K-nearest neighbors (KNN) - TF-IDF - L1

May 7, 2024

1 Initialization

Connect to Google Drive:

[ ]:

```
# from google.colab import drive
# drive.mount('/content/drive')

# %cd '/content/drive/MyDrive/GitHub/emotion-dectection-from-text'
```

Preparing necessary packages:

[ ]:

```
import numpy as np
import matplotlib.pyplot as plt

from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import accuracy_score
from joblib import dump, load

from preset_function import evaluate_model, draw_learning_curve,␣
 ↪load_processed_data

X_train_bow, X_test_bow, X_train_tfidf, X_test_tfidf, X_train_bow_L1,␣
 ↪X_test_bow_L1, X_train_tfidf_L1, X_test_tfidf_L1 =␣
 ↪load_processed_data('input')

y_train, y_test = load_processed_data('output')

%matplotlib inline
```

[ ]:

```
X_train = X_train_tfidf_L1
X_test = X_test_tfidf_L1
```

2 Basic training

We define the model and train it first

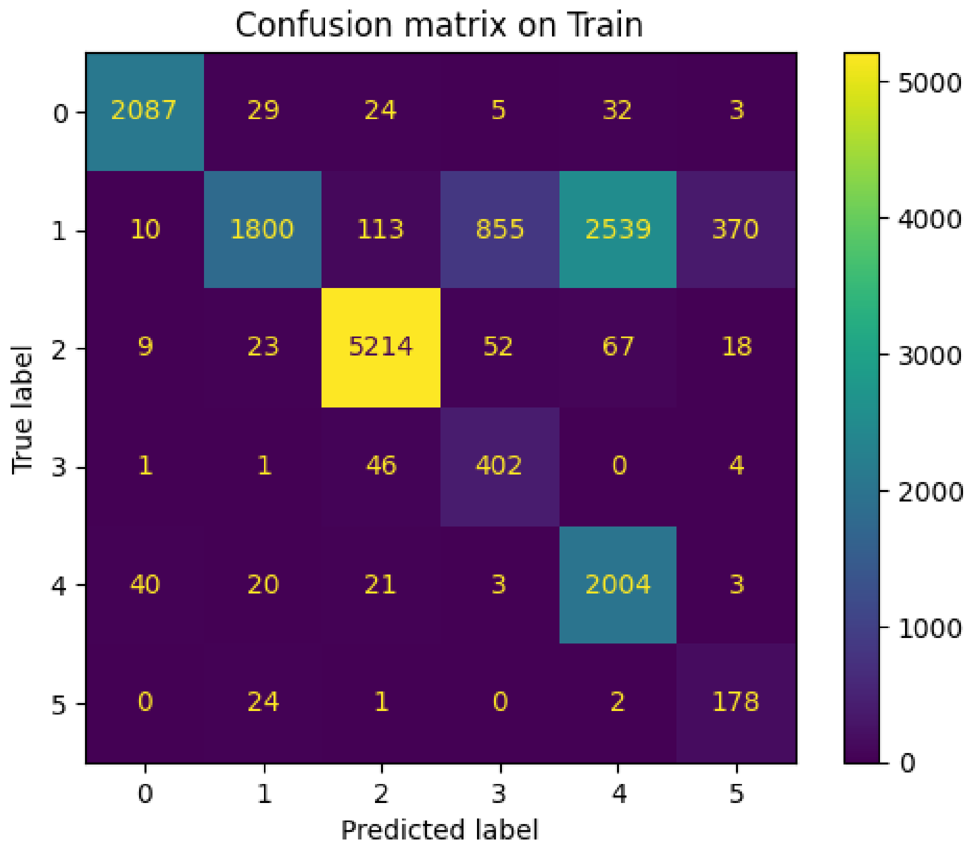
```
[ ]: knn_model = KNeighborsClassifier(n_neighbors = 3)
     knn_model.fit(X_train, y_train)
```

