META SCIFOR TECHNOLOGIES, BANGALORE.

AI INTERN

MAJOR PROJECT
REPORT

(FACE MASK DETECTION PROJECT)

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CONTENT

1) PROBLEM STATEMENT

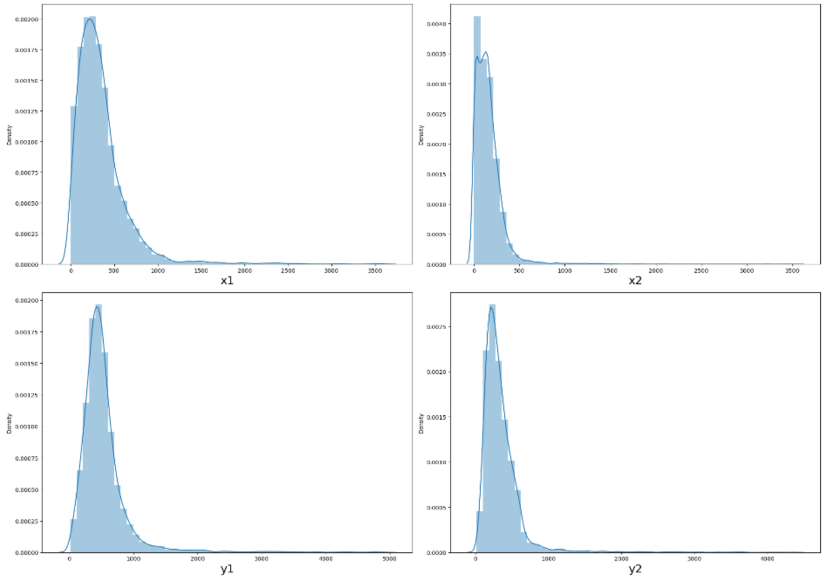
Project Title: Face Mask Detection with Machine Learning

Objective: The goal of this project is to develop a machine learning model to accurately detect whether individuals are wearing face masks in images. This is particularly relevant in contexts where mask-wearing compliance is essential, such as in public health scenarios.

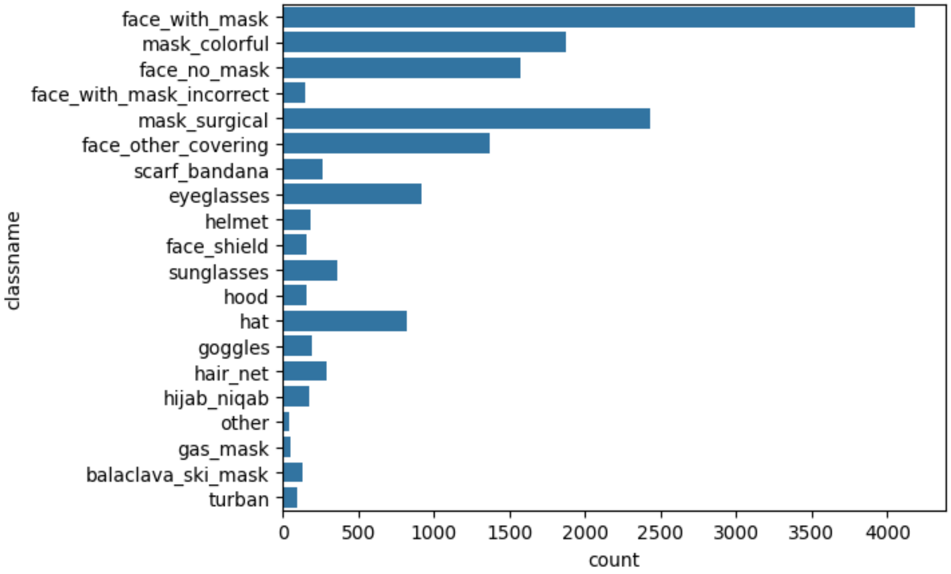
Project Description: In this project, students will leverage machine learning techniques to build and train a model for face mask detection. The project will involve collecting and preparing data, selecting appropriate algorithms, training the model, and evaluating its performance. The final deliverable will be a model capable of classifying images into categories of "masked" and "unmasked."

