AmazonFineFoodReview_Assignment

April 18, 2018

1 T-SNE Visualization for Amazon Fine Food Reviews with Polarity Based Color-Coding

In [1]:
```
%matplotlib inline

import sqlite3
import pandas as pd #for data frames
import numpy as np #numpy array operations
import nltk #natural lang processing, for processing text
import string
import matplotlib.pyplot as plt
import seaborn as sns #for plotting
from sklearn.feature_extraction.text import TfidfTransformer
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.metrics import roc_curve, auc
from nltk.stem.porter import PorterStemmer
import pickle
import seaborn as sn
```

In [2]:
```
pickle_in=open("cleanedData.pickle","rb")
final = pickle.load(pickle_in)
all_positive_words = pickle.load(pickle_in)
all_negative_words = pickle.load(pickle_in)
```

In [3]:
```
final.head()
```

Out[3]:

	Id	ProductId	UserId	ProfileName	\
138706	150524	0006641040	ACITT7DI6IDDL	shari zychinski	
138688	150506	0006641040	A2IW4PEEKO2R0U	Tracy	
138689	150507	0006641040	A1S4A3IQ2MU7V4	sally sue "sally sue"	
138690	150508	0006641040	AZGXZ2UUK6X	Catherine Hallberg "(Kate)"	
138691	150509	0006641040	A3CMRKGE0P909G	Teresa	

	HelpfulnessNumerator	HelpfulnessDenominator	Score	Time	\
138706	0	0	positive	939340800	
138688	1	1	positive	1194739200	

```
138689                     1                       1  positive  1191456000
138690                     1                       1  positive  1076025600
138691                     3                       4  positive  1018396800

                                              Summary  \
138706                    EVERY book is educational
138688  Love the book, miss the hard cover version
138689                chicken soup with rice months
138690      a good swingy rhythm for reading aloud
138691              A great way to learn the months

                                                    Text  \
138706  this witty little book makes my son laugh at l...
138688  I grew up reading these Sendak books, and watc...
138689  This is a fun way for children to learn their ...
138690  This is a great little book to read aloud- it ...
138691  This is a book of poetry about the months of t...

                                                CleanedText
138706  b'witti littl book make son laugh loud recit c...
138688  b'grew read sendak book watch realli rosi movi...
138689  b'fun way children learn month year learn poem...
138690  b'great littl book read nice rhythm well good ...
138691  b'book poetri month year goe month cute littl ...
```

In [4]:
```
pickle_in = open("BOW_tfidf_avgW2V_TfidfW2V.pickle","rb")
count_vect = pickle.load(pickle_in) #BOW
final_counts = pickle.load(pickle_in) #BOW

tf_idf_vect = pickle.load(pickle_in) #TFIDF
final_tf_idf = pickle.load(pickle_in) #TFIDF
features = pickle.load(pickle_in) #TFIDF

w2v_model = pickle.load(pickle_in) #w2v
words = pickle.load(pickle_in) #w2v

sent_vectors = pickle.load(pickle_in) #avg W2V
```

```
C:\Users\Dell\Anaconda3\lib\site-packages\gensim\utils.py:1197: UserWarning: detected Windows;
  warnings.warn("detected Windows; aliasing chunkize to chunkize_serial")
```

2 1)Avg W2V T-SNE

In [5]:
```
print(len(sent_vectors))
print(len(sent_vectors[0]))
```

```
364171
```

50

Observation: 364171 reviews and 50 dimensions/unique features

```
In [6]: pickleIn = open("listOfSentAfterCleaninhHTML_Punc.pickle","rb")
        list_of_sent = pickle.load(pickleIn)

In [7]: len(list_of_sent)

Out[7]: 364171

In [8]: type(sent_vectors)

Out[8]: list

In [9]: import pandas as pd

In [10]: sentence_vect_df = pd.DataFrame(sent_vectors)

In [11]: sentence_vect_df.shape

Out[11]: (364171, 50)

In [12]: sentence_vect_df.head()

Out[12]:          0         1         2         3         4         5         6   \
         0  0.132234 -0.364272 -0.824118 -0.306644  0.578700 -0.461712  0.688433
         1  0.634248 -1.090646  0.134773 -0.479418  0.825783 -0.520739  0.602169
         2 -0.075600 -0.206586 -0.025804 -0.498216  1.097475 -0.432626  0.586218
         3  0.175865 -0.517111 -0.373042 -0.791520  1.030001 -0.333961  0.471097
         4  0.437872 -0.358316 -0.442967 -0.805648  0.901151  0.058111  0.853637

                  7         8         9     ...           40        41        42  \
         0 -0.290176  0.190121 -0.222507     ...    -1.169374 -0.074575  0.138904
         1 -0.438830  0.087120 -0.396176     ...    -1.076318  0.541288  0.227777
         2 -0.866296 -0.001912 -0.241171     ...    -0.818745 -0.490779  0.207907
         3 -0.599948  0.107120 -0.341359     ...    -0.818534  0.219210  0.312482
         4 -0.636608  0.121565 -0.918326     ...    -0.842042 -0.198485  0.004800

                  43        44        45        46        47        48        49
         0 -0.459231  0.409991  0.008275  0.037868  0.477947 -0.107722  0.475282
         1 -0.317019  0.067416 -0.125908  0.058165 -0.472353 -0.325060  0.225436
         2 -0.523702  0.130281  0.201787  0.041148 -0.001624 -0.292683  0.595262
         3 -0.401670  0.309404 -0.311354  0.275265 -0.067895 -0.719411  0.087224
         4 -0.696316  0.364423 -0.097710  0.229285  0.488443  0.008654  0.406747

         [5 rows x 50 columns]

In [13]: sentence_vect_df[0:1]
```

```
Out[13]:          0         1         2         3       4         5         6   \
         0  0.132234 -0.364272 -0.824118 -0.306644  0.5787 -0.461712  0.688433

                  7         8         9     ...           40        41        42  \
         0 -0.290176  0.190121 -0.222507     ...    -1.169374 -0.074575  0.138904

                  43        44        45        46        47        48        49
         0 -0.459231  0.409991  0.008275  0.037868  0.477947 -0.107722  0.475282

         [1 rows x 50 columns]
```

```
In [14]: data = sentence_vect_df[0:10000]
```

```
In [15]: data.shape
```

```
Out[15]: (10000, 50)
```

```
In [16]: Scores = final['Score']
         Scores.head()
```

```
Out[16]: 138706    positive
         138688    positive
         138689    positive
         138690    positive
         138691    positive
         Name: Score, dtype: object
```

```
In [17]: Scores.shape
```

```
Out[17]: (364171,)
```

```
In [18]: Scores = Scores.head(10000)
         Scores.shape
```

```
Out[18]: (10000,)
```

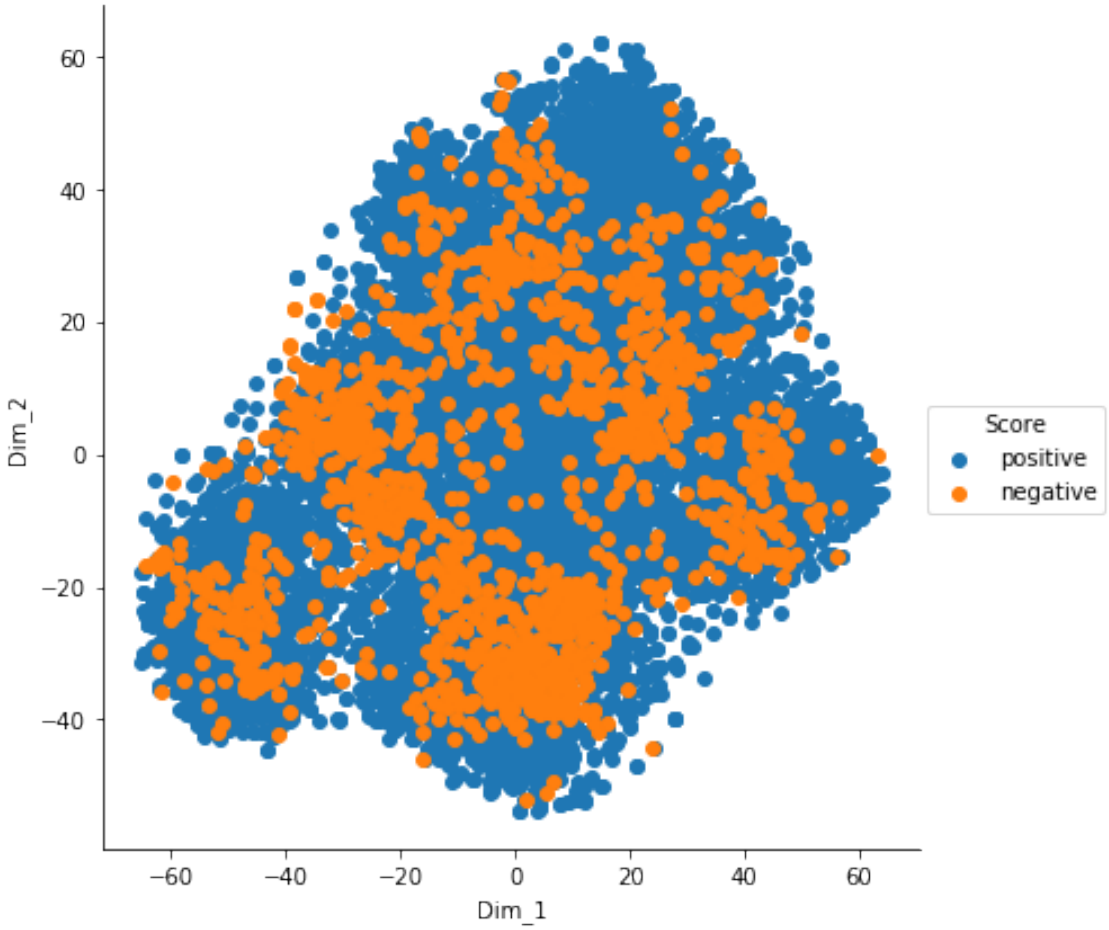
```
In [19]: # Data Preprocessing:Column Standardizing the data i.e making mean=0 and var=1

         from sklearn.preprocessing import StandardScaler
         standardized_data = StandardScaler().fit_transform(data)
         standardized_data.shape
```

```
Out[19]: (10000, 50)
```