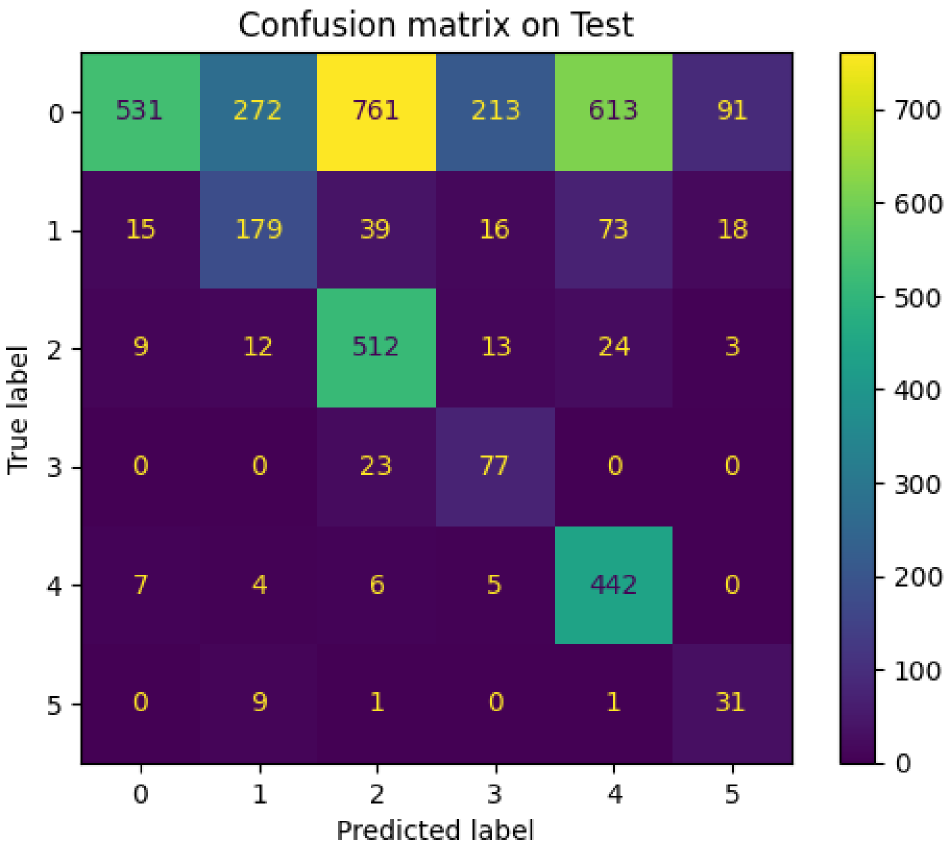
```
[ ]: KNeighborsClassifier(n_neighbors=3)
```

Getting prediction on training set (without cross validation) then evaluate it!

```
[ ]: evaluate_model(knn_model, X_train, X_test, y_train, y_test, include_training =␣
       ↪True)
```

```
Score of on train are:
        - Accuracy score: 0.7303
        - Micro F1 score: 0.7303
        - Macro F1 score: 0.6516
Score of on test are:
        - Accuracy score: 0.4430
        - Micro F1 score: 0.4430
        - Macro F1 score: 0.4279
```



