Experiment-2

In the experiment 2 here it is comparing tfidf vs countVectizer

In [1]:

```
import pandas as pd
import numpy as np
import os
import string
from nltk.corpus import stopwords
from nltk.stem.porter import PorterStemmer
import nltk
import matplotlib.pyplot as plt
nltk.download('stopwords')
nltk.download('wordnet')
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
%matplotlib inline
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\Admin\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to
[nltk_data]     C:\Users\Admin\AppData\Roaming\nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
```

In [2]:

```
dataset=pd.read_csv('Research_Article_train.csv')
#dataset.head(15)

dataset.head(5)
```

Out[2]:

	ID	TITLE	ABSTRACT	Computer Science	Physics	Mathematics	Statistics	Quantitative Biology	Quantitative Finance
0	1	1 .what Reconstructing Subject-Specific Effect...	Predictive models allow subject-specific inf...	1	0	0	0	0	0
1	2	Rotation Invariance Neural Network	Rotation invariance and translation invarian...	1	0	0	0	0	0
2	3	Spherical polyharmonics and Poisson kernels fo...	We introduce and develop the notion of spher...	0	0	1	0	0	0

	ID	TITLE	ABSTRACT	Computer Science	Physics	Mathematics	Statistics	Quantitative Biology	Quantitative Finance
3	4	A finite element approximation for the stochas...	The stochastic Landau--Lifshitz--Gilbert (LL...	0	0	1	0	0	0
4	5	Comparative study of Discrete Wavelet Transfor...	Fourier-transform infra-red (FTIR) spectra o...	1	0	0	1	0	0

In [3]:

```
dataset.columns
```

Out[3]:

```
Index(['ID', 'TITLE', 'ABSTRACT', 'Computer Science', 'Physics', 'Mathematics',
       'Statistics', 'Quantitative Biology', 'Quantitative Finance'],
      dtype='object')
```

In [5]:

```
dataset['ID']=dataset['ID'].astype(float)
dataset['Computer Science']=dataset['Computer Science'].astype(float)
dataset['Physics']=dataset['Physics'].astype(float)
dataset['Mathematics']=dataset['Mathematics'].astype(float)
dataset['Statistics']=dataset['Statistics'].astype(float)
dataset['Quantitative Biology']=dataset['Quantitative Biology'].astype(float)
dataset['Quantitative Finance']=dataset['Quantitative Finance'].astype(float)
dataset.dtypes
```

Out[5]:

```
ID                      float64
TITLE                    object
ABSTRACT                 object
Computer Science        float64
Physics                 float64
Mathematics             float64
Statistics              float64
Quantitative Biology    float64
Quantitative Finance    float64
dtype: object
```

In [6]:

```
y=dataset[['Computer Science', 'Physics', 'Mathematics',
       'Statistics', 'Quantitative Biology', 'Quantitative Finance']]
```

In [7]:

```
#combining 2 text columns title and abstract into one and drop columns title and abstra
dataset['Text']=dataset['TITLE']+' '+dataset['ABSTRACT']
dataset.drop(columns=['TITLE','ABSTRACT'], inplace=True)
#dataset.head(5)
```

Data Preprocessing

In [8]:

```
remove_punc = string.punctuation
def remove_punctuation(text):
    return text.translate(str.maketrans('', '', remove_punc))
```

In [9]:

```
stopword = set(stopwords.words('english'))
def remove_stopwords(text):
    """custom function to remove the stopwords"""
    return " ".join([word for word in str(text).split() if word not in stopword])
```

In [10]:

```
from nltk.stem import PorterStemmer
stemmer = PorterStemmer()
def stem_words(text):
    return " ".join([stemmer.stem(word) for word in text.split()])
```

In [11]:

```
from nltk.stem import WordNetLemmatizer
lemmatizer = WordNetLemmatizer()
def lemmatize_words(text):
    return " ".join([lemmatizer.lemmatize(word) for word in text.split()])
```

