Report

December 6, 2017

1 Distinguishing News From Fake News

Due December 9

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CSE 415 Fall 2017, Assignment 7

```
In [49]: #load any required packages here
         %matplotlib inline
         import time
         import itertools
         import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         from sklearn.metrics import confusion_matrix
         from sklearn.metrics import f1_score
         from sklearn.model_selection import train_test_split
         from sklearn.feature_extraction.text import CountVectorizer
         from sklearn.feature_extraction.text import TfidfVectorizer
```

1.1 1. Importing Data

First, we want to import the fake news table from the source I found. The data I found is from https://github.com/GeorgeMcIntire/fake_real_news_dataset

According to the dataset documentation, text and metadata from fake news sites:

- **Unnamed: 0:** unique id
- **title:** title of an article
- **text:** content of an article
- **label:** label telling if the news is fake or real

```
In [50]: data = pd.read_csv("fake_or_real_news.csv")
         fake_news = data.set_index("Unnamed: 0")
         y = fake_news.label
         fake_news = fake_news.drop("label", axis=1)
         data.head(10)
```

Out[50]:

	Unnamed: 0	title	text	label
0	8476	You Can Smell Hillarys Fear	Daniel Greenfield, a Shillman Journalism Fello...	FAKE
1	10294	Watch The Exact Moment Paul Ryan Committed Pol...	Google Pinterest Digg Linkedin Reddit Stumbleu...	FAKE
2	3608	Kerry to go to Paris in gesture of sympathy	U.S. Secretary of State John F. Kerry said Mon...	REAL
3	10142	Bernie supporters on Twitter erupt in anger ag...	Kaydee King (@KaydeeKing) November 9, 2016 T...	FAKE
4	875	The Battle of New York: Why This Primary Matters	It's primary day in New York and front-runners...	REAL
5	6903	Tehran, USA	\nIm not an immigrant, but my grandparents ...	FAKE
6	7341	Girl Horrified At What She Watches Boyfriend D...	Share This Baylee Luciani (left), Screenshot o...	FAKE
7	95	Britains Schindler Dies at 106	A Czech stockbroker who saved more than 650 Je...	REAL
8	4869	Fact check: Trump and Clinton at the 'commande...	Hillary Clinton and Donald Trump made some ina...	REAL
9	2909	Iran reportedly makes new push for uranium con...	Iranian negotiators reportedly have made a las...	REAL

```
In [51]: print(data.shape)
```

```
(6335, 4)
```

1.2 2. Seperating Training Data & Testing Data

Using random to seperate training data and testing data

```
In [52]: x_train, x_test, y_train, y_test = train_test_split(fake_news['text'], y, test_size=0
```

```
In [76]: pd.DataFrame(x_test).head(10)
```

Out[76]:

Unnamed: 0	text
4856	Donald Trump threatened to sue the New York Ti...
5323	Planned Parenthood: Abortion pill usage now ri...
4265	In a last dash, final "hail mary" attempt to e...
1697	Washington (CNN) Donald Trump and Ben Carson n...
3809	The Obama administration announced Friday it w...
8717	Three local military veterans to receive rec...
10396	Home This Month Popular What The Trump Skeptic...
269	But then the sobering realization sets in: the...
1387	Killing Obama administration rules, dismantlin...
2139	The party looks to Kamala Harris, Catherine Co...