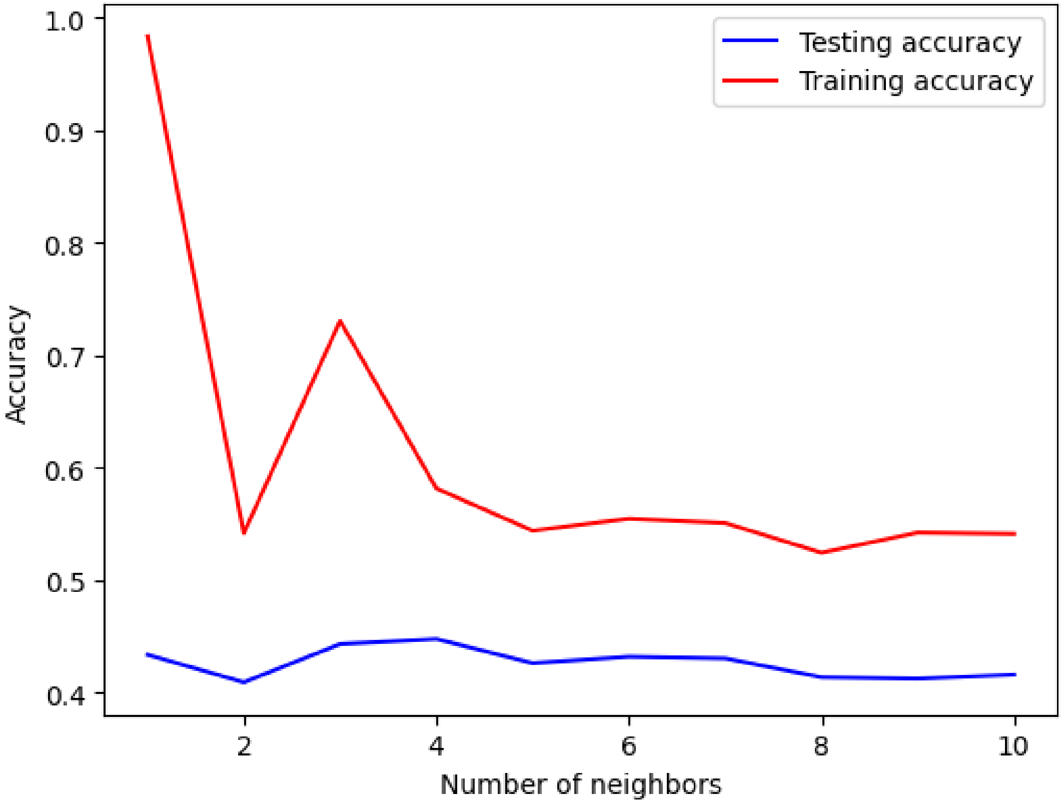


Now we draw the plot for a range of k-neighbors

[ ]:

```
# Setting the hyperparameter range
K = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
accuracy_list = list()
valid_accuracy_list = list()

for k in K:
  knn_model = KNeighborsClassifier(n_neighbors = k)
  knn_model.fit(X_train, y_train)

  data_pred_y = knn_model.predict(X_test)
  data_valid_y = knn_model.predict(X_train)

  accuracy_list.append([k, accuracy_score(y_test, data_pred_y)])
  valid_accuracy_list.append([k, accuracy_score(y_train, data_valid_y)])

accuracy_list = np.asarray(accuracy_list)
valid_accuracy_list = np.asarray(valid_accuracy_list)
```

```
plt.plot(accuracy_list[:, 0], accuracy_list[:, 1], label = "Testing accuracy",␣
 ↪color = 'b')
plt.plot(valid_accuracy_list[:, 0], valid_accuracy_list[:, 1], label =␣
 ↪"Training accuracy", color = 'r')
plt.xlabel('Number of neighbors')
plt.ylabel('Accuracy')
plt.legend()
plt.show()
```



2.0.1 Model evaluation

[ ]:

```
dict_param = {'n_neighbors': np.arange(1, 51),
              'p': np.arange(1, 3),
              'weights': ['uniform', 'distance']}
best_knn_model = GridSearchCV(KNeighborsClassifier(), param_grid = dict_param,␣
 ↪n_jobs = 8, cv = 10, scoring = 'accuracy')

best_knn_model.fit(X_train, y_train)
```

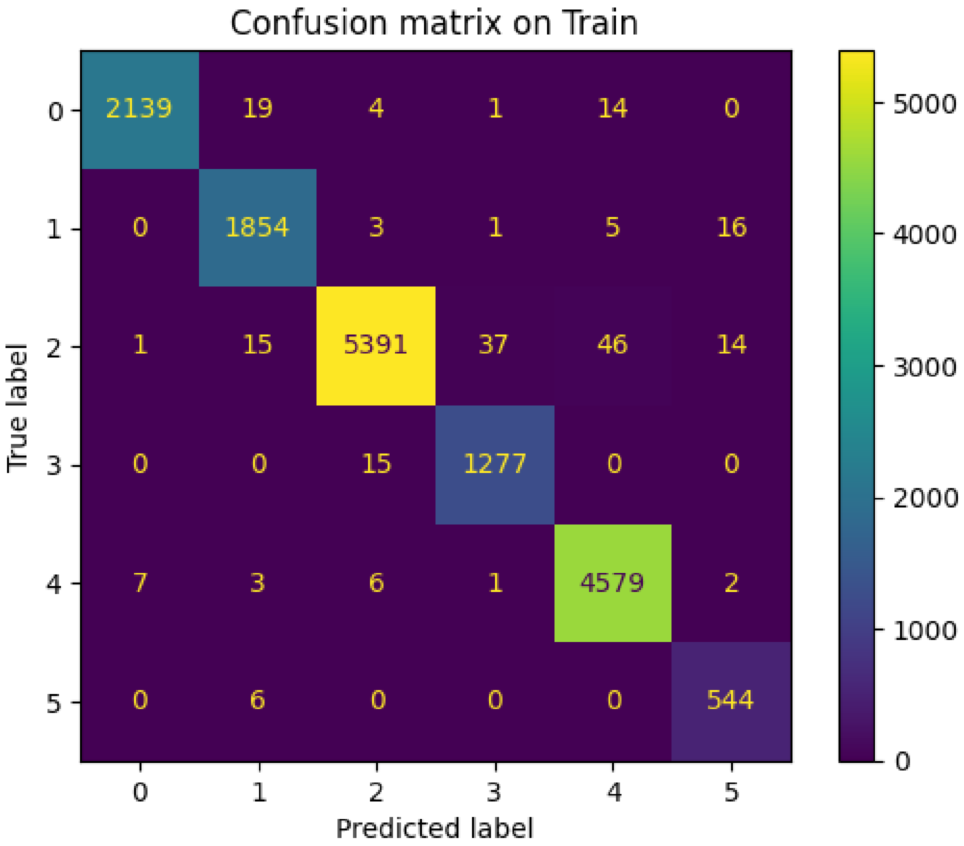
```
[ ]: GridSearchCV(cv=10, estimator=KNeighborsClassifier(), n_jobs=8,
                  param_grid={'n_neighbors': array([ 1,  2,  3,  4,  5,  6,  7,  8,
      9, 10, 11, 12, 13, 14, 15, 16, 17,
            18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34,
            35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50]),
                              'p': array([1, 2]),
                              'weights': ['uniform', 'distance']},
                  scoring='accuracy')
```

```
[ ]: print("Best parameters for k_NN on TF-IDF - L1 Dataset:", best_knn_model.
      ↪best_params_)
```

```
Best parameters for k_NN on TF-IDF - L1 Dataset: {'n_neighbors': 40, 'p': 2,
'weights': 'distance'}
```