In [12]:

```
def preprocessing(dataset):
    #convert to string type
    dataset['Text'] = dataset['Text'].astype(str)
    #convert to the lowercase
    dataset["Text"] = dataset["Text"].str.lower()
    #remove punctuations
    dataset["Text"] = dataset["Text"].apply(lambda text: remove_punctuation(text))
    #stopwords removal
    dataset["Text"] = dataset["Text"].apply(lambda text: remove_stopwords(text))
    #Remove Numbers
    dataset['Text'] =dataset["Text"].str.replace('\d+', '')
    #stemming
    dataset["Text"] = dataset["Text"].apply(lambda text: stem_words(text))
    #Lemmatisation
    dataset["Text"] = dataset["Text"].apply(lambda text: lemmatize_words(text))
    return dataset
```

In [13]:

```
import warnings
warnings.filterwarnings('ignore')
processed_data=preprocessing(dataset)
```

In [15]:

```
clean_data=processed_data[['Text','Computer Science','Physics','Mathematics','Statistic
clean_data.head(5)
```

Out[15]:

	Text	Computer Science	Physics	Mathematics	Statistics	Quantitative Biology	Quantitative Finance
0	reconstruct subjectspecif effect map predict m...	1.0	0.0	0.0	0.0	0.0	0.0
1	rotat invari neural network rotat invari trans...	1.0	0.0	0.0	0.0	0.0	0.0

	Text	Computer Science	Physics	Mathematics	Statistics	Quantitative Biology	Quantitative Finance
2	spheric polyharmon poisson kernel polyharmon f...	0.0	0.0	1.0	0.0	0.0	0.0
3	finit element approxim stochast maxwelllandaul...	0.0	0.0	1.0	0.0	0.0	0.0
4	compar studi discret wavelet transform wavelet...	1.0	0.0	0.0	1.0	0.0	0.0

Text featurisation with CountVectorizer

In [16]:

```
from sklearn.feature_extraction.text import CountVectorizer
vectorizer=CountVectorizer()
vector=vectorizer.fit(clean_data['Text'])

#print(vector.vocabulary_)
```

In [17]:

```
X=vector.transform(clean_data['Text'])
```

Splitting Dataset

In [18]:

```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.20,random_state=0)
```

Build the Model

In [19]:

```
from sklearn.ensemble import RandomForestClassifier
```

In [20]:

```
rfclassifier=RandomForestClassifier(n_estimators=200)
```

In [21]:

```
rfclassifier.fit(X_train,y_train)
```

Out[21]:

```
RandomForestClassifier(n_estimators=200)
```

In [22]:

```
prediction=rfclassifier.predict(X_test)
prediction
```

Out[22]:

```
array([[0., 0., 1., 0., 0., 0.],
       [0., 0., 1., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0.],
       ...,
       [0., 0., 1., 0., 0., 0.],
       [0., 0., 0., 0., 0., 0.],
       [1., 0., 0., 0., 0., 0.]])
```

In [24]:

```
from sklearn.metrics import accuracy_score
```

```
# View accuracy score
accuracy_score(y_test, prediction)
```

Out[24]:
```
0.5687723480333731
```

Text Featurisation with TF-IDF

In [25]:
```
tfidf=TfidfVectorizer(analyzer='word',max_features=10000,min_df=5, max_df=0.9, token_pa
X=tfidf.fit_transform(clean_data['Text'])
X=X.toarray()
X
```

Out[25]:
```
array([[0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.]])
```

In [26]:
```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.20,random_state=0)
```