2.0.1 With 10k data points, Perplexity=30, iterations=1000 -> Default

```
In [82]: from sklearn.manifold import TSNE
         import seaborn as sn

         data_10000 = standardized_data[0:10000,:]
```

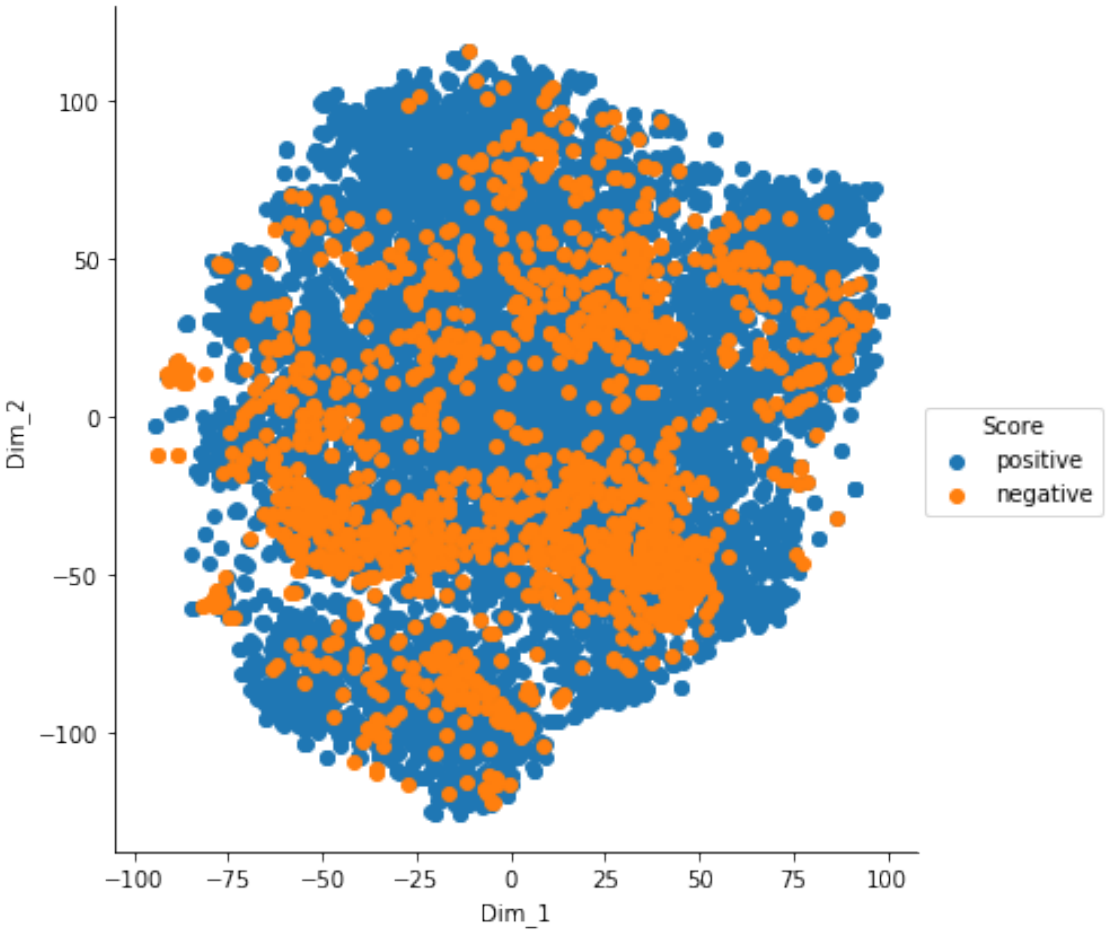
```
Scores_10000 =Scores

model = TSNE(n_components=2, random_state=0)

tsne_data = model.fit_transform(data_10000)

tsne_data = np.vstack((tsne_data.T, Scores_10000)).T

tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))

sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
plt.show()
```



2.0.2 With 10k data points, Perplexity=10, iterations=1500

```
In [83]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=10,n_iter=1500)
```

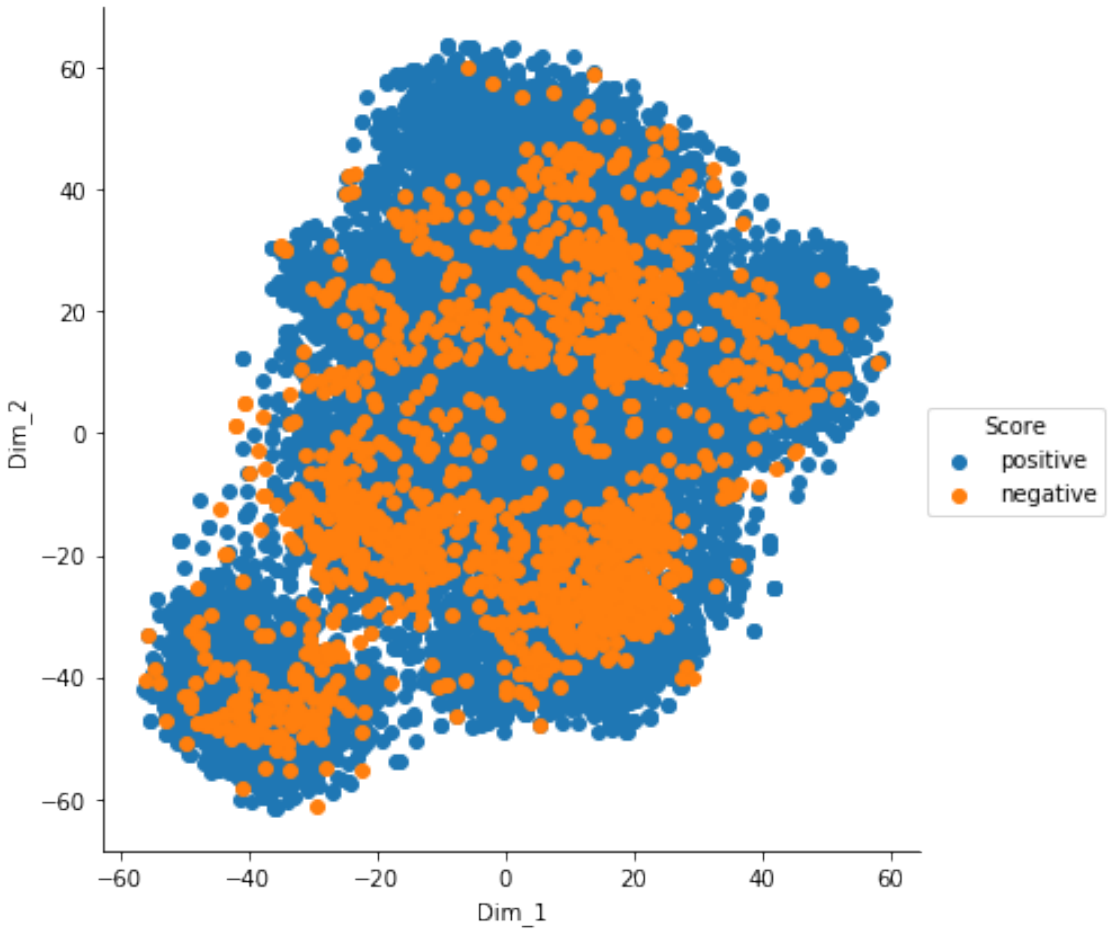
```
tsne_data = model.fit_transform(standardized_data[0:10000])


tsne_data = np.vstack((tsne_data.T, final['Score'].head(10000))).T

tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
plt.show()
```