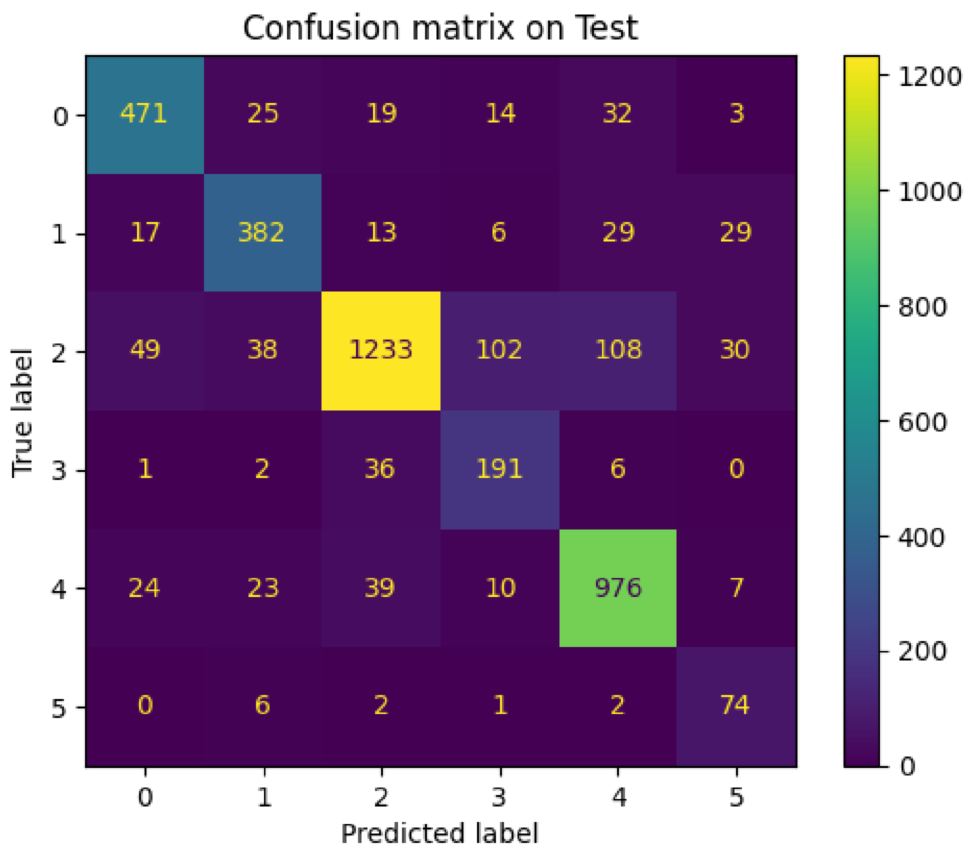
```
[ ]: evaluate_model(best_knn_model, X_train, X_test, y_train, y_test,␣
      ↪include_training=True)
```

```
Score of on train are:
        - Accuracy score: 0.9865
        - Micro F1 score: 0.9865
        - Macro F1 score: 0.9824
Score of on test are:
        - Accuracy score: 0.8317
        - Micro F1 score: 0.8317
        - Macro F1 score: 0.7824
```



Confusion matrix on Train

True label \ Predicted label	0	1	2	3	4	5
0	2139	19	4	1	14	0
1	0	1854	3	1	5	16
2	1	15	5391	37	46	14
3	0	0	15	1277	0	0
4	7	3	6	1	4579	2
5	0	6	0	0	0	544



	0	1	2	3	4	5
0	471	25	19	14	32	3
1	17	382	13	6	29	29
2	49	38	1233	102	108	30
3	1	2	36	191	6	0
4	24	23	39	10	976	7
5	0	6	2	1	2	74

3 Export models

```
[ ]: directory = "data/models/"

     dump(best_knn_model, directory + "best_knn_model_tfidf_L1.joblib")
```

```
[ ]: ['data/models/best_knn_model_tfidf_L1.joblib']
```