1.3 3. Vectorizing Data

- **TfidfVectorizer()**

```
In [53]: vectorizer_tfidf = TfidfVectorizer(stop_words='english', max_df=0.8)
         tfidf_train = vectorizer_tfidf.fit_transform(x_train)
         tfidf_test = vectorizer_tfidf.transform(x_test)
```

- **CountVectorizer()**

```
In [54]: vectorizer_count = CountVectorizer(stop_words='english')
         count_train = vectorizer_count.fit_transform(x_train)
         count_test = vectorizer_count.transform(x_test)
```

```
In [55]: # Get the feature names of `tfidf_vectorizer`
         print(vectorizer_tfidf.get_feature_names()[-10:])

         # Get the feature names of `count_vectorizer`
         print(vectorizer_count.get_feature_names()[:10])
```

```
['', '', '', '', '', '', '', '', '', 'ade']
['00', '000', '0000', '00000031', '000035', '00006', '0001', '0001pt', '000ft', '000km']
```

1.4 4. Building Confusion Matrix Plot

```
In [56]: def plot_confusion_matrix(cm, classes,
                                  title='Confusion matrix',
                                  cmap=plt.cm.Blues):
             """
             This function prints and plots the confusion matrix.
             Normalization can be applied by setting `normalize=True`.
             """
             plt.imshow(cm, interpolation='nearest', cmap=cmap)
             plt.title(title)
             plt.colorbar()
             tick_marks = np.arange(len(classes))
             plt.xticks(tick_marks, classes, rotation=45)
             plt.yticks(tick_marks, classes)

             fmt = 'd'
             thresh = cm.max() / 2.
             for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
                 plt.text(j, i, format(cm[i, j], fmt),
                          horizontalalignment="center",
                          color="white" if cm[i, j] > thresh else "black")

             plt.tight_layout()
             plt.ylabel('True')
             plt.xlabel('Predicted')
```

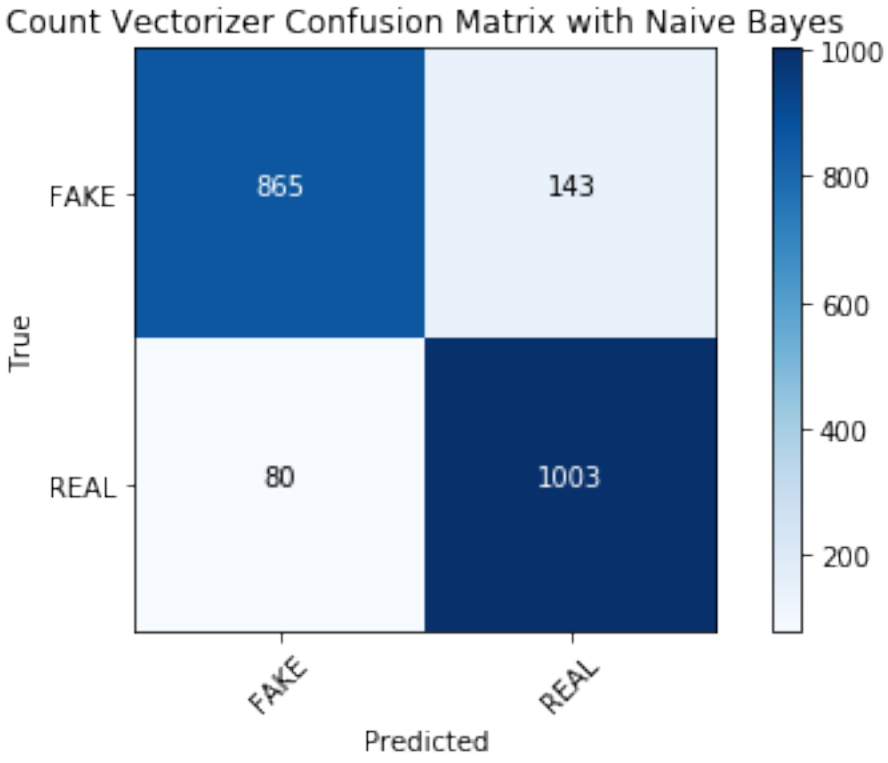
1.5 5. Building Classifier Models

- **Multinomial Naive Bayes**

```
In [57]: from sklearn.naive_bayes import MultinomialNB
```

