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Paper Details

Paper citation

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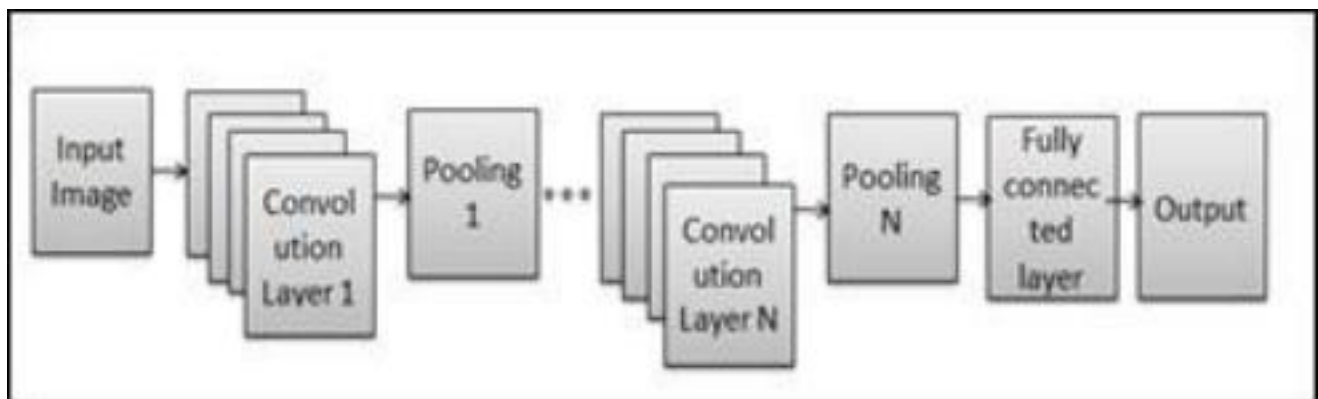4. Year of Publication   : 9 Sep 2020

The Dataset Used

- The dataset contains different types of objects like dogs ,
  Cars , Fruits and persons.

The Implemented Algorithm

Architecture of CNN Model

    A. Input Image.
    B. Convolution Layer.
    C. Pooling Layer.
    D. Fully Connected Layer.

Basic Architecture of CNN

A. Input image

- The input image is the image given to the model to check the
output by performing various functions on it. It is given to the
block named as convolution layer.

B. Convolution Layer

- Convolution is the first layer to extract features from the given input image. Convolution restores the relationship between pixels by learning image features using small squares of input data. It is a mathematical operation which takes two inputs such as image matrix and a filter.

C. Pooling Layer

- The section of pooling layers reduces the number of parameters when the images are too large. Spatial pooling is also called subsampling or down sampling that reduces the dimensionality of each map Without Changing important information. Spatial pooling can be of The different types:
1) Max Pooling
2) Average Pooling
3) Sum Pooling

Max pooling take the largest element from the rectified feature map. Taking the largest element could also take the average pooling. Sum of all elements in the feature map call as sum pooling.

Fig.6 Pooling
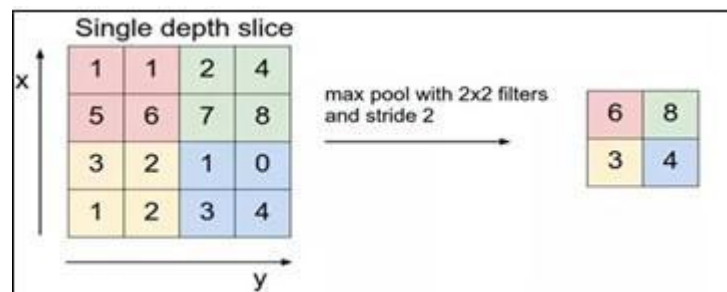
D. Fully Connected Layer

- The layer we call as FC layer, we flattened our matrix into a vector and feed it into a fully connected layer like a neural network.

-The fully connected layer combines all the features together to create a model. Finally an activation function such as softmax or sigmoid is used to classify the outputs as cat, dog, car, truck etc.