2.0.3 With 10k data points, Perplexity=40, iterations=1500

In [84]:
```
from sklearn.manifold import TSNE

model = TSNE(n_components=2, random_state=0,perplexity=40,n_iter=1500)
```

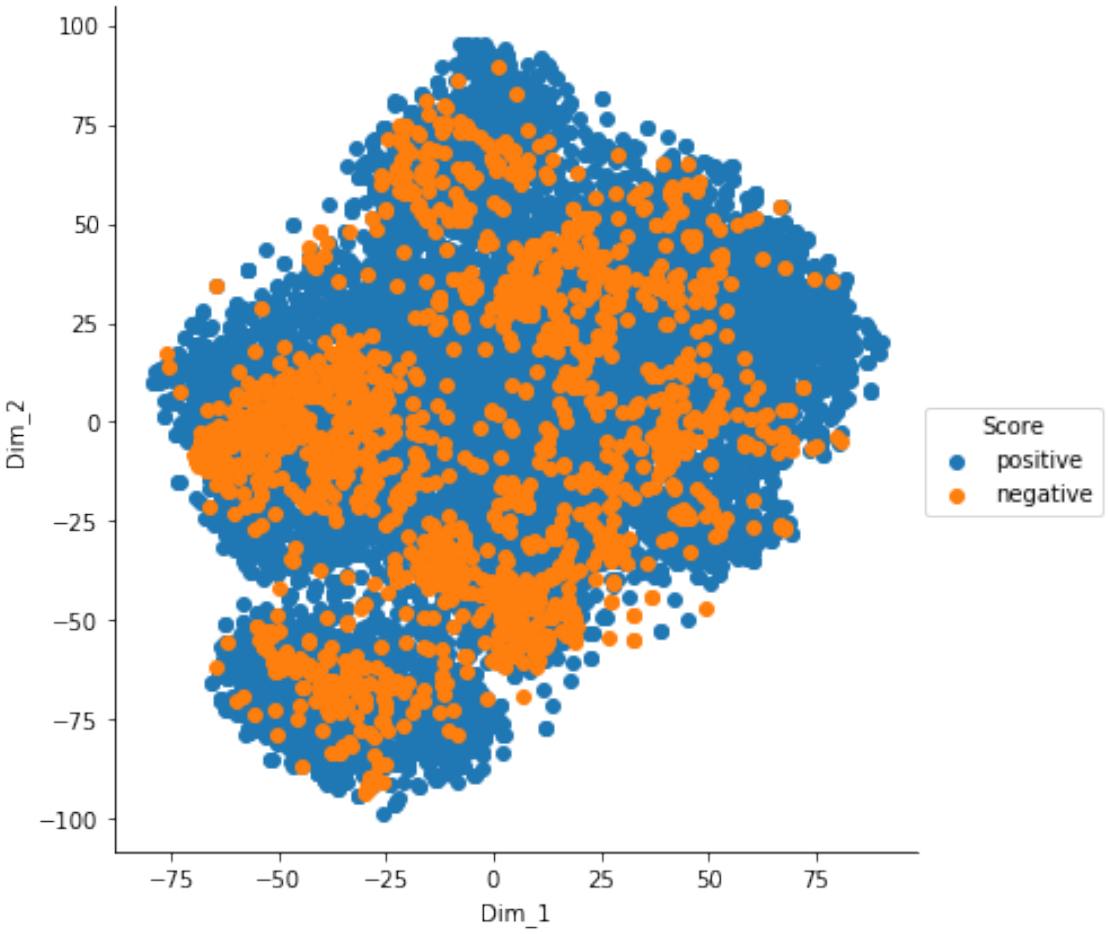
```
tsne_data = model.fit_transform(standardized_data[0:10000])


tsne_data = np.vstack((tsne_data.T, final['Score'].head(10000))).T

tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
plt.show()
```



2.0.4 With 10k data points, Perplexity=20, iterations=1500

```
In [85]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=20,n_iter=1500)

         tsne_data = model.fit_transform(standardized_data[0:10000])
```

```
tsne_data = np.vstack((tsne_data.T, final['Score'].head(10000))).T

tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
plt.show()
```



3 2)BOW T-SNE

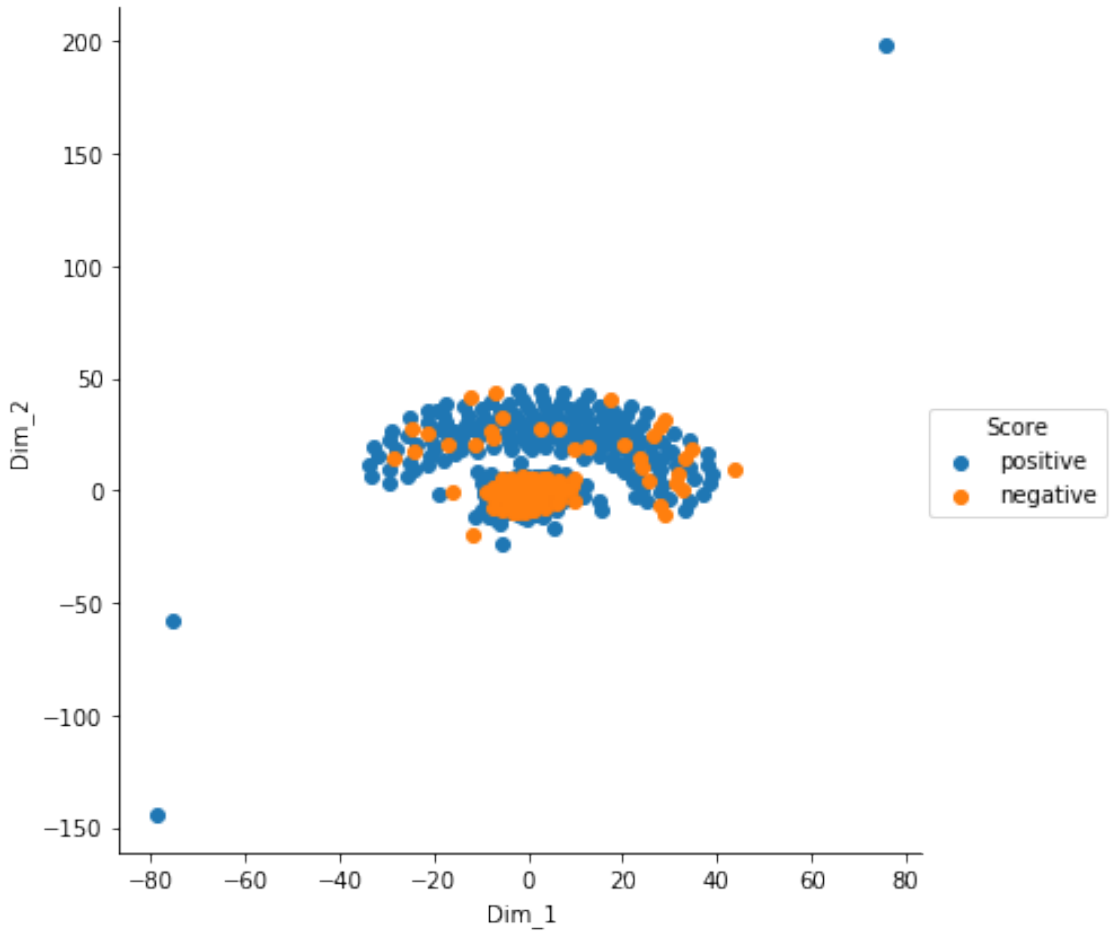
In [19]:
```
print(type(count_vect))
print(type(final_counts))
```

```
<class 'sklearn.feature_extraction.text.CountVectorizer'>
<class 'scipy.sparse.csr.csr_matrix'>
```

```
In [20]: final_counts.shape

Out[20]: (364171, 115281)

In [21]: len(count_vect.get_feature_names())

Out[21]: 115281

In [22]: from scipy.sparse import csc_matrix

         coo = final_counts.tocoo(copy=False)

In [23]: '''pd.DataFrame({'index': coo.row, 'col': coo.col, 'data': coo.data}
                        )[['index', 'col', 'data']].sort_values(['index', 'col']
                        ).reset_index(drop=True)'''

Out[23]: "pd.DataFrame({'index': coo.row, 'col': coo.col, 'data': coo.data}\n

In [24]: bow_final = final_counts[0:1000].toarray()

In [25]: type(bow_final)

Out[25]: numpy.ndarray

In [26]: bow_df = pd.DataFrame(bow_final)

In [27]: bow_df.shape

Out[27]: (1000, 115281)

In [145]: standardized_data = StandardScaler().fit_transform(bow_df)
          standardized_data.shape
          type(standardized_data)

Out[145]: numpy.ndarray
```