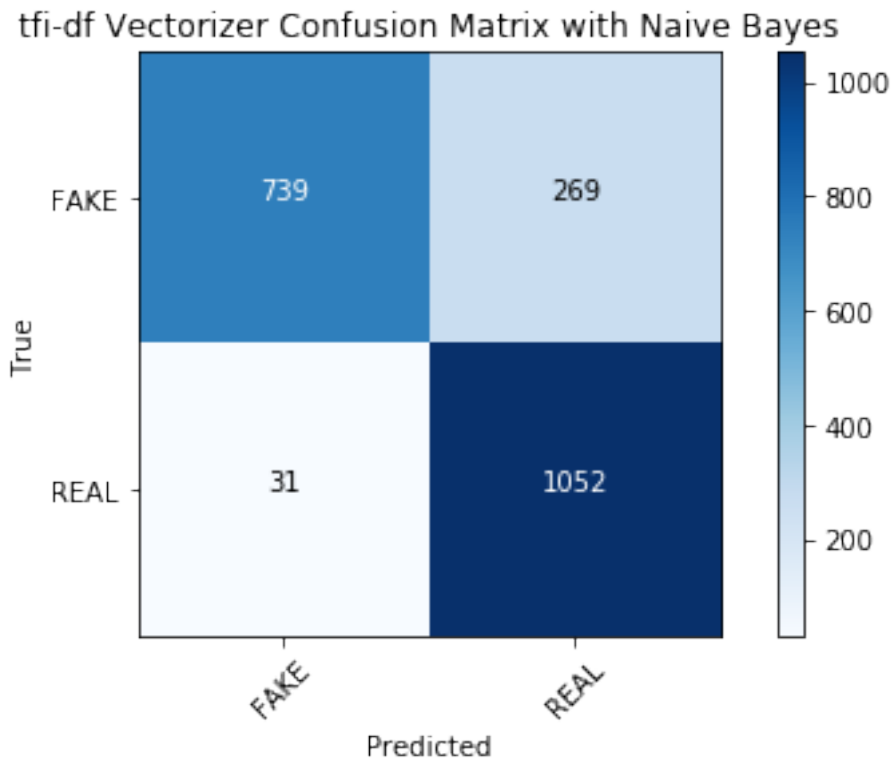
```
In [85]: clf = MultinomialNB()
         clf.fit(count_train, y_train)
         pred = clf.predict(count_test)
         f1_nb_count = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_nb_count)
         cm_nb_count = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_nb_count, classes=['FAKE', 'REAL'], title='Count Vectorizer C
```

```
f1_score: 0.89314
```




```
In [86]: clf = MultinomialNB()
         clf.fit(tfidf_train, y_train)
         pred = clf.predict(tfidf_test)
         f1_nb_tfidf = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_nb_tfidf)
         cm_nb_tfidf = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_nb_tfidf, classes=['FAKE', 'REAL'], title='tfi-df Vectorizer
```

```
f1_score: 0.85403
```

