

Face Mask Detection

ML Project Group Number-18

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Introduction

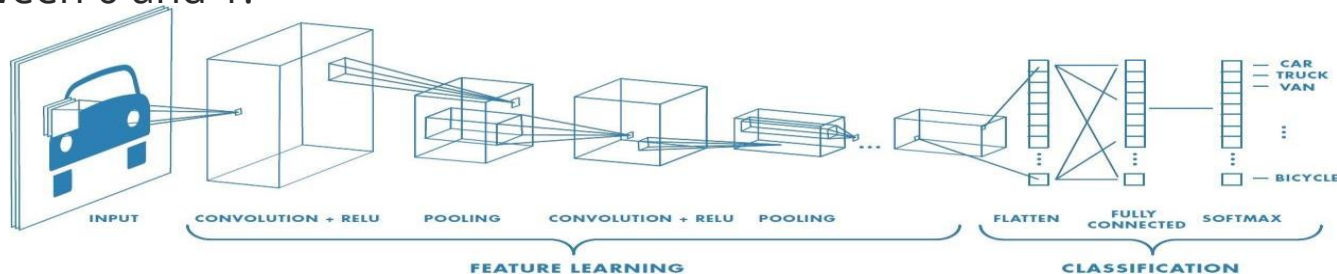
- Digital Sector playing crucial role in transforming health sector.
- Face Mask Detection is used for detecting covid-19 mask in images.
- We have used different approaches for training our model on kaggle dataset - <https://www.kaggle.com/andrewmvd/face-mask-detection>
- Different approaches are CNN-SGD, MLP, SVM and Random Forest algorithm.
- We use deep learning CNN for image classification.

Problem Statement

We have to predict whether a person is wearing a face mask or not and also find the best algorithm which has highest accuracy for our given kaggle dataset.

Convolutional Neural Networks

- In neural networks, Convolutional neural network (ConvNets or CNNs) is one of the main categories to do images recognition, images classifications.
- CNN image classifications takes an input image, process it and classify it under certain categories .
- Deep learning CNN models to train and test, each input image will pass it through a series of convolution layers with filters (Kernels), Pooling, fully connected layers (FC) and apply Softmax function to classify an object with probabilistic values between 0 and 1.



CNNs have an input layer, and output layer, and hidden layers. The hidden layer usually consist of convolutional layers, ReLU layers, pooling layers, and fully connected layers.

- Convolutional layers apply a convolution operation to the input. This passes the information on to the next layer.
- Pooling combines the outputs of clusters of neurons into a single neuron in the next layer.
- Fully connected layers connect every neuron in one layer to every neuron in the next layer.

Proposed Solution Architecture

- Total params: 1,704,839
- Trainable params: 1,704,839
- Non-trainable params: 0

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 298, 298, 16)	448
max_pooling2d (MaxPooling2D)	(None, 149, 149, 16)	0
conv2d_1 (Conv2D)	(None, 147, 147, 32)	4640
max_pooling2d_1 (MaxPooling2D)	(None, 73, 73, 32)	0
conv2d_2 (Conv2D)	(None, 71, 71, 64)	18496
max_pooling2d_2 (MaxPooling2D)	(None, 35, 35, 64)	0
conv2d_3 (Conv2D)	(None, 33, 33, 64)	36928
max_pooling2d_3 (MaxPooling2D)	(None, 16, 16, 64)	0
flatten (Flatten)	(None, 16384)	0
dense (Dense)	(None, 100)	1638500
dropout (Dropout)	(None, 100)	0
dense_1 (Dense)	(None, 56)	5656
dense_2 (Dense)	(None, 3)	171

Parameters Explanation

- **Input Layer:** Input layer has nothing to learn so no learnable parameter.
Thus parameter = 0

m =width , n =height , d =previous layer's filter , k =number of filter

- **CONV layer:** $((m*n*d)+1*k)$
- **POOL Layer:** No learnable parameter as all it does is calculate a specific number. So number of parameter = 0

C = current layer neurons , p = previous layer neurons

- **Fully Connected Layer:** $(C*(p+1))$

Dataset

We have dataset from kaggle in which 853 images are present. The 853 images belonging to 3 classes.