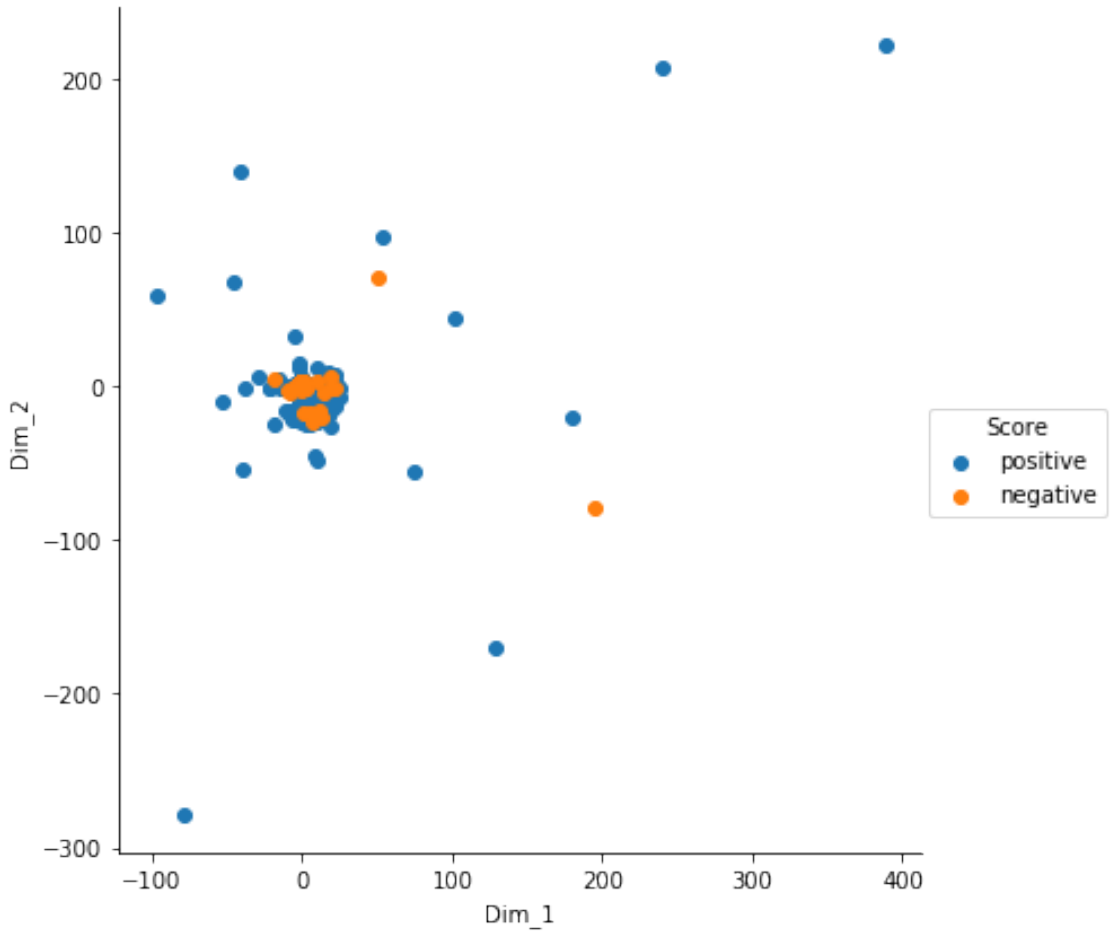
3.0.1 with perplexity = 10, iterations=250

```
In [129]: from sklearn.manifold import TSNE

          model = TSNE(n_components=2, random_state=0,perplexity=10,n_iter=250)

          tsne_data = model.fit_transform(standardized_data)


          tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

          tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


          sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_leg
          plt.show()
```



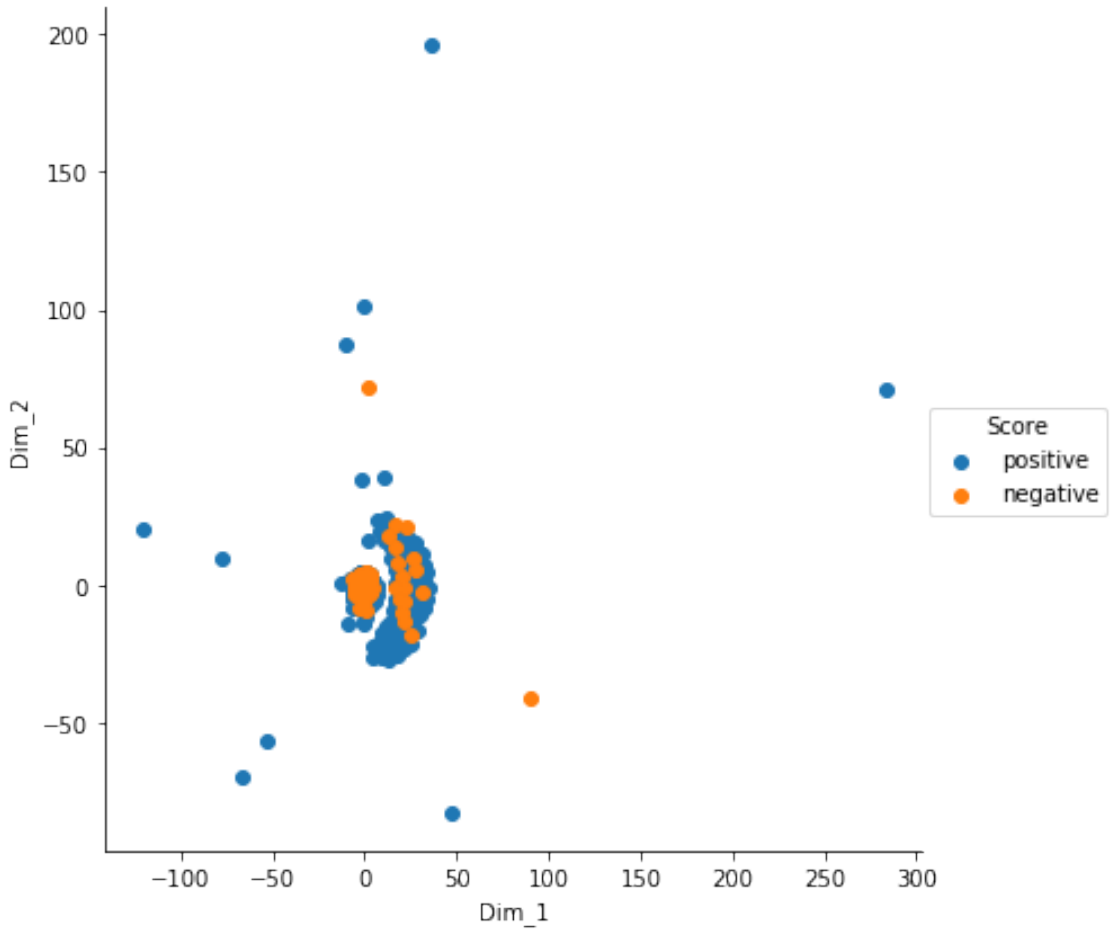
3.0.2 with perplexity = 40, iterations=250

```
In [130]: from sklearn.manifold import TSNE

          model = TSNE(n_components=2, random_state=0,perplexity=40,n_iter=250)

          tsne_data = model.fit_transform(standardized_data)


          tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

          tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


          sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_leg
          plt.show()
```