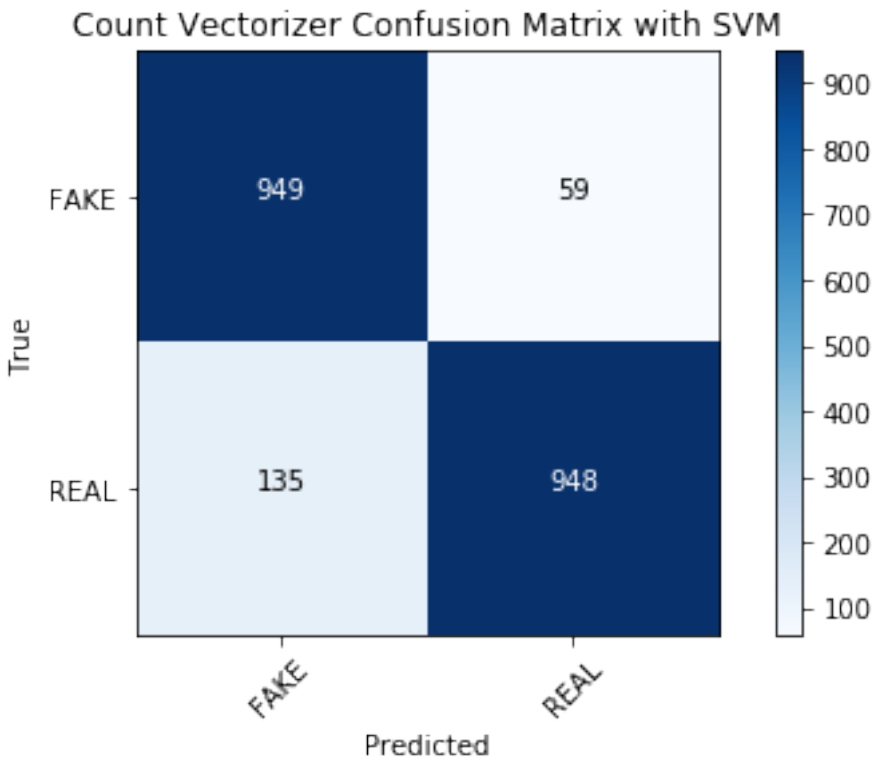


- **Support Vector Machine**

```
In [60]: from sklearn.svm import SVC
```

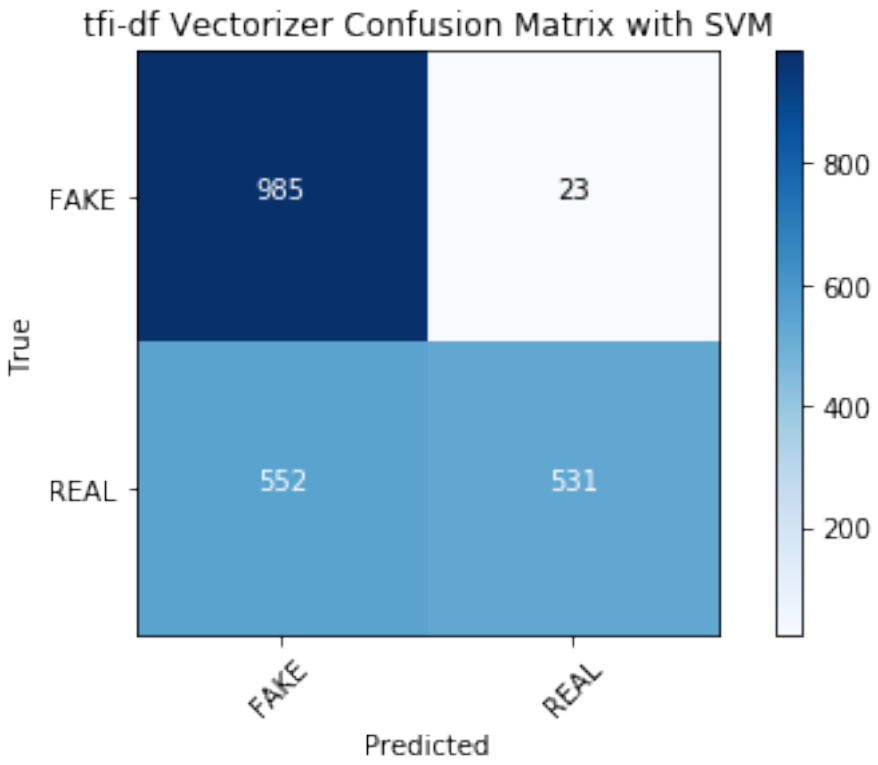
```
In [87]: clf = SVC(kernel="linear", C=0.025)
         clf.fit(count_train, y_train)
         pred = clf.predict(count_test)
         f1_svm_count = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_svm_count)
         cm_svm_count = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_svm_count, classes=['FAKE', 'REAL'], title='Count Vectorizer
```

```
f1_score: 0.90722
```