These classes are

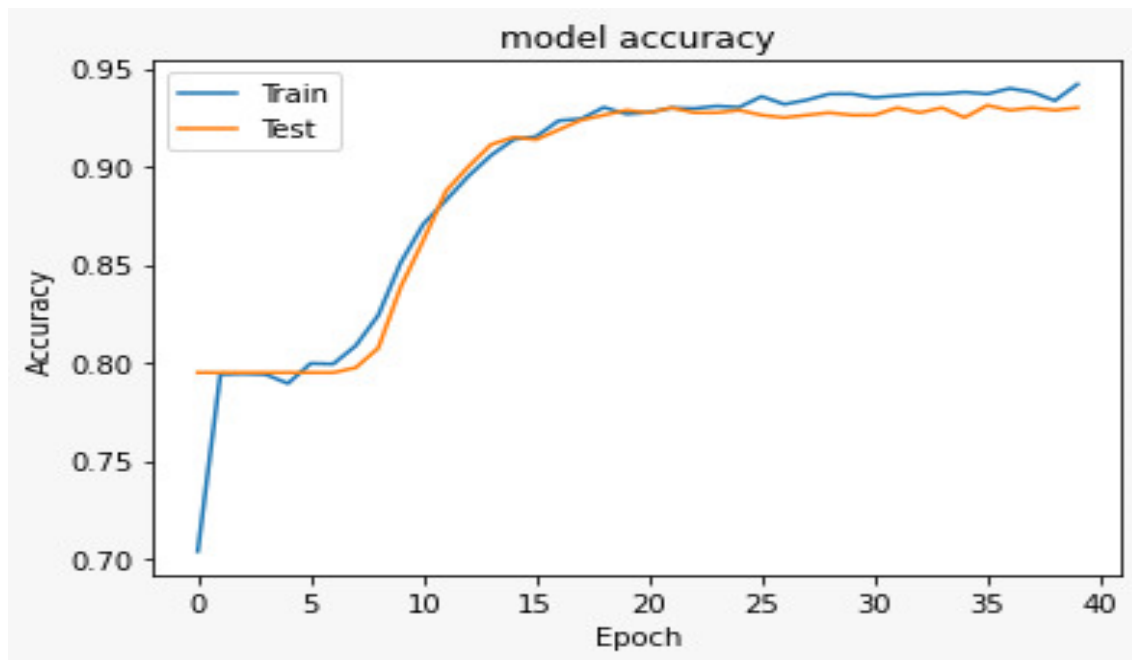
1. With_mask
2. Without_mask
3. Mask worn incorrectly.

Experimental Analysis

We have compared our approach to other approaches on the same dataset and the result as follows :

MODEL	Accuracy(approx)
Multilayer Perceptron	93.86%
SVM	93.6196%
Random Forest	93.9877%
CNN	94.3%

Graph



Limitation of the ML Model

- MLP, SVM and Random Forest algorithm is not feasible for higher pixels values.
- CNN is bit slow while Running Code.

Conclusion

This deep learning model to detect if a person is wearing a mask or not. The aim of this work is to ensure the use of mask to stop the spread of deadly Coronavirus . The model contains a face detection algorithm using a Convolution Neural Network which detects face mask with an accuracy of 94.3%. The proposed model will help to identify people not wearing mask and ensure safety from COVID-19

Contribution

Amar Kumar- Code Implementation, Slide Making, Research Paper Reading

Deepak Kumar Yadav - Report Making, Research Paper Reading, Slide Making, Helped in Code Implementation

Dwarka Prasad Bairwa: Architecture Proposed

Saksham Tomar : Research , Slide Making, Report Making , Literature Reading.

Sanchit Kumar: Code Implementation , Slide Making , Result Analysis in Report, Literature Reading

Utkarsh Mishra: Research, Report making, Literature Reading, slide making.

**Thank
You**