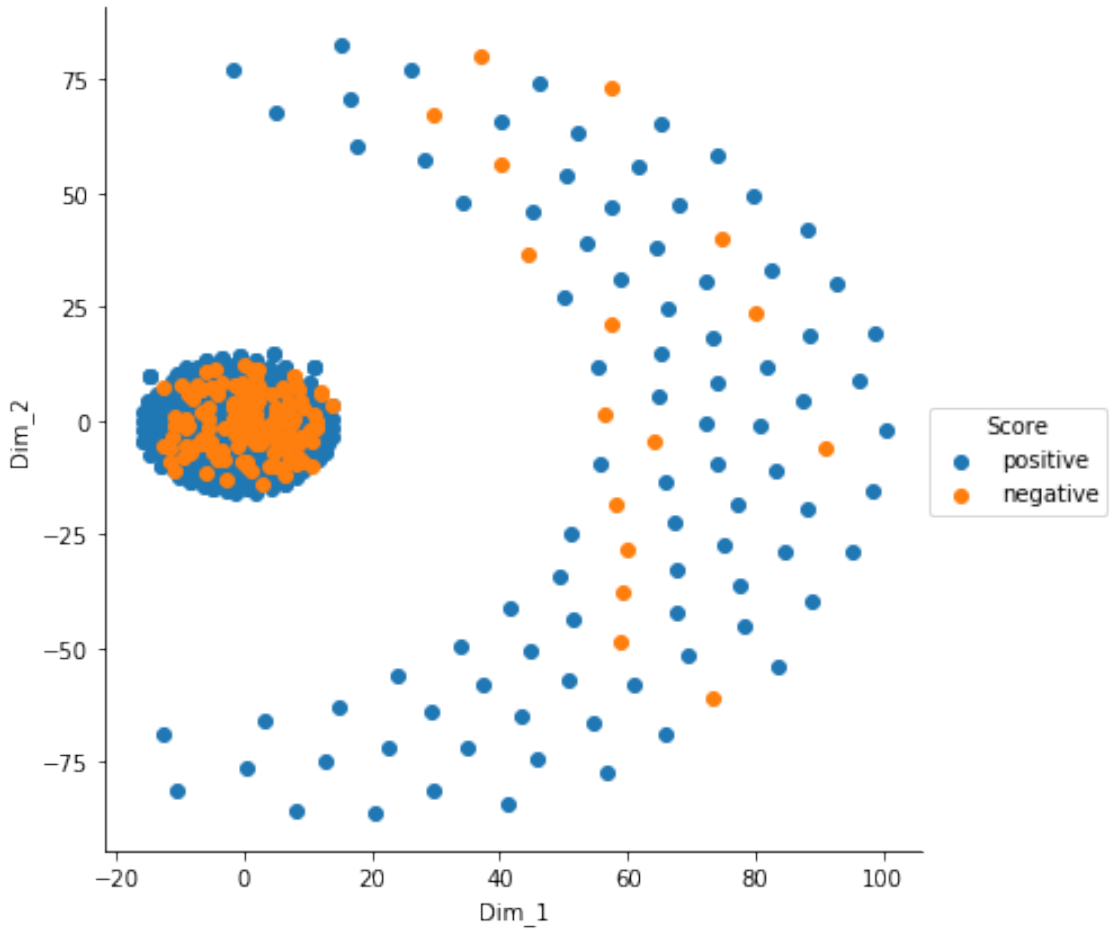
3.0.3 with perplexity = 25, iterations=250

```
In [131]: from sklearn.manifold import TSNE

          model = TSNE(n_components=2, random_state=0,perplexity=25,n_iter=250)

          tsne_data = model.fit_transform(standardized_data)


          tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

          tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


          sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_leg
          plt.show()
```



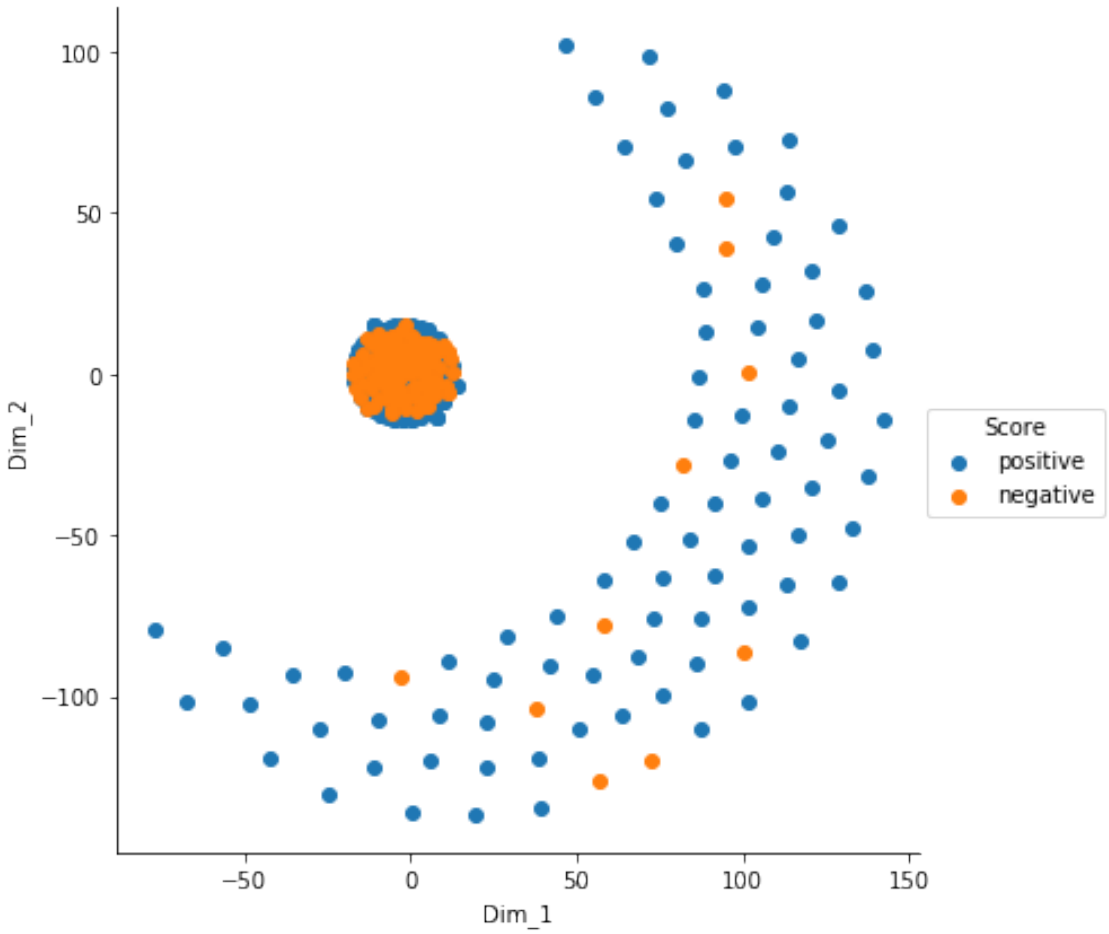
3.0.4 with perplexity = 25, iterations=1000

In [132]:
```
from sklearn.manifold import TSNE

model = TSNE(n_components=2, random_state=0,perplexity=25,n_iter=1000)

tsne_data = model.fit_transform(standardized_data)


tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_leg
plt.show()
```



