Logistic regression model using title data vectorized with word2Vec

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_title_train_wv_2d
%store -r x_title_test_wv_2d
%store -r y_title_train_wv
%store -r y_title_test_wv
```

In [ ]:

```
#rename variables for ease of use

x_train =  x_title_train_wv_2d
x_test =  x_title_test_wv_2d
y_train = y_title_train_wv
y_test = y_title_test_wv
```

In [ ]:

```
#define model

lr = LogisticRegression()
```

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_w2v_title_lr = cross_validate(lr, x_train, y_train, cv = k_folds, scoring=scorer)
```

In [ ]:

```
#check cross validation scores

cv_scores_w2v_title_lr
```

Out[ ]:

```
{'fit_time': array([0.82080364, 0.66622233, 0.853719  , 0.60737753, 0.66422296]),
 'score_time': array([0.03989291, 0.04188561, 0.03889537, 0.03091741, 0.04089189]),
 'test_accuracy': array([0.81959014, 0.82703098, 0.81505429, 0.81615225, 0.81810418]),
 'test_precision': array([0.80843237, 0.81747405, 0.80786026, 0.80615993, 0.80309101]),
 'test_recall': array([0.78081443, 0.78314917, 0.76425227, 0.77653783, 0.77750069]),
 'test_f1_score': array([0.79438343, 0.79994357, 0.78545146, 0.79107168, 0.79008869])}
```

In [ ]:

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

lr.fit(x_train, y_train)
```

```
end=process_time()
```

In [ ]:

```
#test model on test set

y_pred = lr.predict(x_test)
```

In [ ]:

```
#view classification report

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

```
              precision    recall  f1-score   support

           0       0.85      0.82      0.84     10131
           1       0.77      0.81      0.79      7436

    accuracy                           0.82     17567
   macro avg       0.81      0.82      0.81     17567
weighted avg       0.82      0.82      0.82     17567
```

In [ ]:

```
#create confusion matrix

conf_matrix=confusion_matrix(y_test, y_pred)
```

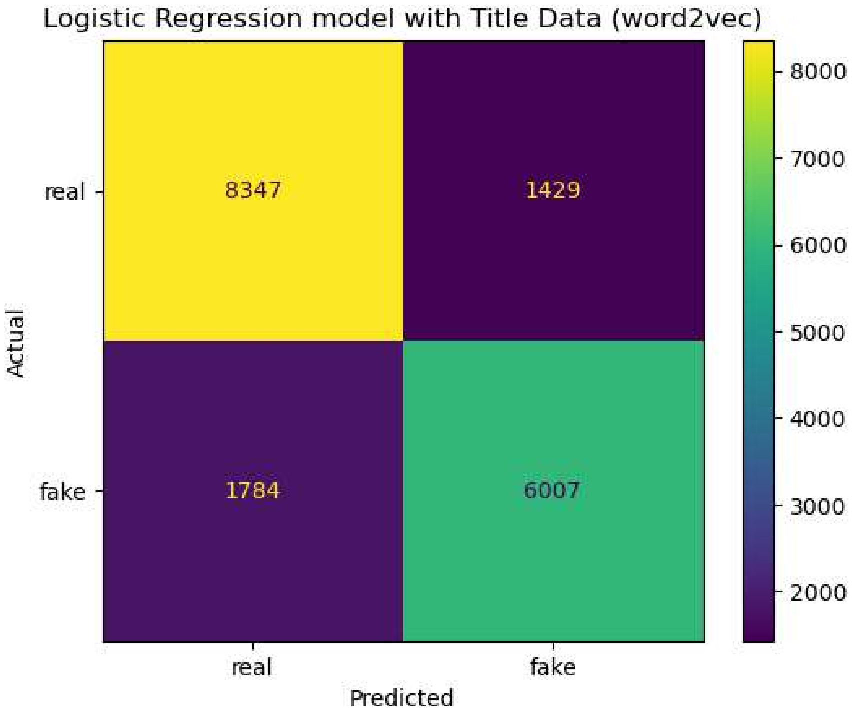
In [ ]:

```
#plot confusion matrix

cm_plot = ConfusionMatrixDisplay(conf_matrix, display_labels = ['real', 'fake'])
cm_plot.plot(values_format='')
cm_plot.ax_.set(
                title='Logistic Regression model with Title Data (word2vec)',
                xlabel='Predicted',
                ylabel='Actual')
```

Out[ ]:

```
[Text(0.5, 1.0, 'Logistic Regression model with Title Data (word2vec)'),
 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': 'title',
        'model type':'logistic regression',
        'vectorize type':'word2vec',
        'accuracy': accuracy,
        'precision': precision,
        'recall': recall,
        'f1': f1,
         'fit time': fit_time
        }
```

In [ ]:

```
w2v_title_lr=pd.DataFrame.from_dict([dict])
```

In [ ]:

```
w2v_title_lr
```

Out[ ]:

	data type	model type	vectorize type	accuracy	precision	recall	f1	fit time
0	title	logistic regression	word2vec	0.8171	0.807827	0.771018	0.788993	3.453125

In [ ]:

```
#save results for later use

%store w2v_title_lr
```

```
Stored 'w2v_title_lr' (DataFrame)
```