Assignment-1

Naïve Bayes Classifier

CS 412 Introduction to Machine Learning

Problem Statement

In this problem, we will attempt to identify spam or ham SMS messages using the naive Bayes model.

(a) Randomly split the messages into a training set D1 (80% of messages) and a testing set D2 (20% of messages). Calculate the testing accuracy, confusion matrix, precision, recall, and F-score of the Naïve Bayes classifier in determining whether a message is spam or ham.
Note: Let's assume that spam is the positive class.

(b) How does the change of alpha affect the classifier performance? Using random split above, evaluate the training and test accuracy and F-score under different selections of alpha. The selection of alpha values are 2i where i = -5; _ _ _ ; 0. Create two plots, the first plot is for the accuracy measure and the second plot is for F-score. In each plot, x-axis represents i, and y-axis represents the performance measure (accuracy/F-score). Each plot contains two line chart, a line chart describing training accuracy/F-score measure, the other line chart is for test accuracy/F-score.

Methodology Used

- The data is imported and preprocessed by converting to lowercase and removing the punctuations.
- The data is split into training and test data, and the words in each message are tokenized.
- A list of spam words and a list of ham words is formed.
- Count of each words given its label is spam/ham is calculated.
- Prior probability of each class is calculated.
- Find the posterior probability of each word in the test message using all of the calculated data and determine its class (spam/ham).

Steps used to run the program

- Install Python 3.x
- Download all the necessary packages
- Add “SpamClassifier.py” and the dataset in the same directory.
- Run the program in the terminal by invoking the Python interpreter manually as follows :

  python SpamClassifier.py

- To test some other dataset, replace the test_data in the for loop where preds is getting calculated with the dataset’s name and it has to be in .csv format.

Result

```
(a)
_____________Naive_Bayes_Classifier_____________
Accuracy =  0.9829596412556054
Precision =  0.9615384615384616
Recall =  0.8992805755395683
F-score =  0.929368029739777
```

(b)