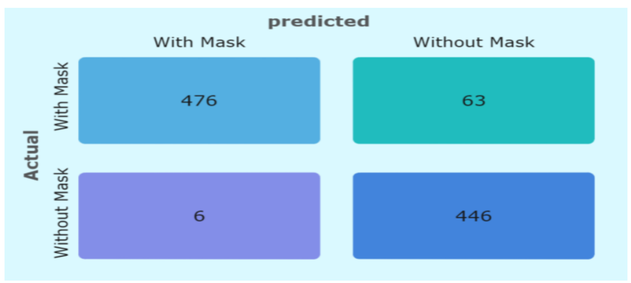
- 128-neuron Dense layer with ReLU activation.

Output Layer:

- 2 neurons, sigmoid activation for binary classification.

Training:

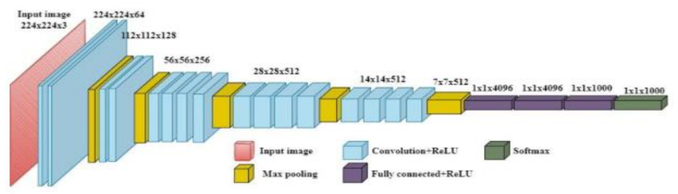
- Data prep and model compilation.
- MobileNetV2 fine-tuned for face mask detection.
- Loss function: Categorical cross entropy.



2-VGG19

Architecture:

- 5 convolutional blocks capture complex features.
- Skipped fully connected layers.
- Output layer: 2 units, sigmoid for binary classification.



Output:

- Flatten layer before Dense.
- Categorical cross-entropy loss.

Training:

- Pre-trained on ImageNet for feature learning.
- Freezed layers except added Dense layer.

Conclusions

	Accuracy	F1 Score	Precision
MobileNet	93%	93%	88%
VGG19	97%	97%	99%
AlexNet	84%	-	-

Team 7

Hesham Tamer
Hassan Hussein
Ziad Ahmed
Mohamed Aziz

References

1. https://www.sciencedirect.com/science/article/pii/S1532046421001775
2. https://www.frontiersin.org/articles/10.3389/fpubh.2022.855254/full