AmazonReviews_KNN_Assignment

May 9, 2018

1 AmazonReviews KNN Assignment

```
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

        import matplotlib.pyplot as plt
        from sklearn.cross_validation import train_test_split
        from sklearn.neighbors import KNeighborsClassifier
        from sklearn.metrics import accuracy_score
        from sklearn.cross_validation import cross_val_score
        from collections import Counter
        from sklearn.metrics import accuracy_score
        from sklearn import cross_validation
```

```
C:\Users\Dell\Anaconda3\lib\site-packages\sklearn\cross_validation.py:41: DeprecationWarning:
  "This module will be removed in 0.20.", DeprecationWarning)
```

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

```
In [3]: 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")
```

```
In [4]: # Weighted TF_IDF W2V
        pickle_in =open("WiightedTfidfW2V.pickle","rb")
        tfidf_sent_vectors = pickle.load(pickle_in)
```

```
In [5]: final.shape
```

```
Out[5]: (364171, 11)
```

```
In [6]: final_counts.shape
```

```
Out[6]: (364171, 115281)
```

```
In [7]: scores = final['Score'].get_values()
        len(scores)
```

```
Out[7]: 364171
```

```
In [8]: li = lambda x: 1 if x=='positive'  else 0
        final_scores = []
        for i in range(0,364171):
            final_scores.append(li(scores[i]))
```

1.1 k-fold Cross Validation Using Time Based Split

```
In [57]: from sklearn.model_selection import TimeSeriesSplit

         def k_fold_cross_validation(x_1,y_1):
             li = list(range(0,16))

             #creating odd list of vals for 'k'
             neighbors = list(filter(lambda x: x%2 != 0,li))

             #empty list to hold CV scores/accuracy
             cv_scores = []
```

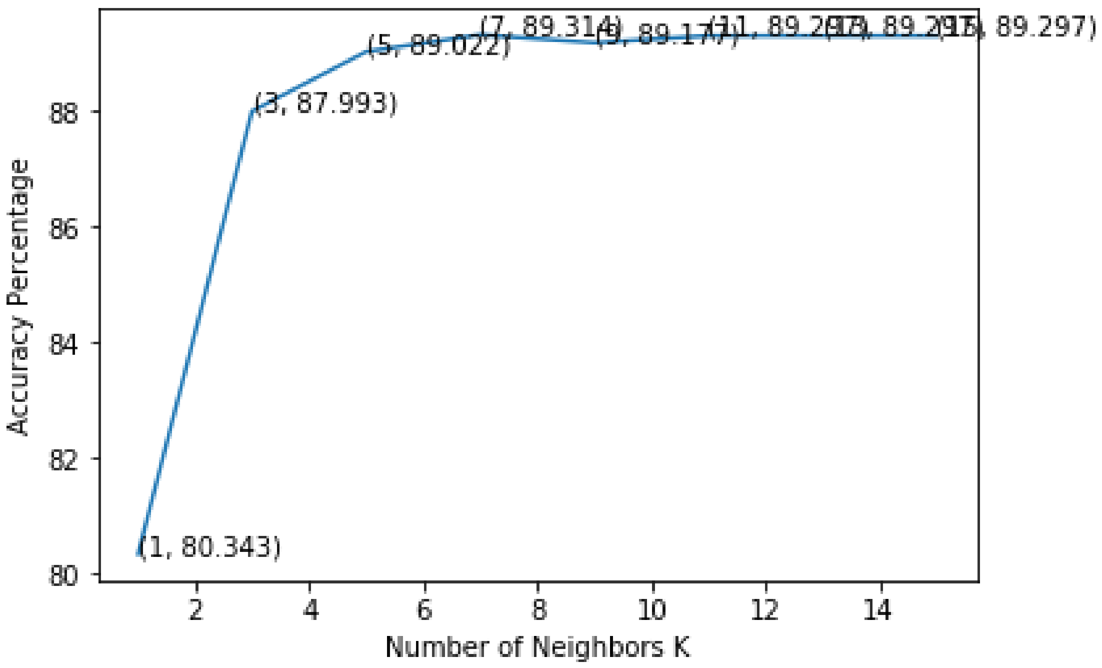
```
    #performing k-fold cross validation with Times Based Split
    for k in neighbors:
        knn = KNeighborsClassifier(n_neighbors=k,algorithm='auto',n_jobs=-1)
        tscv = TimeSeriesSplit(n_splits=5)
        acc_sum=0
        cnt=0
        for train_index, test_index in tscv.split(x_1):
            X_train, X_test = x_1[train_index], x_1[test_index]
            Y_train, Y_test = y_1[train_index], y_1[test_index]
            knn.fit(X_train,Y_train)
            pred = knn.predict(X_test)
            acc = accuracy_score(Y_test, pred, normalize=True )*float(100)
            acc_sum=acc_sum+acc
            cnt=cnt+1
        cv_scores.append(acc_sum/cnt)



    # determining best k
    optimal_k = neighbors[cv_scores.index(max(cv_scores))]
    print('\nThe optimal number of neighbors is %d.' % optimal_k)

    # plot misclassification error vs k
    plt.plot(neighbors, cv_scores)

    for xy in zip(neighbors, np.round(cv_scores,3)):
        plt.annotate('(%s, %s)' % xy, xy=xy, textcoords='data')

    plt.xlabel('Number of Neighbors K')
    plt.ylabel('Accuracy Percentage')
    plt.show()

    print("the Accuracy for each k value is : ", np.round(cv_scores,3))
    print('*********************************************************************')
    print("optimal k value is: ",optimal_k)
    return optimal_k;
```

