YASH DHUMAL 14369 C3 BATCH

In [1]:
```
import pandas as pd
```

In [2]:
```
df = pd.read_csv("emails.csv")
```

In [3]:
```
df.shape
```

Out[3]:
```
(5172, 3002)
```

In [4]:
```
df.head()
```

Out[4]:

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

5 rows × 3002 columns

In [5]:
```
x= df.drop(['Email No.','Prediction'],axis =1)
y= df['Prediction']
```

In [6]:
```
x.shape
```

Out[6]:
```
(5172, 3000)
```

In [7]:
```
x.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5172 entries, 0 to 5171
Columns: 3000 entries, the to dry
dtypes: int64(3000)
memory usage: 118.4 MB
```

In [8]:
```
x.dtypes
```

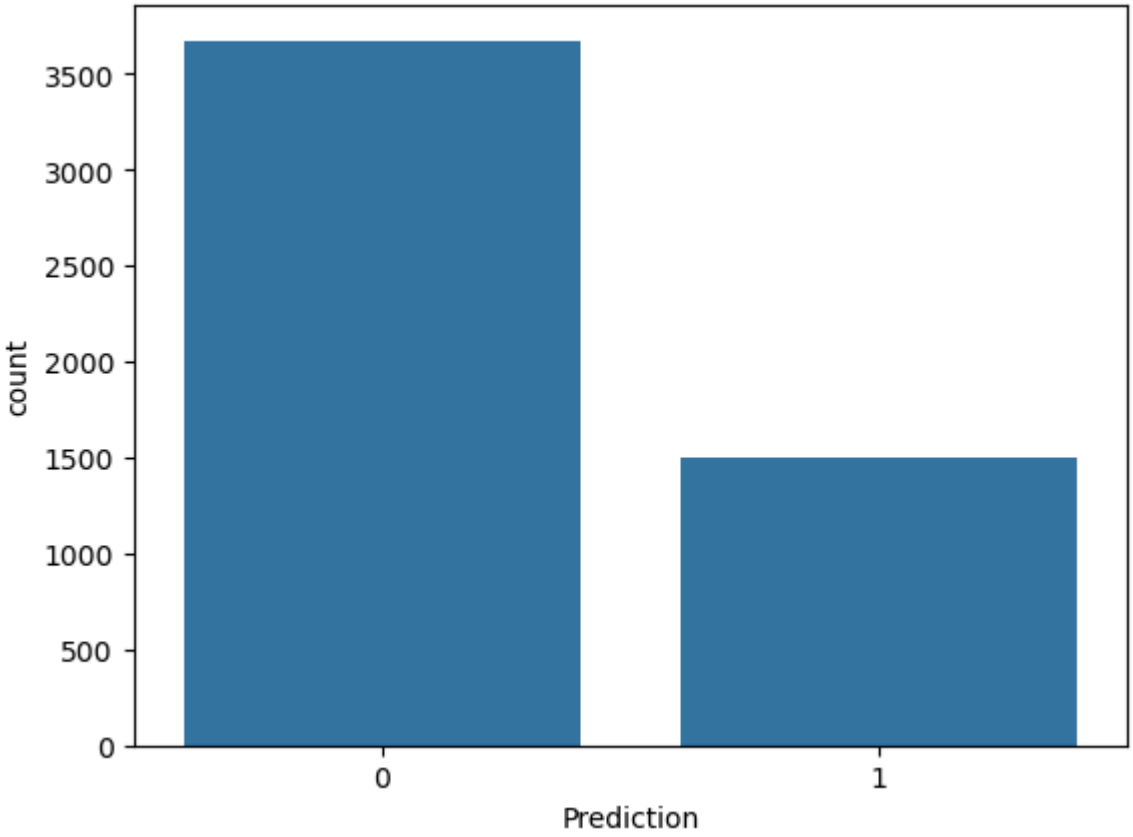
Out[8]:
```
the               int64
to                int64
ect               int64
and               int64
for               int64
                  ...
infrastructure    int64
military          int64
allowing          int64
ff                int64
dry               int64
Length: 3000, dtype: object
```