In [27]:
```
classifier=RandomForestClassifier(n_estimators=200)
```

In [28]:
```
classifier.fit(X_train,y_train)
```

Out[28]:
```
RandomForestClassifier(n_estimators=200)
```

In [29]:
```
prediction=classifier.predict(X_test)
```

In [31]:
```
# View accuracy score
accuracy_score(y_test, prediction)
```

Out[31]:
```
0.5899880810488677
```

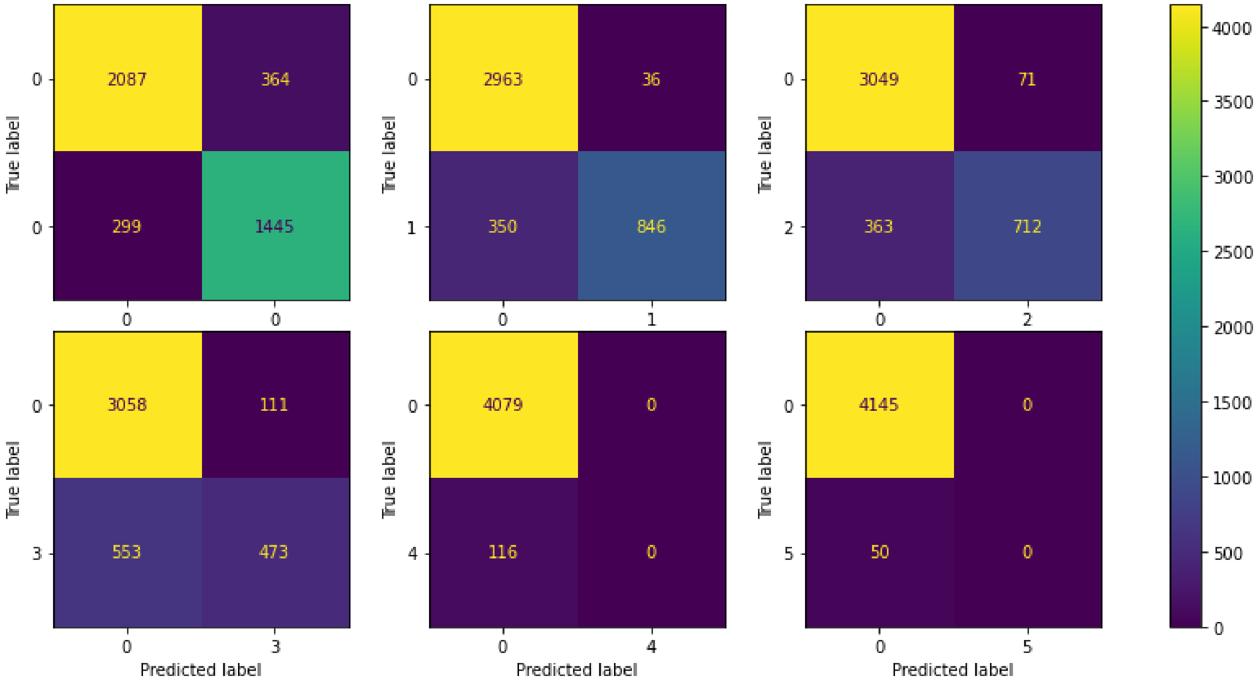
The accurary of building the model with tfidf is better than the model with CountVectorizer. Acuracy is increased by 0.02%

In [32]:
```
from sklearn.metrics import multilabel_confusion_matrix
print(multilabel_confusion_matrix(y_test,prediction))
```

```
[[[2087  364]
  [ 299 1445]]

 [[2963   36]
  [ 350  846]]

 [[3049   71]
  [ 363  712]]

 [[3058  111]
  [ 553  473]]

 [[4079    0]
  [ 116    0]]

 [[4145    0]
  [  50    0]]]
```

In [33]:

```
from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay
ytest=y_test.values
f, axes = plt.subplots(2, 3, figsize=(15, 7))
axes = axes.ravel()
for i in range(6):
    disp = ConfusionMatrixDisplay(confusion_matrix(ytest[:, i],prediction[:, i]),displa

    disp.plot(ax=axes[i], values_format='.4g')
    disp.im_.colorbar.remove()

plt.subplots_adjust(wspace=0.10, hspace=0.1)
f.colorbar(disp.im_, ax=axes)
plt.show()
```



In [34]:

```
from sklearn.metrics import classification_report
print(classification_report(y_test,prediction))
```

```
              precision    recall  f1-score   support

           0       0.80      0.83      0.81      1744
           1       0.96      0.71      0.81      1196
           2       0.91      0.66      0.77      1075
           3       0.81      0.46      0.59      1026
           4       0.00      0.00      0.00       116
           5       0.00      0.00      0.00        50

   micro avg       0.86      0.67      0.75      5207
   macro avg       0.58      0.44      0.50      5207
weighted avg       0.84      0.67      0.73      5207
```

```
samples avg       0.74      0.71      0.71      5207
```

```
In [ ]:
```