2 BOW K-Fold CV

```
In [58]: final_counts.shape
```

```
Out[58]: (364171, 115281)
```

```
In [76]: # Total data frame

         x = final_counts[0:10000]
         # this is only Score/rating  of data

         y = final_scores[0:10000]

In [77]: #splitting the train and test data

         x_1, x_test, y_1, y_test = cross_validation.train_test_split(x,y, test_size=0.3, rando

In [78]: #x_1 = np.array(x_1)

         y_1 = np.array(y_1)

         #x_test = np.array(x_test)

         y_test = np.array(y_test)

         x_1

Out[78]: <7000x115281 sparse matrix of type '<class 'numpy.int64'>'
                 with 365189 stored elements in Compressed Sparse Row format>

In [79]: optim_k_val = k_fold_cross_validation(x_1,y_1)


The optimal number of neighbors is 7.
```



```
the Accuracy for each k value is :  [80.343 87.993 89.022 89.314 89.177 89.297 89.297 89.297]
**********************************************************************
optimal k value is:  7
```

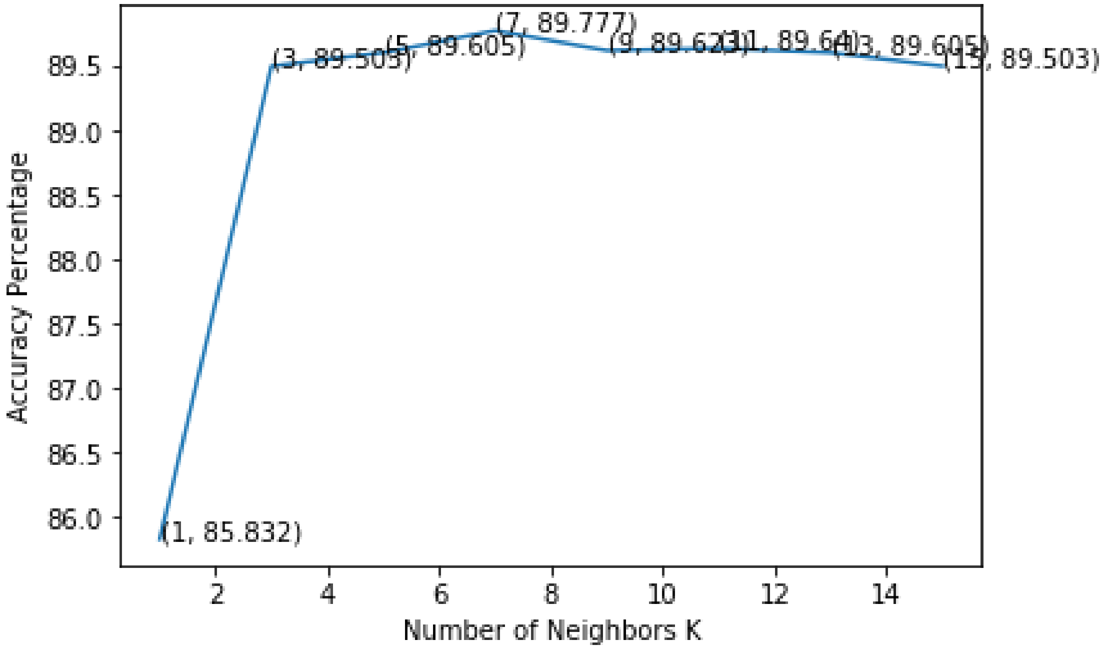
```
In [80]: knn_optimal = KNeighborsClassifier(n_neighbors=optim_k_val)

         # fitting the model
         knn_optimal.fit(x_1, y_1)

         # predict the response
         pred = knn_optimal.predict(x_test)

         # evaluate accuracy
         acc = accuracy_score(y_test, pred) * 100
         print('\nThe accuracy of the knn classifier for k = %d is %f%%' % (optim_k_val, acc))
```

```
The accuracy of the knn classifier for k = 7 is 88.233333%
```