In [9]:
```
set(x.dtypes)
```

Out[9]:
```
{dtype('int64')}
```

In [10]:
```
import seaborn as sns
sns.countplot(x=y)
```

Out[10]:
```
<Axes: xlabel='Prediction', ylabel='count'>
```



In [12]:
```
y.value_counts()
```

Out[12]:
```
Prediction
0    3672
1    1500
Name: count, dtype: int64
```

In [13]:
```
from sklearn.preprocessing import MinMaxScaler
scaler= MinMaxScaler()
x_scaled = scaler.fit_transform(x)
```

In [14]:
```
x_scaled
```

Out[14]:
```
array([[0.        , 0.        , 0.        , ..., 0.        , 0.        ,
        0.        ],
       [0.03809524, 0.09848485, 0.06705539, ..., 0.        , 0.00877193,
        0.        ],
       [0.        , 0.        , 0.        , ..., 0.        , 0.        ,
        0.        ],
       ...,
       [0.        , 0.        , 0.        , ..., 0.        , 0.        ,
        0.        ],
       [0.00952381, 0.0530303 , 0.        , ..., 0.        , 0.00877193,
        0.        ],
       [0.1047619 , 0.18181818, 0.01166181, ..., 0.        , 0.        ,
        0.        ]])
```

In [27]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x_scaled,y,random_state=0, test
```

In [28]:
```
x_scaled.shape
```

Out[28]:
```
(5172, 3000)
```

In [29]:
```
x_train.shape
```

Out[29]:
```
(3620, 3000)
```

In [33]:
```
x_test.shape
```

Out[33]:
```
(1552, 3000)
```

In [34]:
```
from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier(n_neighbors = 5)
knn.fit(X_train, y_train)
```

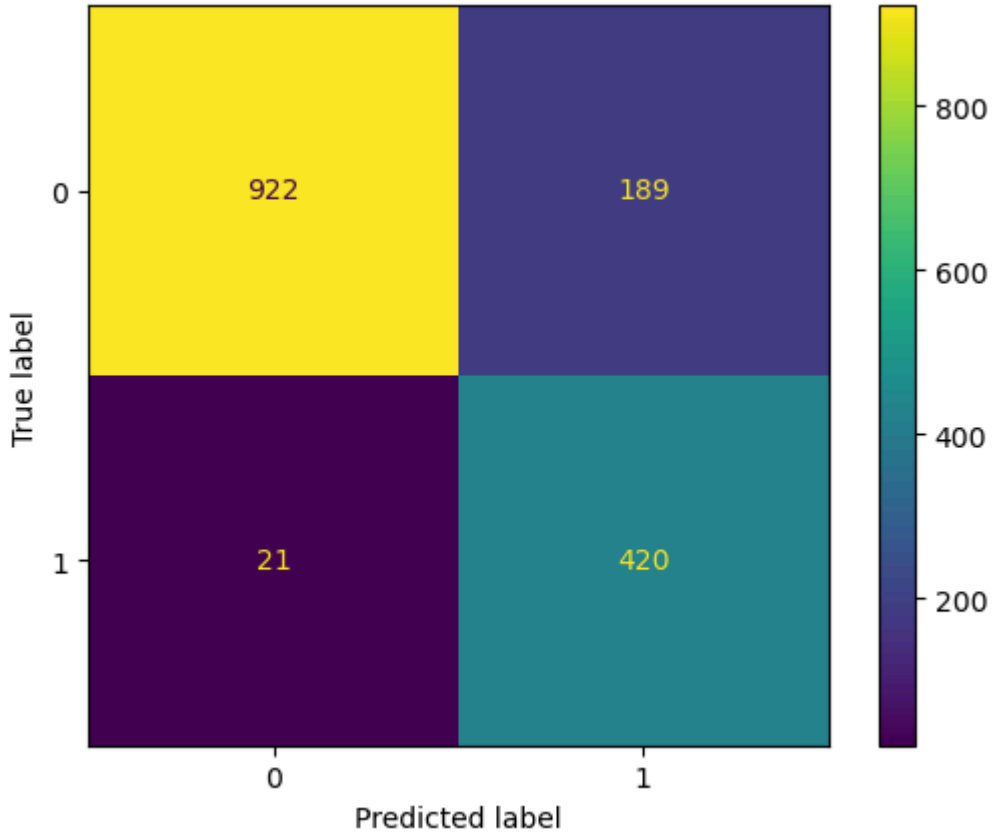
Out[34]:
```
▾ KNeighborsClassifier
KNeighborsClassifier()
```

In [35]:
```
y_pred=knn.predict(X_test)
```

In [36]:
```
from sklearn.metrics import ConfusionMatrixDisplay,accuracy_score,classification_re
```

In [37]:
```
ConfusionMatrixDisplay.from_predictions(y_test, y_pred)
```

Out[37]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x1c147ddab70>
```