2) DATA COLLECTION

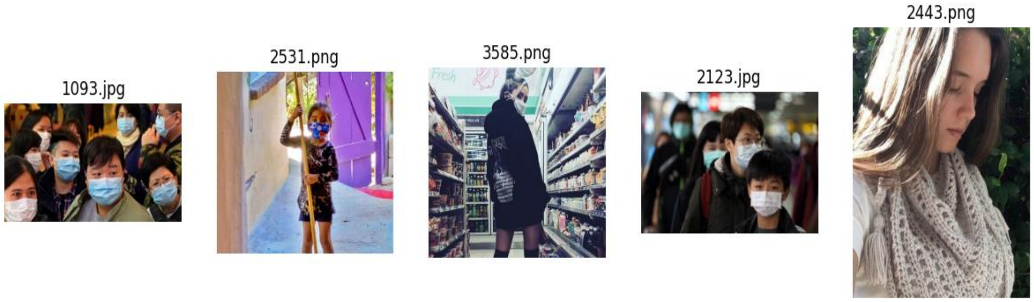
- Loading the Face Mask Detection Dataset, which includes images of both masked and unmasked faces from the Kaggle website.
- Accessing the google drive to load the data.
- Using zipfile function for extracting the dataset.
- The zipfile consists of train.csv, submission.csv, medical masks such as images and annotations.
- Import the Necessary Libraries Numpy, Pandas, Data Visualization libraries such as Matplotlib, Seaborn and Machine Learning Libraries such as Scikit-learn, train_test_split for splitting the dataset as training set and testing set for Model Training, and Classification metrics such as accuracy score, Confusion metrics, ROC AUC curve, Keras and Tensorflow for Model Training.
- Loading the train.csv, submission.csv, image directory and annotation directory and explore.
- Check the null or missing values by data.describe() function.
- Impute the missing values with the mean values of the respective continuous features



- Visualize the classname from train.csv



- Load the sample images, Loading the first 5 annotations by json open.



- Contents of 6238.jpg.json:

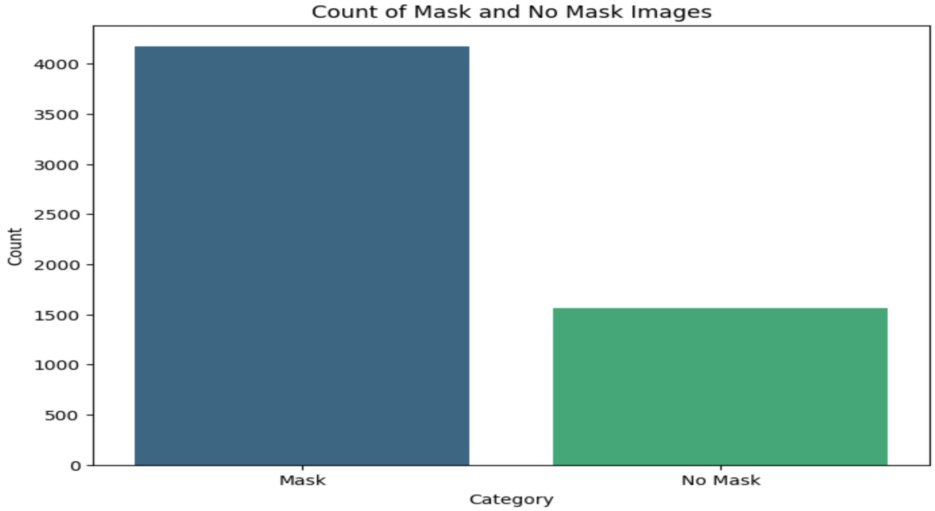
```
{

  "FileName": "6238.jpg",

   "NumOfAnno": 1,
   "Annotations": [
      {
         "isProtected": false,
         "ID": 542400505668348608,
         "BoundingBox": [
            244,
            80,
            572,
            511
         ],
         "classname": "face_no_mask",
         "Confidence": 1,
         "Attributes": {}
      }
}
```

3) DATA PREPROCESSING

- Preprocess the data with Image directory, annotation directory with train.csv dataset to predict the class as mask and without mask.
- Plot the count for mask and No mask.



- Split the data into X and y as numpy arrays, perform train_test_split function with test size 0.2, check the training and testing set shape.

