Support vector machine 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

svm = SVC()
```

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_svm = cross_validate(svm, x_train, y_train, cv = k_folds, scoring=scorer)
```

In [ ]:
```
#check cross validation scores

cv_scores_tfidf_text_svm
```

Out[ ]:
```
{'fit_time': array([1974.44684649, 1919.48578477, 1899.22134447, 1891.6689961 ,
        1909.08538151]),
 'score_time': array([154.1011641 , 153.63205504, 151.59031868, 146.77961111,
        155.28961396]),
 'test_accuracy': array([0.94815809, 0.95023176, 0.94973771, 0.94327193, 0.94205197]),
 'test_precision': array([0.9391635 , 0.94536883, 0.94671107, 0.93470604, 0.92814208]),
 'test_recall': array([0.94506696, 0.94171271, 0.93941063, 0.93903103, 0.94125797]),
 'test_f1_score': array([0.94210598, 0.94353723, 0.94304672, 0.93686354, 0.93465401])}
```

In [ ]:
```
#fit model on the whole training set
start = process_time()
```

```
svm.fit(x_train, y_train)

end=process_time()
```

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

y_pred = svm.predict(x_test)
```

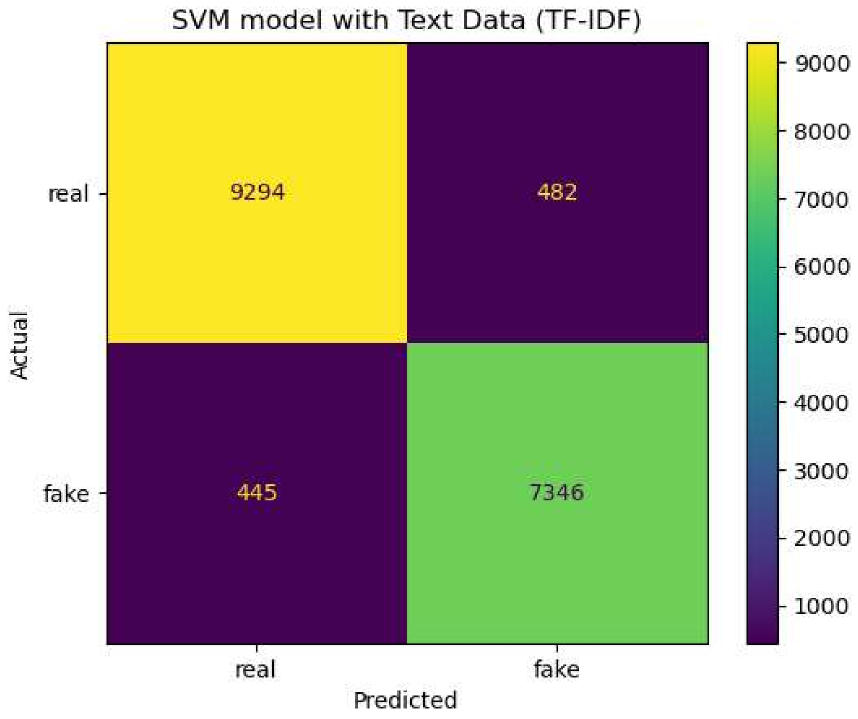
In [ ]:
```
#view classification report

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

```
              precision    recall  f1-score   support

           0       0.95      0.95      0.95      9739
           1       0.94      0.94      0.94      7828

    accuracy                           0.95     17567
   macro avg       0.95      0.95      0.95     17567
weighted avg       0.95      0.95      0.95     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='SVM model with Text Data (TF-IDF)',
                xlabel='Predicted',
                ylabel='Actual')
```

Out[ ]:
```
[Text(0.5, 1.0, 'SVM 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':'SVM',
        'vectorize type':'TF-IDF',
        'accuracy': accuracy,
        'precision': precision,
        'recall': recall,
        'f1': f1,
         'fit time': fit_time
        }
```

In [ ]:
```
tfidf_text_SVM=pd.DataFrame.from_dict([dict])
```

In [ ]:
```
tfidf_text_SVM
```

Out[ ]:

	data type	model type	vectorize type	accuracy	precision	recall	f1	fit time
0	text	SVM	TF-IDF	0.947231	0.938426	0.942883	0.940649	2539.4375

In [ ]:
```
#save results for later use

%store tfidf_text_SVM
```

```
Stored 'tfidf_text_SVM' (DataFrame)
```