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IMAGE ANALYSIS AND COMPUTER VISION
(CS898BA)   FINAL PROJECT

RESULTS:
A deep learning classifier (CNN) is deployed on the pizza-non-pizza dataset that aims to classify if an image is a pizza or not a pizza
The accuracies obtained for CNN are:

```
Train accuracy: 0.8001453280448914
Validation accuracy: 0.7823129296302795
Test accuracy: 0.7466216087341309
```

```
F1 score value for cnn:  0.58892128279883339
Precision value for cnn:  0.517948717948718
Recall value for cnn:  0.6824324324324325
```

ANALYSIS:
We can observe that the test accuracy is 74% for the cnn model built with 12 layers where in 8 layers are convolutional layers with pooling layers and 4 layers are fully connected layers with the last layer being the output layer with an activation function "sigmoid" for the binary classification. Looking at the training,validation and test accuracies together we can observe that the CNN model is not much overfitted or under-fitted making the model closer to an ideal one. This accuracy can be credited to the image preprocessing done by using imagedata generators in the first step of modeling. Image data generators help models understand images better and make them more robust.
Now to extract the features from the validation dataset using one of the fully connected layers in the CNN model created, we consider a fully connected layer with 400 units.

```python
Dense(400, activation='relu'),
Dense(512, activation='relu'),
Dense(1, activation='sigmoid') #output layer(sigmoid is used for binary classification)
```

The new train dataset has the features extracted from the validation dataset of the original dataset extracted from this fully connected layer. After deploying linear and non linear SVMs and checking their accuracies,the accuracy of non linear SVM with "rbf" kernel gave better results than the linear one.The non linear svm is trained on the new dataset and the model is tested on the test dataset that is extracted from the test data using the same fully connected layer just like the train set and as asked in the question.

```
Test accuracy 0.5675675675675675
f1score 0.5428571428571428
recall 0.5135135135135135
```

The loss in accuracy can be because of loss of information due to extracted features,inappropriate hyperparameters in SVM or the SVM may not be able to capture the complexity of the data,or the features extracted may not bewell suited the SVM classification task.In conclusion, the CNN did well on the dataset I chose with 74% accuracy while the non-linear svm acquired only 56% accuracy. Even taking f1score and recall into consideration, CNN's performance is better than SVM.