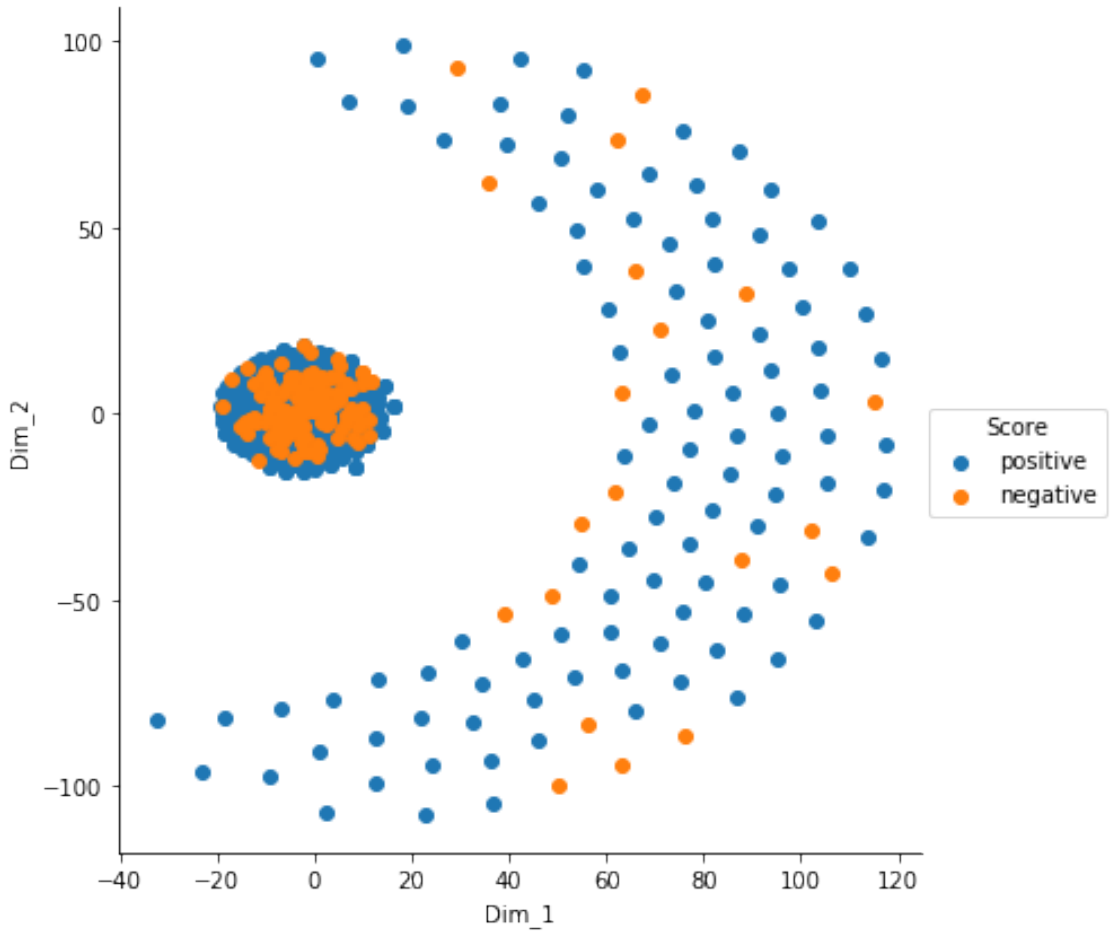
3.0.5 with perplexity = 30, iterations=1800

```
In [133]: from sklearn.manifold import TSNE

          model = TSNE(n_components=2, random_state=0,perplexity=30,n_iter=1800)

          tsne_data = model.fit_transform(standardized_data)


          tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

          tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


          sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_leg
          plt.show()
```



3.0.6 with perplexity = 20, iterations=2000

```
In [134]: from sklearn.manifold import TSNE

          model = TSNE(n_components=2, random_state=0,perplexity=20,n_iter=2000)

          tsne_data = model.fit_transform(standardized_data)


          tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

          tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


          sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_leg
          plt.show()
```



4 3)TF-IDF T-SNE

```
In [19]: type(final_tf_idf)
```

```
Out[19]: scipy.sparse.csr.csr_matrix
```

```
In [20]: final_tf_idf.shape
```

```
Out[20]: (364171, 2910192)
```

```
In [21]: tfidf_final = final_tf_idf[0:500].toarray()
         len(tfidf_final)
```

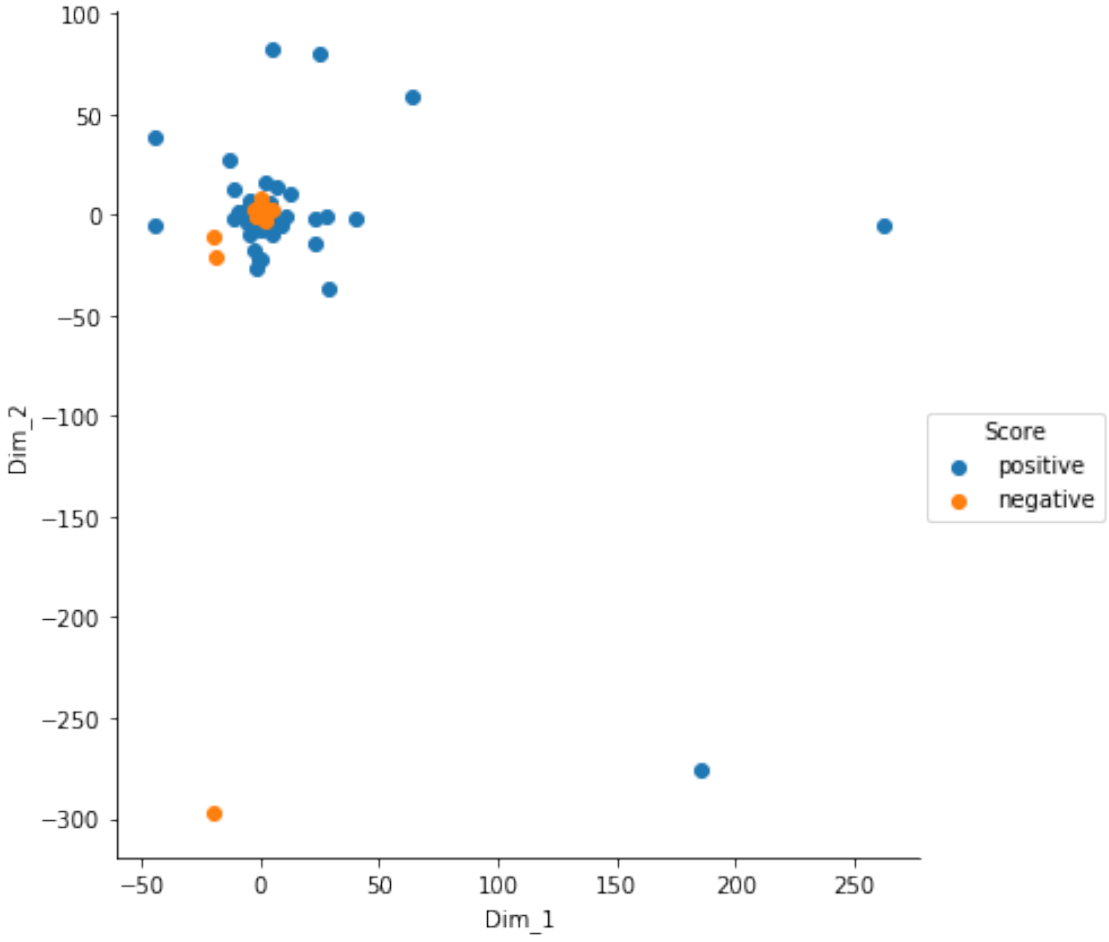
```
Out[21]: 500
```

```
In [22]: tfidf_data = pd.DataFrame(tfidf_final)
         tfidf_data.shape
```

```
Out[22]: (500, 2910192)
```

4.0.1 with perplexity=20, iterations = 250, 500 data points

In [23]:
```
from sklearn.manifold import TSNE

model = TSNE(n_components=2, random_state=0,perplexity=20,n_iter=250)

tsne_data = model.fit_transform(tfidf_data)


tsne_data = np.vstack((tsne_data.T, final['Score'].head(500))).T

tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
plt.show()
```