Fig. After pooling layer, flattened as FC
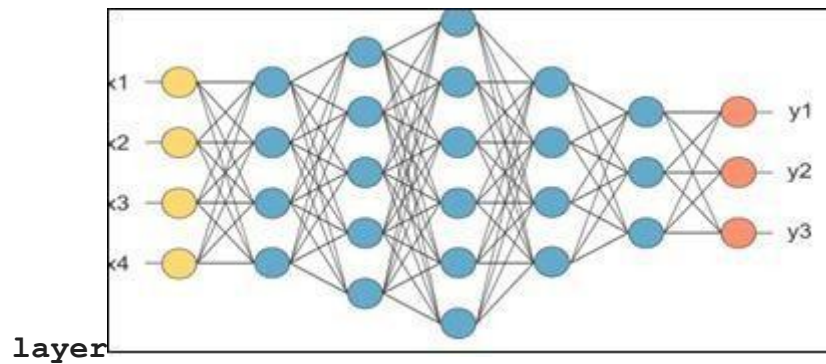
layer

E. Output

- The output image provides the result of the model. On the basis of the fully connected layer the output is carried out.
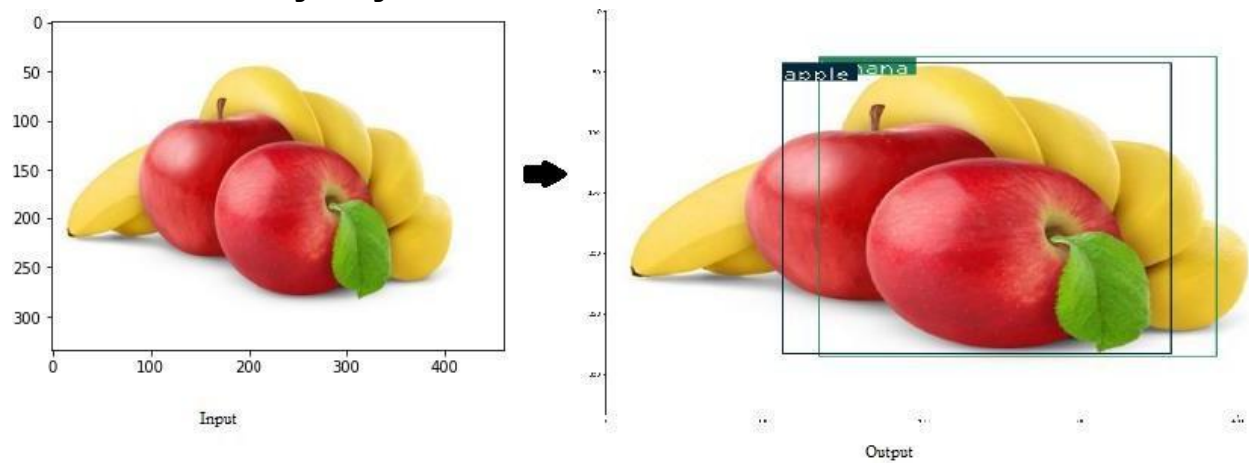
F. Result

The performance of a model for object detection is evaluated using the precision and recall across each of the best matching bounding boxes for the known objects in the image.

Fig.5 Object Detection result in case of animals

Input

Output
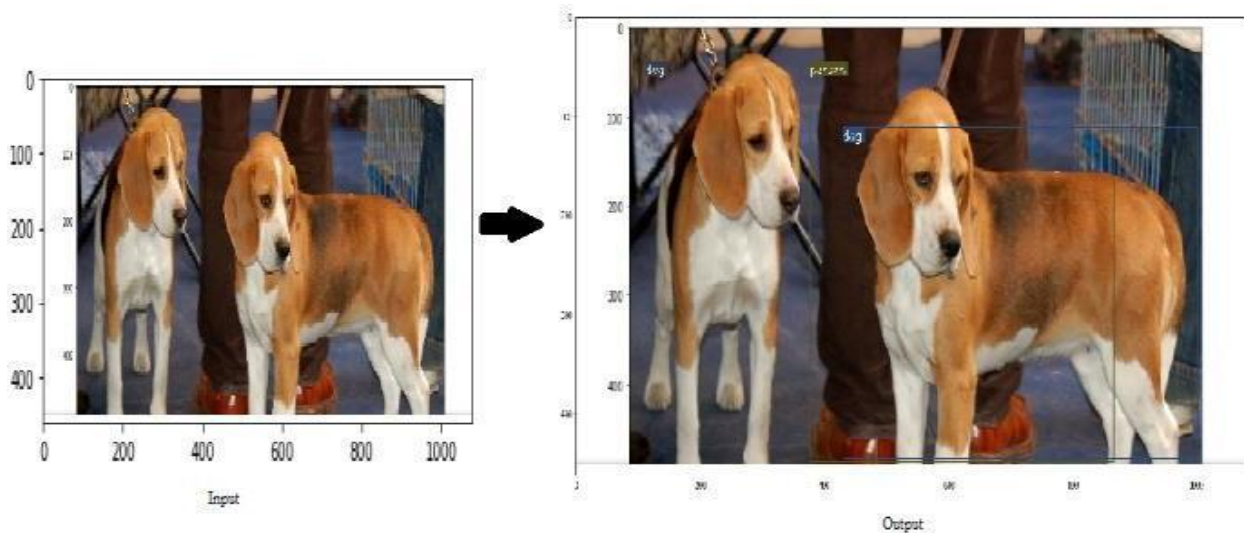
Fig. Object Detection result in case of animals

