ML LAB ASSIGNMENT 5 BC61

Classify the email using the binary classification method. Email Spam detection has two states: a) Normal State – Not Spam, b) Abnormal State – Spam. Use K-Nearest Neighbors and Support Vector Machine for classification. Analyze their performance. Dataset link: The emails.csv dataset on the Kaggle https://www.kaggle.com/datasets/balaka18/email-spam-classification-dataset-csv

```
# for dataframe operations and plots

import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline

# for model operations and data splitting
import warnings
warnings.filterwarnings('ignore')
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn import metrics
```

+ Code + Text

```
# reading the dataset
df=pd.read_csv('/content/emails.csv')
```

```
df.shape
```

```
(5172, 3002)
```

```
df.head()
```

	Email No.	the	to	ect	and	for	of	a	you	hou	...	connevey	jay	valued	lay	infrastructure	military	allowing	ff	dry
0	Email 1	0	0	1	0	0	0	2	0	0	...	0	0	0	0	0	0	0	0	0
1	Email 2	8	13	24	6	6	2	102	1	27	...	0	0	0	0	0	0	0	1	0
2	Email 3	0	0	1	0	0	0	8	0	0	...	0	0	0	0	0	0	0	0	0
3	Email 4	0	5	22	0	5	1	51	2	10	...	0	0	0	0	0	0	0	0	0
4	Email 5	7	6	17	1	5	2	57	0	9	...	0	0	0	0	0	0	0	1	0

5 rows × 3002 columns

```
df.columns
```

```
Index(['Email No.', 'the', 'to', 'ect', 'and', 'for', 'of', 'a', 'you', 'hou',
       ...
       'connevey', 'jay', 'valued', 'lay', 'infrastructure', 'military',
       'allowing', 'ff', 'dry', 'Prediction'],
      dtype='object', length=3002)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5172 entries, 0 to 5171
Columns: 3002 entries, Email No. to Prediction
dtypes: int64(3001), object(1)
memory usage: 118.5+ MB
```

```
# count of null values
df.isnull().sum()
```

```
Email No.     0
the           0
to            0
ect           0
and           0
             ..
military      0
allowing      0
ff            0
dry           0
Prediction    0
Length: 3002, dtype: int64
```

```
# Dropping not required columns
df.drop(['Email No.'],axis=1,inplace=True)
```

```
# copying into dataframes for splitting
X = df.drop(['Prediction'],axis = 1)
y = df['Prediction']


from sklearn.preprocessing import scale
X = scale(X)
# split into train and test for model training
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.3, random_state = 42)


# training the model with neighbor count = 6
from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier(n_neighbors=6)

knn.fit(X_train, y_train)
y_pred = knn.predict(X_test)


print("Prediction",y_pred)
```

```
Prediction [0 0 1 ... 0 1 1]
```

```
# accuracy socre for KNN
print("KNN accuracy = ",metrics.accuracy_score(y_test,y_pred))
```

```
KNN accuracy =  0.8337628865979382
```

```
print("Confusion matrix",metrics.confusion_matrix(y_test,y_pred))
```

```
Confusion matrix [[867 230]
 [ 28 427]]
```

```
# cost C = 1 for SVC model
model = SVC(C = 1)

# fit
model.fit(X_train, y_train)

# predict
y_pred = model.predict(X_test)


metrics.confusion_matrix(y_true=y_test, y_pred=y_pred)
```

```
array([[1091,    6],
       [  90,  365]])
```

```
# score for SVC model
print("SVM accuracy = ",metrics.accuracy_score(y_test,y_pred))
```

```
SVM accuracy =  0.9381443298969072
```

SVM's accuracy is greater than that of KNN's accuracy, with different combinations of cost value and neighbours values , the result might be different.

SVM outperforms KNN as SVM models are able to handle high-dimensional data, learn non-linear relationships, and are less prone to overfitting.