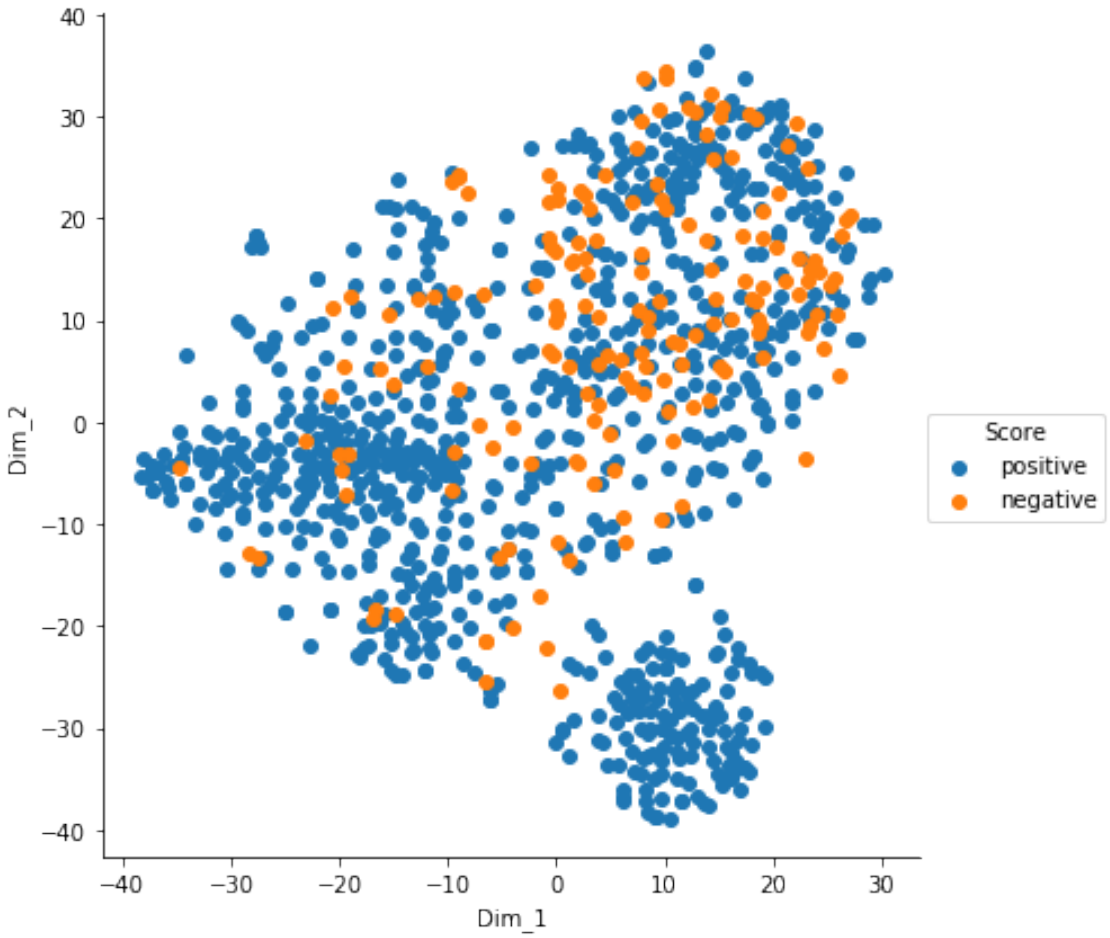


5 4)Weighted TF-IDF W2V -> T-SNE

```
In [20]: pickle_in =open("WiightedTfidfW2V.pickle","rb")
         tfidf_sent_vectors = pickle.load(pickle_in)

In [25]: tfidf_w2v = pd.DataFrame(tfidf_sent_vectors)

In [26]: tfidf_w2v.shape

Out[26]: (1000, 50)

In [28]: standardized_data = StandardScaler().fit_transform(tfidf_w2v)
         standardized_data.shape
         type(standardized_data)

Out[28]: numpy.ndarray
```

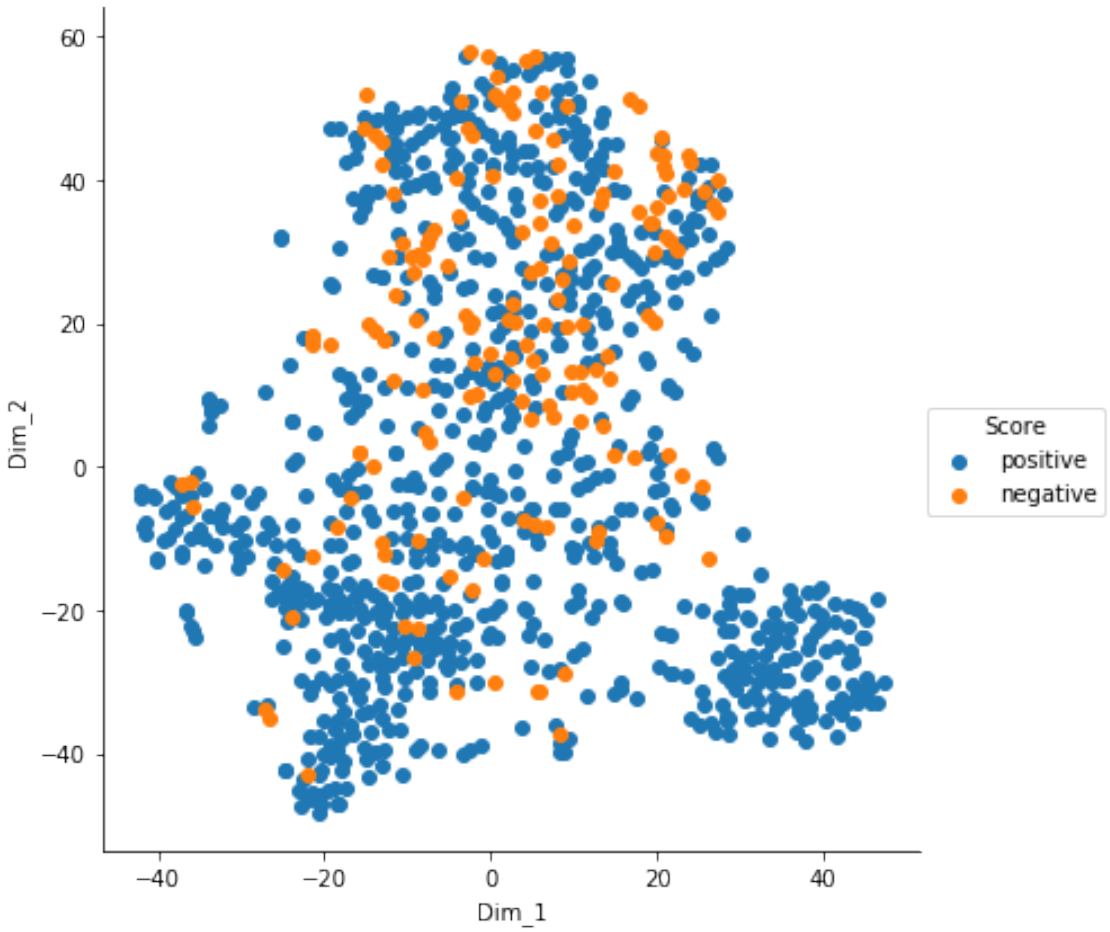
5.0.1 With perplexity=30

```
In [29]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=30,n_iter=2500)

         tsne_data = model.fit_transform(standardized_data)


         tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

         tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


         sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
         plt.show()
```



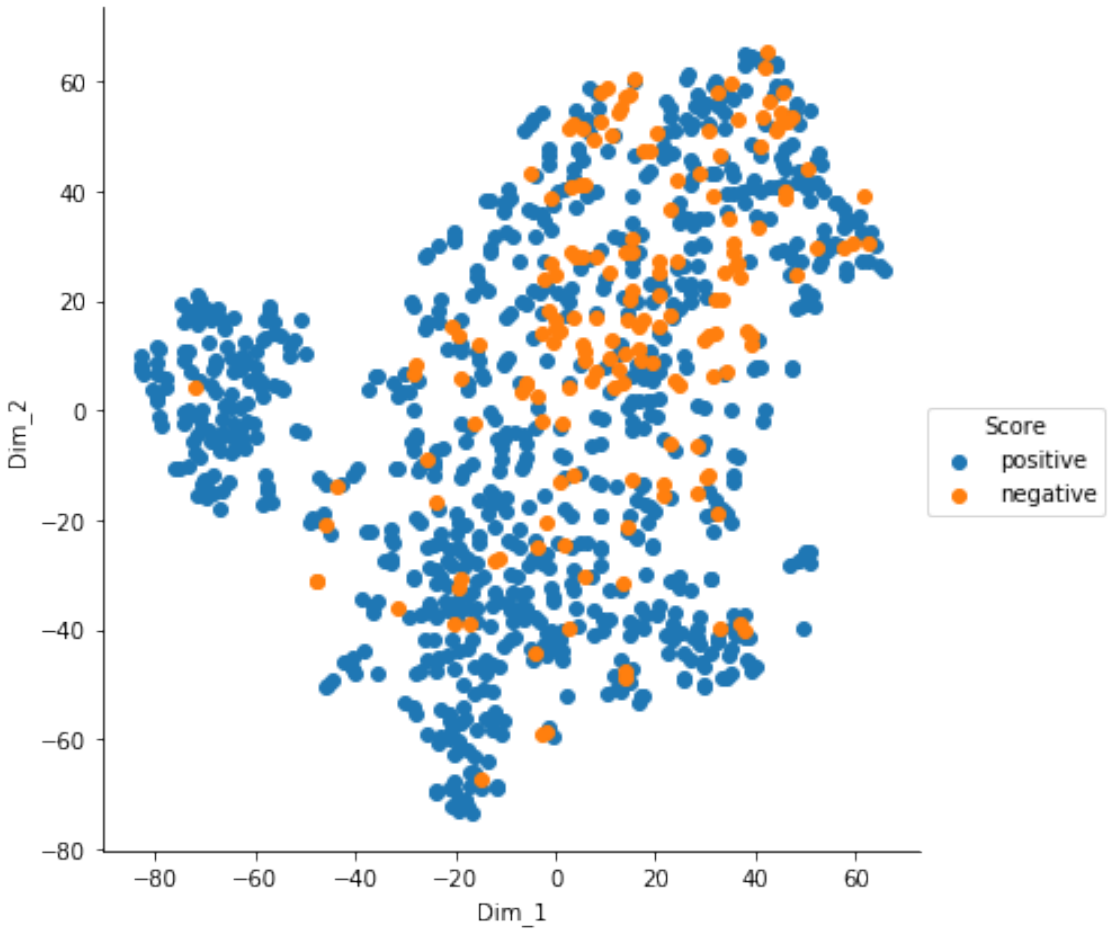
5.0.2 With Perplexity=20

```
In [30]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=20,n_iter=2500)

         tsne_data = model.fit_transform(standardized_data)


         tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

         tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


         sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
         plt.show()
```