Fig. Object Detection result in case of fruits

Fig. Object Detection result in case of vehicles

Project Documentation

General Information on the selected dataset :

- Dataset Name : Face Mask Detection
- Dataset Link : [Mask DataSet Link](#)
- The dataset has 3829 image separated into two distinct categories:
  - With mask (1894)
  - Without mask (1935)
- The dimension of images is (224,224,3)

Implementation details :

The ratio used for training, validation, and testing

	Training	Testing	Validation
Ratio	65%	20%	10%
Number of Images	2464 image	617 image	760 image

Block Diagram of implemented model :

Input   Convolution (Feature maps)   Max-pooling   Fully Connected   Output
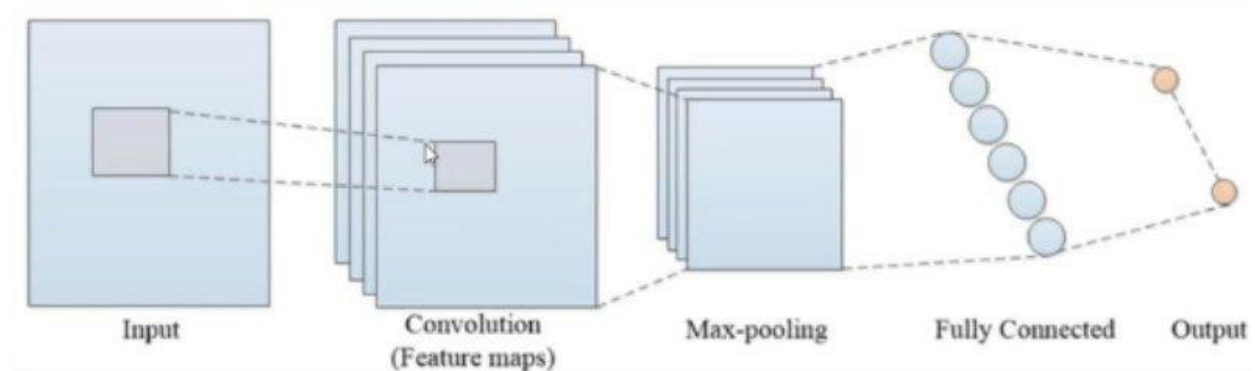
Hyperparameter :

- INIT_LEARNING_RATE = 1e-4
- EBOCHS = 20
- BATCH_SIZE =32
- ImageDataGenerator(
    Rotation_range   = 20,
    Zoom_range   = 0.15,
    Width_shift_range   = 0.2,
    Height_shift_range   = 0.2,
    Shear_range   = 0.15,
    Horizontal_flip   = True,
    Fill_mode   = "nearest"
)
- We perform on hot encoding on Labels
- We perform relue activation function on input layer
- We perform softmax activation function on output layer
- Steps_per_epoch = length of train / BATCH_SIZE
- Validation_steps = length of test / BATCH_SIZE

Results Details:

