Naive-Bayes model using text data vectorized with TF-IDF

In [ ]:

```
#import packages

import numpy as np

import pandas as pd

from sklearn.model_selection import KFold, cross_validate

from sklearn.pipeline import Pipeline

from sklearn.linear_model import LogisticRegression
from sklearn.naive_bayes import MultinomialNB
from sklearn.svm import SVC

from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, confusion_matrix, ConfusionMatrixDispl

import matplotlib as plt

from time import process_time
```

In [ ]:

```
#import data

%store -r x_text_train_tf
%store -r x_text_test_tf
%store -r y_text_train_tf
%store -r y_text_test_tf
```

In [ ]:

```
#rename variables for ease of use

x_train = x_text_train_tf
x_test = x_text_test_tf
y_train = y_text_train_tf
y_test = y_text_test_tf
```

In [ ]:

```
#define model

mnb = MultinomialNB()
```

In [ ]:

```
#define scoring metrics for cross validation

scorer = {'accuracy': make_scorer(accuracy_score),
          'precision': make_scorer(precision_score),
          'recall': make_scorer(recall_score),
          'f1_score' : make_scorer(f1_score)
          }
```

In [ ]:

```
#define KFold

k_folds = KFold(n_splits = 5, random_state=42, shuffle=True)
```

In [ ]:

```
#cross validate on training set to check model stability

cv_scores_tfidf_text_mnb = cross_validate(mnb, x_train, y_train, cv = k_folds, scoring=scorer)
```

In [ ]:

```
#check cross validation scores

cv_scores_tfidf_text_mnb
```

Out[ ]:

```
{'fit_time': array([0.07380319, 0.06083751, 0.05784488, 0.05983973, 0.0588448 ]),
 'score_time': array([0.02194238, 0.02197242, 0.01792026, 0.0179522 , 0.0179522 ]),
 'test_accuracy': array([0.85569651, 0.8570383 , 0.85799683, 0.8559229 , 0.84518726]),
 'test_precision': array([0.84408004, 0.84      , 0.84426458, 0.84291609, 0.82107574]),
 'test_recall': array([0.8300082 , 0.83535912, 0.83310383, 0.83396843, 0.82903851]),
 'test_f1_score': array([0.83698498, 0.83767313, 0.83864708, 0.83841839, 0.82503792])}
```

In [ ]:

```
#fit model on the whole training set
start = process_time()

mnb.fit(x_train, y_train)

end=process_time()
```

```
In [ ]: #test model on test set

        y_pred = mnb.predict(x_test)
```

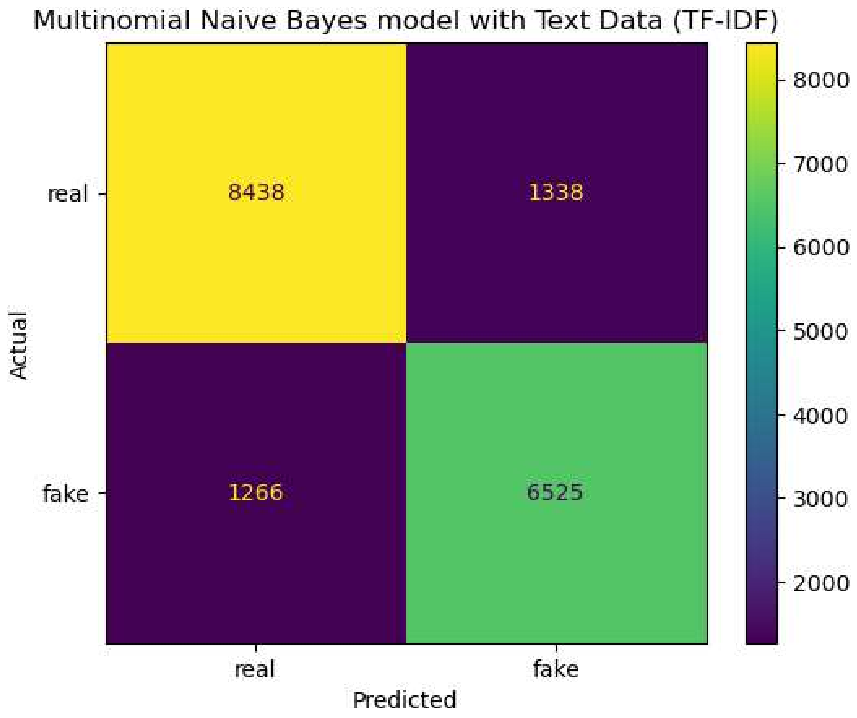
```
In [ ]: #view classification report

        print(classification_report(y_pred, y_test))
```

```
              precision    recall  f1-score   support

           0       0.86      0.87      0.87      9704
           1       0.84      0.83      0.83      7863

    accuracy                           0.85     17567
   macro avg       0.85      0.85      0.85     17567
weighted avg       0.85      0.85      0.85     17567
```

```
In [ ]: #view confusion matrix

        conf_matrix=confusion_matrix(y_test, y_pred)
```

```
In [ ]: cm_plot = ConfusionMatrixDisplay(conf_matrix, display_labels = ['real', 'fake'])
        cm_plot.plot(values_format='')
        cm_plot.ax_.set(
                        title='Multinomial Naive Bayes model with Text Data (TF-IDF)',
                        xlabel='Predicted',
                        ylabel='Actual')
```

```
Out[ ]: [Text(0.5, 1.0, 'Multinomial Naive Bayes model with Text Data (TF-IDF)'),
         Text(0.5, 0, 'Predicted'),
         Text(0, 0.5, 'Actual')]
```



```
In [ ]: accuracy=accuracy_score(y_test, y_pred)
        precision=precision_score(y_test, y_pred)
        recall=recall_score(y_test, y_pred)
        f1=f1_score(y_test, y_pred)
        fit_time=end-start
```

```
In [ ]: dict = {'data type': 'text',
                'model type':'multinomial Naive-Bayes',
                'vectorize type':'TF-IDF',
                'accuracy': accuracy,
                'precision': precision,
                'recall': recall,
                'f1': f1,
                'fit time': fit_time
               }
```

In [ ]:

```
tfidf_text_mnb=pd.DataFrame.from_dict([dict])
```

In [ ]:

```
tfidf_text_mnb
```

Out[ ]:

	data type	model type	vectorize type	accuracy	precision	recall	f1	fit time
0	text	multinomial Naive-Bayes	TF-IDF	0.851768	0.829836	0.837505	0.833653	0.03125

In [ ]:

```
#save results for later use

%store tfidf_text_mnb
```

```
Stored 'tfidf_text_mnb' (DataFrame)
```