In [38]:
```
y_test.value_counts()
```

Out[38]:
```
Prediction
0    1111
1     441
Name: count, dtype: int64
```

In [39]:
```
accuracy_score(y_test, y_pred)
```

Out[39]:
```
0.8646907216494846
```

In [41]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.98      0.83      0.90      1111
           1       0.69      0.95      0.80       441

    accuracy                           0.86      1552
   macro avg       0.83      0.89      0.85      1552
weighted avg       0.90      0.86      0.87      1552
```

In [42]:
```
import numpy as np
import matplotlib.pyplot as plt
```

In [43]:
```
error =[]
for k in range(1,41):
    knn = KNeighborsClassifier(n_neighbors =k)
    knn.fit(X_train, y_train)
    y_pred = knn.predict(X_test)
    error.append(np.mean(y_pred !=y_test))
```

In [44]:
```
error
```

Out[44]:
```
[0.10824742268041238,
 0.10502577319587629,
 0.11855670103092783,
 0.11082474226804123,
 0.13530927835051546,
 0.12886597938144329,
 0.15914948453608246,
 0.15528350515463918,
 0.17719072164948454,
 0.17010309278350516,
 0.19974226804123713,
 0.19652061855670103,
 0.21520618556701032,
 0.21198453608247422,
 0.22809278350515463,
 0.22551546391752578,
 0.23904639175257733,
 0.23646907216494845,
 0.2538659793814433,
 0.25193298969072164,
 0.2654639175257732,
 0.26417525773195877,
 0.27448453608247425,
 0.27512886597938147,
 0.28865979381443296,
 0.2867268041237113,
 0.3015463917525773,
 0.3002577319587629,
 0.3086340206185567,
 0.30605670103092786,
 0.3131443298969072,
 0.3125,
 0.31894329896907214,
 0.3176546391752577,
 0.32989690721649484,
 0.3279639175257732,
 0.33634020618556704,
 0.33505154639175255,
 0.34085051546391754,
 0.3389175257731959]
```

In [45]:
```
knn = KNeighborsClassifier(n_neighbors =1)
knn.fit(X_train, y_train)
```

Out[45]:
```
KNeighborsClassifier
KNeighborsClassifier(n_neighbors=1)
```

In [46]:
```
y_pred = knn.predict(X_test)
```

In [47]:
```
accuracy_score(y_test, y_pred)
```

Out[47]:
```
0.8917525773195877
```

In [50]:
```
from sklearn.svm import SVC
svm = SVC(kernel = 'linear')
svm.fit(X_train, y_train)
```

Out[50]:

```
SVC
SVC(kernel='linear')
```

In [51]:

```
y_pred = svm.predict(X_test)
```

In [52]:

```
accuracy_score(y_test, y_pred)
```

Out[52]:

```
0.9755154639175257
```