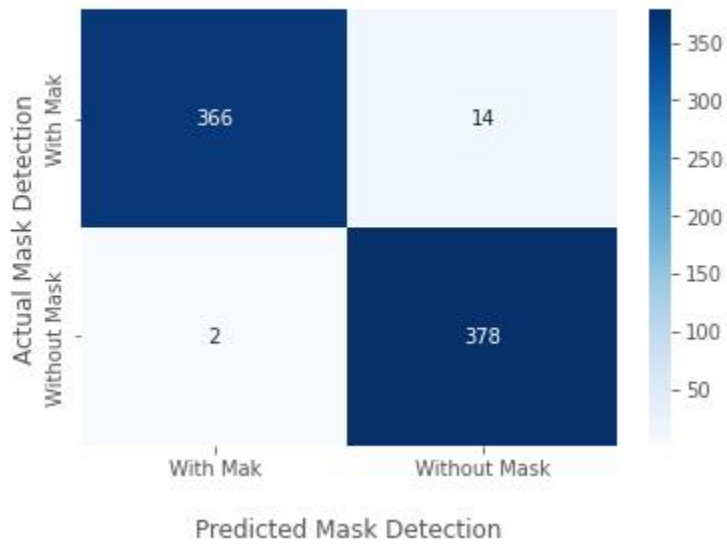# Model Accuracy

- Loss   : 0.07
- Accuracy   : 97.76 %
- Validation Accuracy : 98.2 %
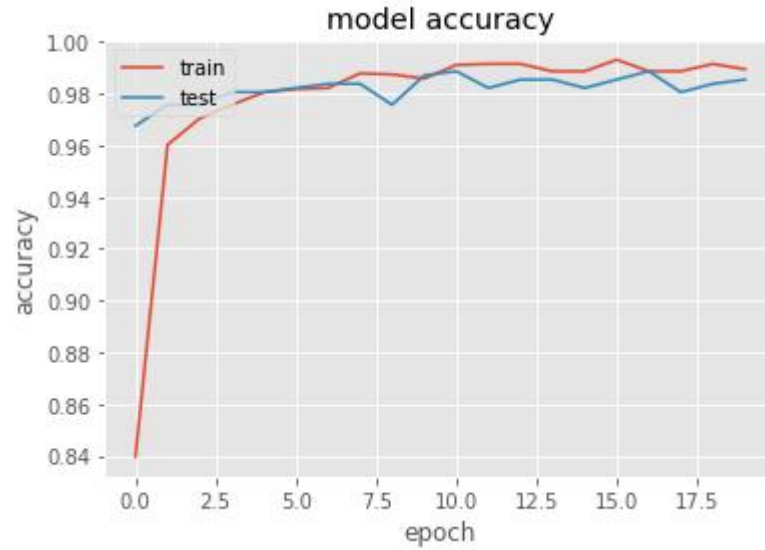- Test Accuracy   : 97.89 %

Confusion Matrix of Testing

Face Mask Detection Confusion Matrix with labels
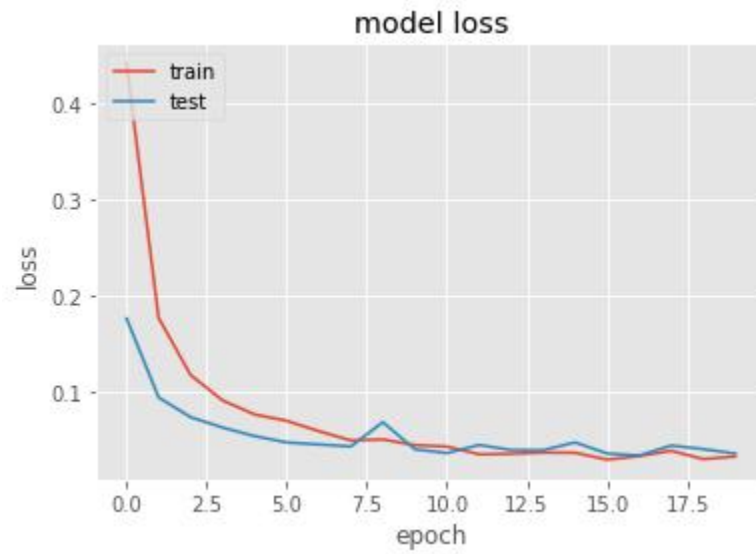

Accuracy Curve of Testing

Loss Curve of Testing

model loss

Roc Curve of Testing

ROC