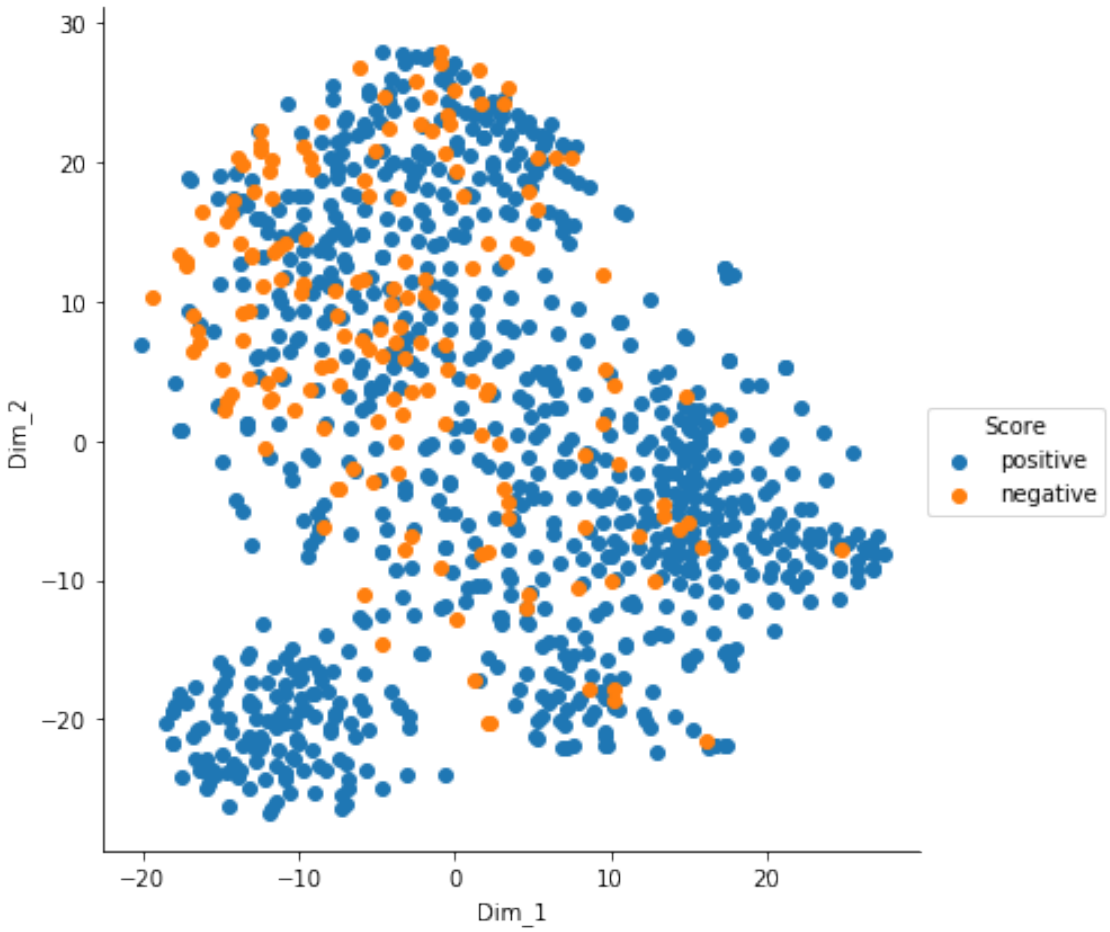
5.0.3 With perplexity=10

```
In [31]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=10,n_iter=2500)

         tsne_data = model.fit_transform(standardized_data)


         tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

         tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


         sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
         plt.show()
```



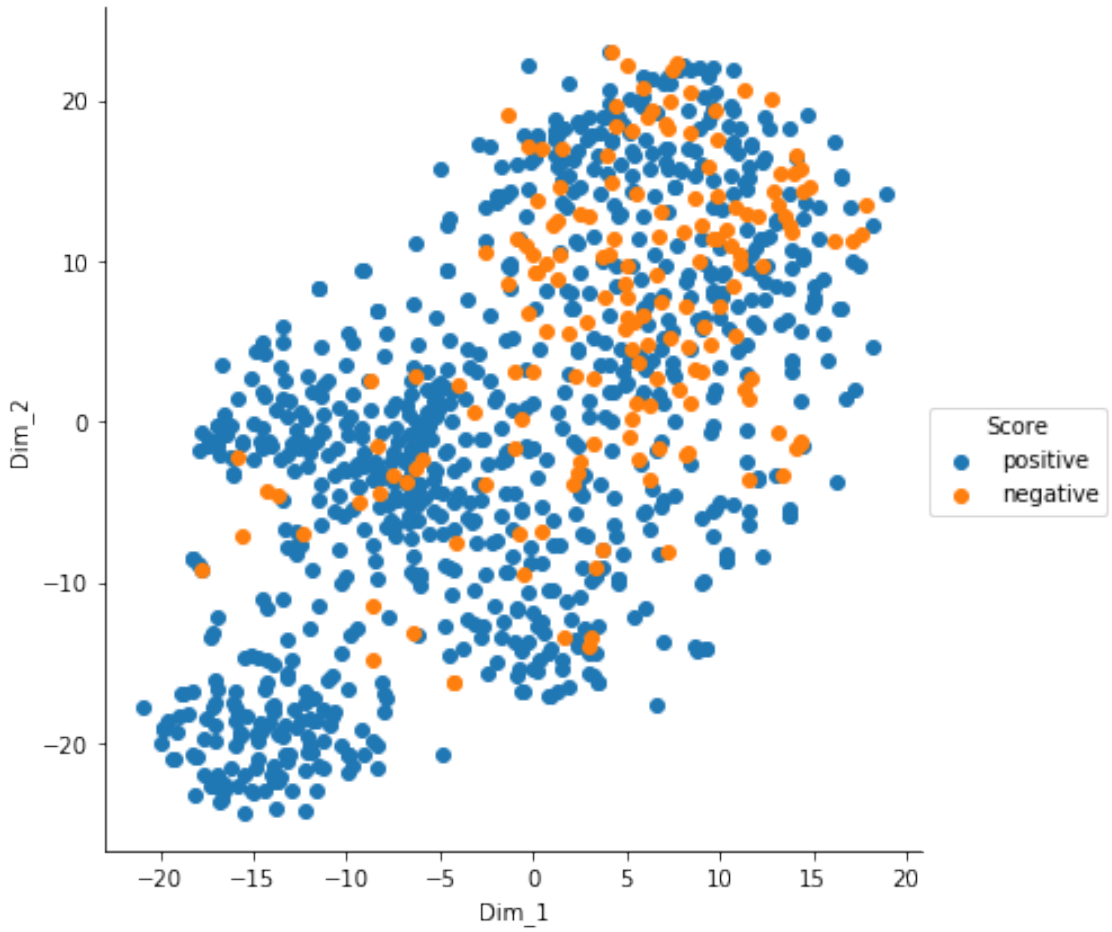
5.0.4 With Perplexity =40

```
In [32]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=40,n_iter=2500)

         tsne_data = model.fit_transform(standardized_data)


         tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

         tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


         sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
         plt.show()
```



5.0.5 With Perplexity = 50

```
In [33]: from sklearn.manifold import TSNE

         model = TSNE(n_components=2, random_state=0,perplexity=50,n_iter=2500)

         tsne_data = model.fit_transform(standardized_data)


         tsne_data = np.vstack((tsne_data.T, final['Score'].head(1000))).T

         tsne_df = pd.DataFrame(data=tsne_data, columns=("Dim_1", "Dim_2", "Score"))


         sn.FacetGrid(tsne_df, hue="Score", size=6).map(plt.scatter, 'Dim_1', 'Dim_2').add_lege
         plt.show()
```



6 Summary:

In This Assignment we have plotted T-SNE for Bag of Words, Average Word2Vec, TF-IDF, Weighted TF-IDF W2V, In all these T-SNE plots we are unable to classify positve and negative reviews into clusters.

6.0.1 Note:

In Every method I have Used subset of data as it is taking huge amount of time to execute on full data set.