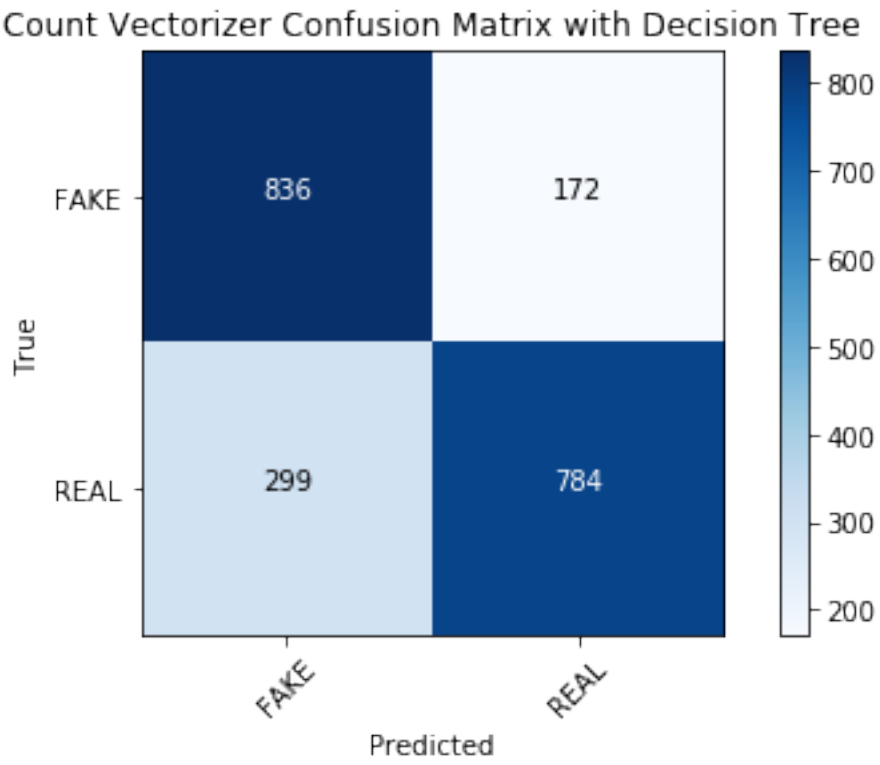

```
In [83]: clf = SVC(kernel="linear", C=0.025)
         clf.fit(tfidf_train, y_train)
         pred = clf.predict(tfidf_test)
         f1_svm_tfidf = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_svm_tfidf)
         cm_svm_tfidf = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_svm_tfidf, classes=['FAKE', 'REAL'], title='tfi-df Vectorize
```

```
f1_score: 0.70916
```



