Team: **NS_10**

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Project Repository
https://github.com/ShirazSevadjian/AI-Face-Mask-Detector

Dataset

The dataset that was used for our Convolutional Neural Network (CNN) is built using multiple sources. Our sources for images include Kaggle datasets such as the “face mask detection dataset” by Wobot Intelligence, and google search queries that were then downloaded using the chrome extension “Download All Images”. One example of a query would be searching the keywords “person wearing cloth mask”. Then, the chrome extension is used to download all images of that specific query in a compressed file, and then the appropriate images are selected and put in the corresponding folder.

Furthermore, our dataset consists of a total of 1600 images, divided into 400 images for each type of mask that we need to classify: cloth, surgical, N95, and 400 images of people not wearing any mask. The images are in a folder corresponding to the type of mask it shows, but it does not have any manual distinction between which are for training sets and testing sets. Our classes have no specific resolution to them, but images will later be resized before being evaluated by the CNN.

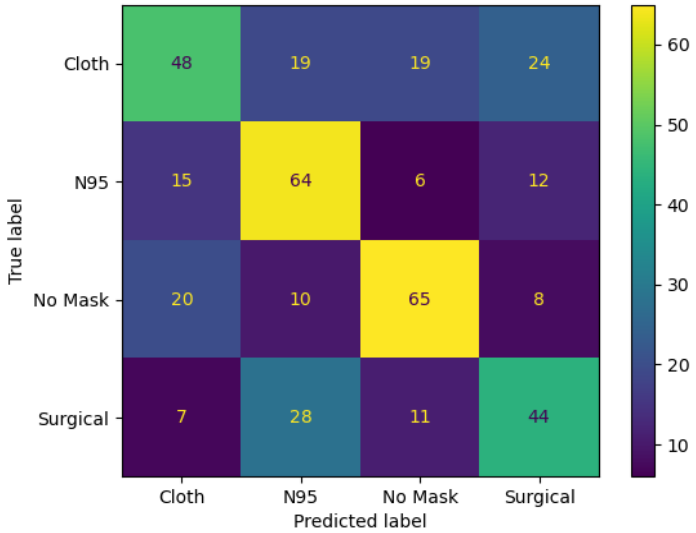
In our pre-processing strategy, the images are resized to 64 pixels in width and 64 pixels in length. Furthermore, a normalization pattern is applied to the images, this normalization consists of a mean and a standard deviation that we calculated for each channel, on the range [-1,1]. This normalization reduces skewness and helps the CNN learn better and quicker; in other words, it increases the overall performance of our network.

CNN Architecture

The CNN was implemented in 3 different versions, the first one with 4 epochs, 15 epochs and 60 epochs. However, across all versions we set a learning rate of 0.001. We decided to train the model in batches of 32 images at the time, giving it ample samples to learn and compare while not overloading it with information. We noticed that across all three versions the performance improved only ever so slightly, about 3% increase in accuracy. We trained the model in one of two ways. First, by iterating through the epochs and for each epoch, train it by making it predict one image at the time. Secondly, we also trained it using the NeuralNetClassifier from the skorch library and the built-in function ".predict()". However, regardless of the method used to train it the results in terms of accuracy were roughly all the same, around 59% to 63%. Furthermore, some suggestions to improve the model would be to train it on smaller batches, around 5 to 10 images per batch with better datasets. An effort to remove biases, we could as well apply random transformations to images such as rotation, grayscale, Horizontal flip, etc. Which could improve the performance of the model significantly.

Evaluation

	Cloth	N95	No Mask	Surgical
Precision	53.33%	52.89%	64.35%	50%
Recall	43.64%	65.98%	63.11%	48.89%
F-score	48%	58.72%	63.73%	49.44%
Accuracy	55.25%			



As shown in the confusion matrix above, we're able to accurately identify 48 cloth masks, 64 N95 masks, 65 with no mask and 44 with surgical masks. This sums up to an overall accuracy of 55.25%. These numbers are subject to change for each run. Our goal for the 2nd phase is to improve the accuracy. We believe that by having more epochs, it will allow the AI to generate more accurate results given the dataset provided. Another area of improvement would be the dataset provided. Certain images that we used in the dataset may have been blurry, small, have multiple people, which would cause the program to give an inaccurate result. We will focus on getting clear and unbiased images that only contain 1 person to have the most accurate dataset/results possible.

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