4) MODEL SELECTION

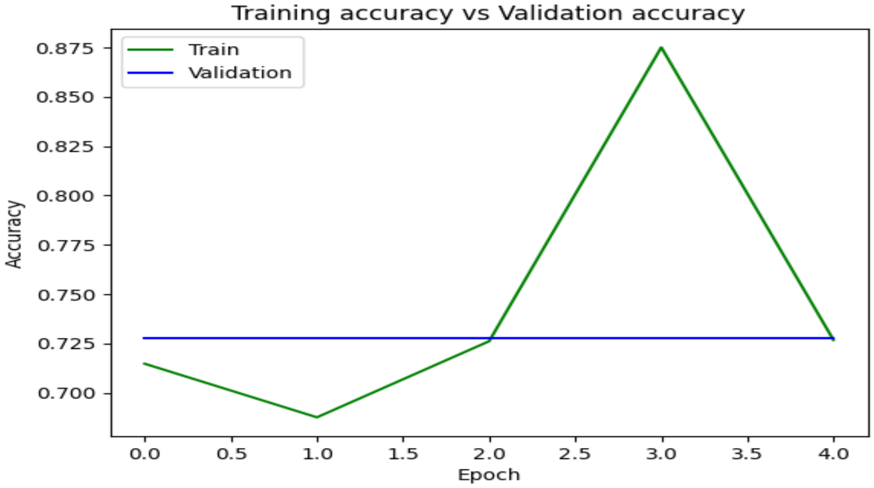
- AlexNet model architecture were used for model training, in the model architecture we have 5 convolutional layers with kernal size of one 11x11, one 5x5 and three 3x3, with activation function relu and same padding, with the input size of 227,227,3.
- We have used three maxpooling layers with pool size (2,2), strides with(2,2).
- We flatten the layer from 2D to 1D for Multi Layer perceptron, we have 2 hidden layers with 4096 neurons with the 'relu' activation function, we use regularization as dropout(0.5)
- As output layer we have 2 classes, activation layer as 'Sigmoid.

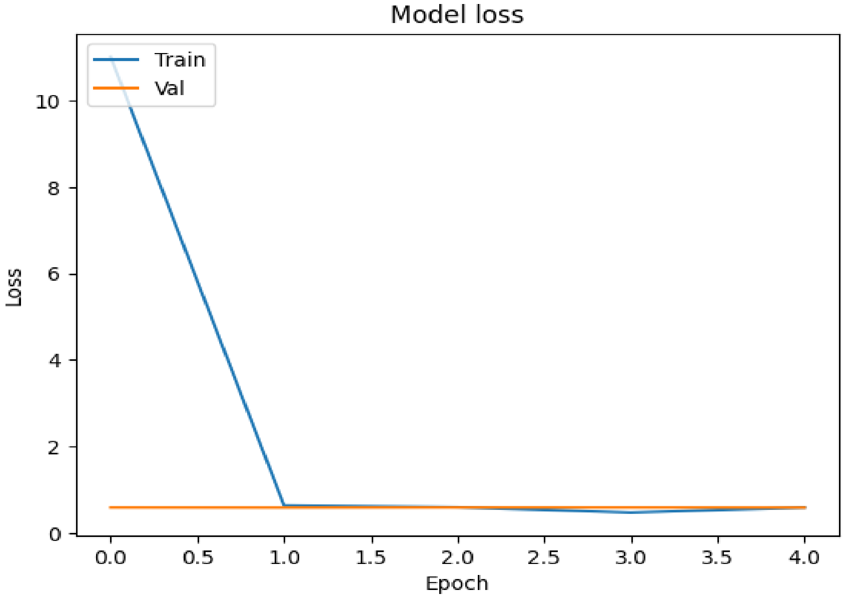
5)MODEL TRAINING

- We compile the model with adam optimizer, loss as binary cross entropy and metrics with accuracy.
- Then generate image with image generator with Horizontal flip, rotation range of 15 perform with X_train.
- Trained the model with 5 epochs with batch size of 32, train generator with X_train, y_train, validation generator with X_test and y_test, steps per epoch calculated with shape of one X_train variable with divide with batch size.