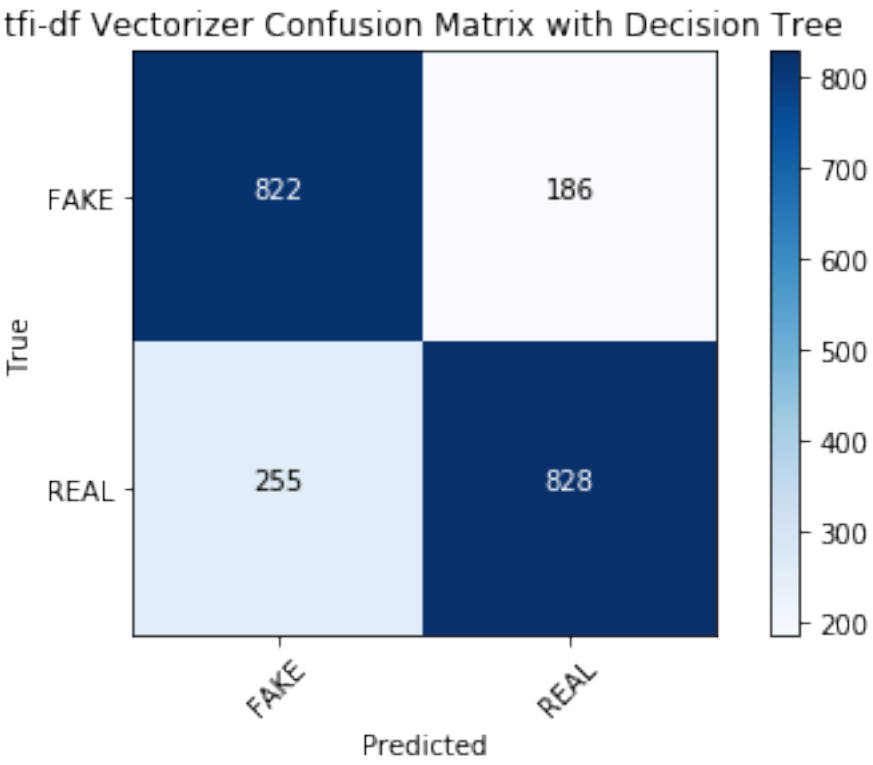
- **Classification Tree**

```
In [63]: from sklearn.tree import  DecisionTreeClassifier

In [82]: clf = DecisionTreeClassifier(max_depth=5)
         clf.fit(count_train, y_train)
         pred = clf.predict(count_test)
         f1_tree_count = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_tree_count)
         cm_tree_count = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_tree_count, classes=['FAKE', 'REAL'], title='Count Vectorize

f1_score: 0.77441
```



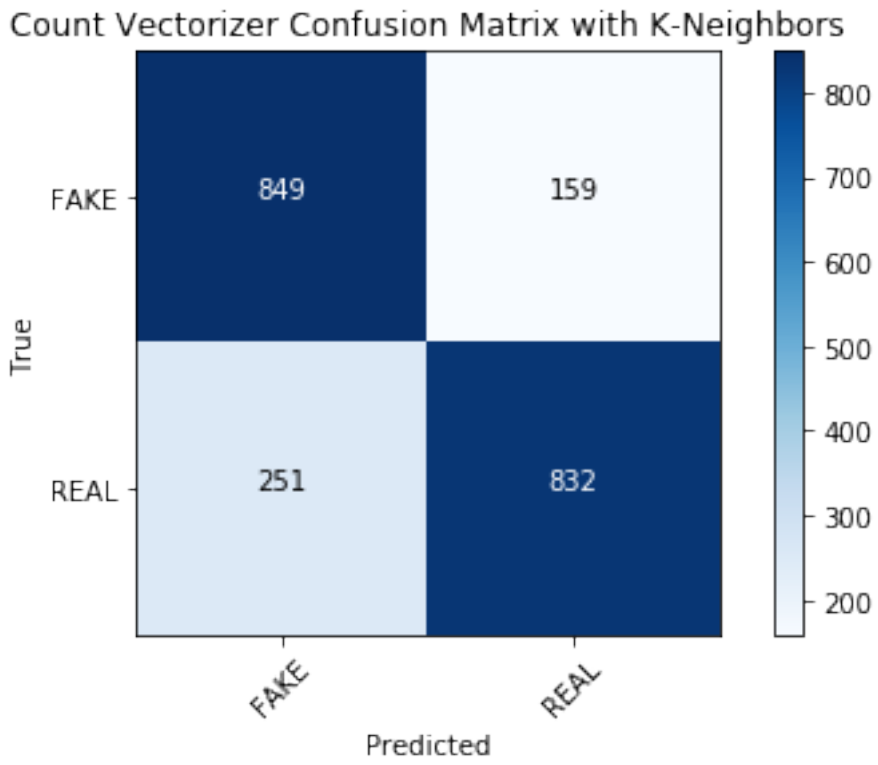

```
In [81]: clf = DecisionTreeClassifier(max_depth=5)
         clf.fit(tfidf_train, y_train)
         pred = clf.predict(tfidf_test)
         f1_tree_tfidf = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_tree_tfidf)
         cm_tree_tfidf = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_tree_tfidf, classes=['FAKE', 'REAL'], title='tfi-df Vectoriz
```

```
f1_score: 0.78912
```