3 TF_IDF K-fold CV

```
In [81]: final_tf_idf.shape

Out[81]: (364171, 2910192)

In [85]: # Total data frame
         x = final_tf_idf[0:10000]

         # this is only Score/rating  of data
         y = final_scores[0:10000]

In [86]: #splitting the train and test data

         x_1, x_test, y_1, y_test = cross_validation.train_test_split(x,y, test_size=0.3, rand

         y_1 = np.array(y_1)
         y_test = np.array(y_test)

In [87]: opt_val = k_fold_cross_validation(x_1,y_1)
```

```
The optimal number of neighbors is 7.
```



```
the Accuracy for each k value is :  [85.832 89.503 89.605 89.777 89.623 89.64  89.605 89.503]
********************************************************************
optimal k value is:  7
```

```
In [88]: knn_optimal = KNeighborsClassifier(n_neighbors=opt_val)

         # fitting the model
         knn_optimal.fit(x_1, y_1)

         # predict the response
         pred = knn_optimal.predict(x_test)

         # evaluate accuracy
         acc = accuracy_score(y_test, pred) * 100
         print('\nThe accuracy of the knn classifier for k = %d is %f%%' % (opt_val, acc))
```

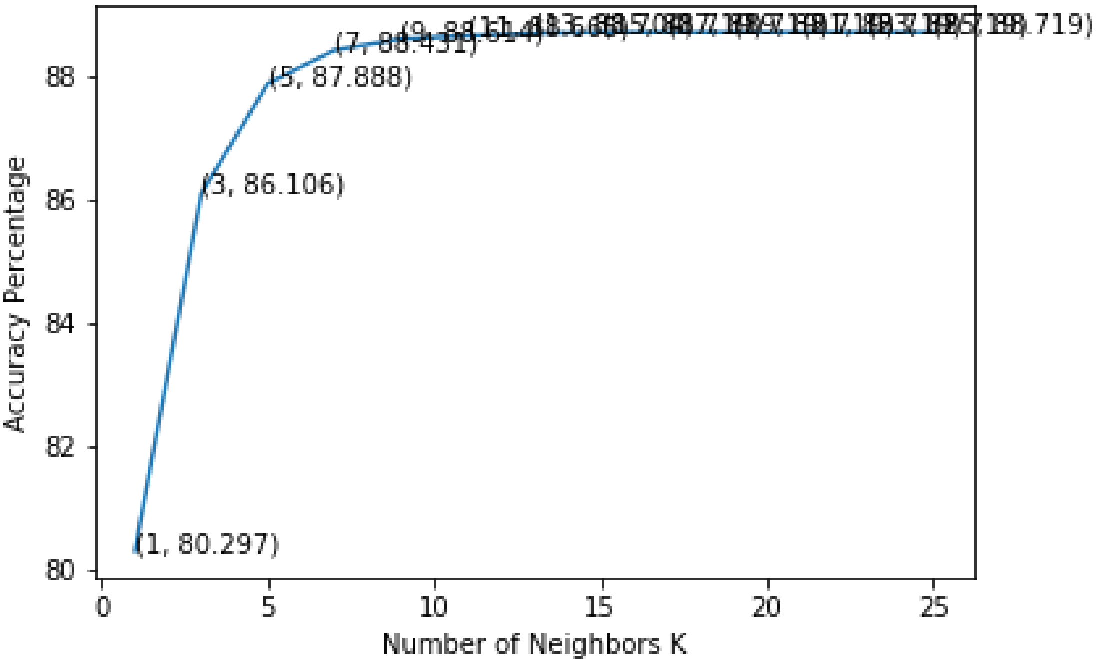
```
The accuracy of the knn classifier for k = 7 is 88.766667%
```

4 W2V K-Fold CV

```
In [17]: # Total data frame
         x = sent_vectors[0:50000]
```

```
        # this is only Score/rating  of data
        y = final_scores[0:50000]

In [18]: #splitting the train and test data

        x_1, x_test, y_1, y_test = cross_validation.train_test_split(x,y, test_size=0.2, rando

        y_1 = np.array(y_1)
        y_test = np.array(y_test)

        x_1 = np.array(x_1)
        x_test = np.array(x_test)

In [19]: opt_val = k_fold_cross_validation(x_1,y_1)
```

```
The optimal number of neighbors is 15.
```



```
the Accuracy for each k value is :  [80.297 86.106 87.888 88.431 88.614 88.665 88.704 88.719 88
 88.719 88.719 88.719]
*********************************************************************
optimal k value is:  15
```