6)MODEL EVALUATION

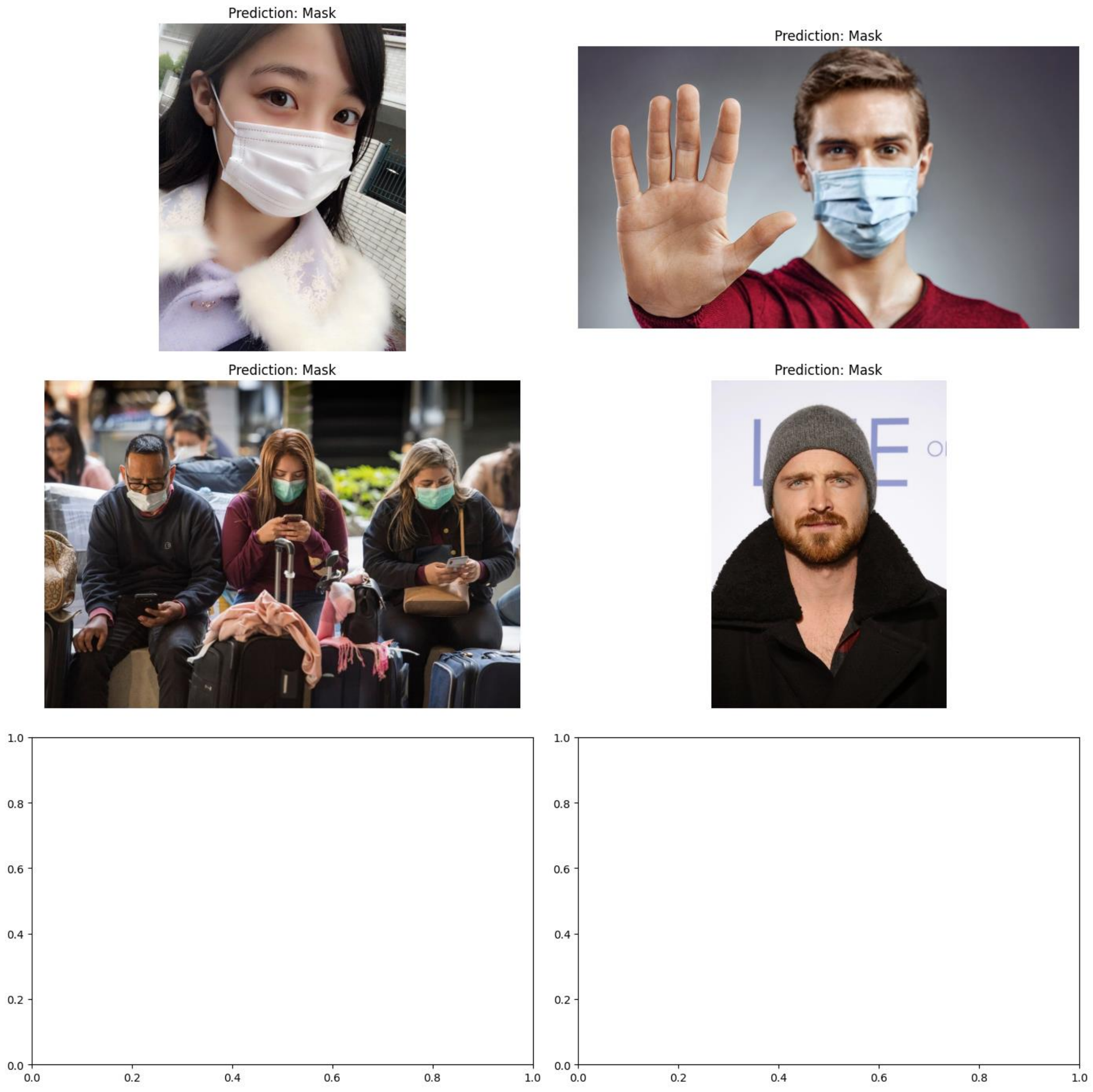
- We have training accuracy of 71% , validation accuracy of 72% .
- We have training loss 0.59 and testing loss with 0.58.





7)TEST IMAGES

- We test the model with submission.csv with random images



Prediction: Mask

Prediction: Mask

Prediction: Mask

Prediction: Mask