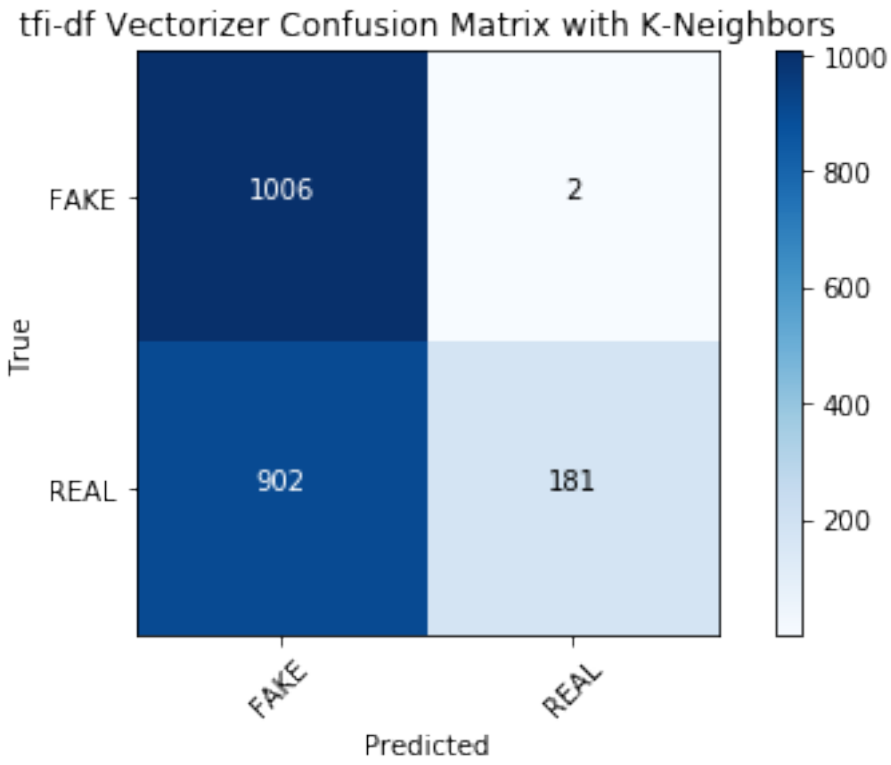
- **KNeighbors Classifier**

```
In [66]: from sklearn.neighbors import KNeighborsClassifier

In [80]: clf =  KNeighborsClassifier(3)
         clf.fit(count_train, y_train)
         pred = clf.predict(count_test)
         f1_knn_count = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_knn_count)
         cm_knn_count = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_knn_count, classes=['FAKE', 'REAL'], title='Count Vectorizer

f1_score: 0.80385
```




```
In [79]: clf =  KNeighborsClassifier(3)
         clf.fit(tfidf_train, y_train)
         pred = clf.predict(tfidf_test)
         f1_knn_tfidf = f1_score(y_test, pred, average='weighted')
         print("f1_score: %0.5f" % f1_knn_tfidf)
         cm_knn_tfidf = confusion_matrix(y_test, pred, labels=['FAKE', 'REAL'])
         plot_confusion_matrix(cm_knn_tfidf , classes=['FAKE', 'REAL'], title='tfi-df Vectoriz
```

```
f1_score: 0.48072
```



1.6 6. Comparing Methods

f1_score table	Count Vecotizer	tfi-df Vectorizer
Naive Bayes	0.89314	0.85403
Support Vector Machine	0.90722	0.70916
Classification Trees	0.77441	0.78912
KNeighbors	0.80385	0.48072