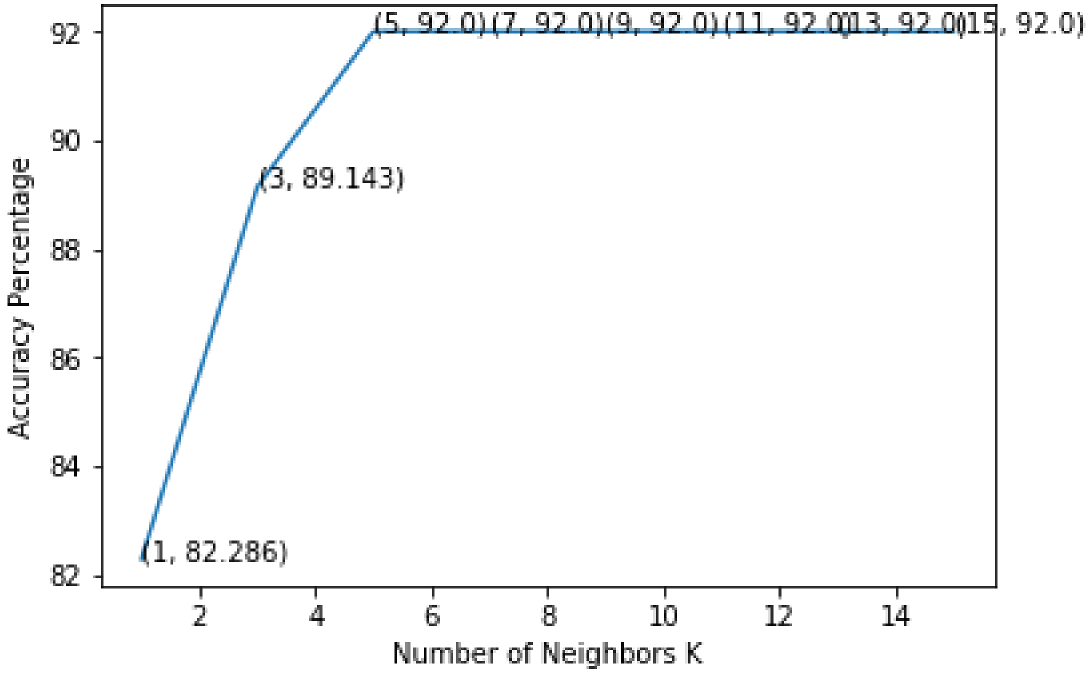
```
In [20]: knn_optimal = KNeighborsClassifier(n_neighbors=opt_val)

         # fitting the model
         knn_optimal.fit(x_1, y_1)

         prediction = knn_optimal.predict(x_test)

         acc = accuracy_score(y_test, prediction) * 100

         print('\nThe accuracy of the knn classifier for k = %d is %f%%' % (opt_val, acc))
```

```

The accuracy of the knn classifier for k = 15 is 88.700000%
```

5 Weighted TF-IDF W2V K-Fold CV

```
In [89]: len(tfidf_sent_vectors)

Out[89]: 1000

In [94]: x = tfidf_sent_vectors[0:300]

         y = final_scores[0:300]

In [95]: x_1, x_test, y_1, y_test = cross_validation.train_test_split(x,y, test_size=0.3, rando


         y_1 = np.array(y_1)
         y_test = np.array(y_test)

         x_1 = np.array(x_1)
         x_test = np.array(x_test)

In [96]: len(y_test)

Out[96]: 90

In [97]: opt_val = k_fold_cross_validation(x_1,y_1)
```

```

The optimal number of neighbors is 5.
```



```
the Accuracy for each k value is :  [82.286 89.143 92.    92.    92.    92.    92.    92.   ]
********************************************************************
optimal k value is:  5
```

```
In [98]: knn_optimal = KNeighborsClassifier(n_neighbors=3)

         knn_optimal.fit(x_1,y_1)

         pred = knn_optimal.predict(x_test)

         acc = accuracy_score(y_test,pred) * 100

         print('\nThe accuracy of the knn classifier for k = %d is %f%%' % (opt_val, acc))
```

```

The accuracy of the knn classifier for k = 5 is 97.777778%
```

6 Summary:

After performing K-Fold Cross Validation here are the results of diff techniques:

1) BOW -> k = 7 acc= 88.23%

2) TF-IDF -> k = 7 acc = 88.7%
3) W2V -> k = 15 acc = 88.7%
4) Weighted TF-IDF W2V -> k = 5 acc = 97.7%(due to memory overflow used less datapoints)