Dataset

April 14, 2019

1 Pattern Project

1.1 Import Necessary Library

```
In [371]: import pandas as pd
          import numpy as np
          import glob
          import os
          from os import listdir
          from os.path import isfile, join
          import csv
          from sklearn.preprocessing import LabelEncoder
          import matplotlib.pyplot as plt

          #DecisionTreeClassifier
          from sklearn.tree import DecisionTreeClassifier

          #Gaussian Naive bayes
          from sklearn.naive_bayes import GaussianNB

          #svm with rbf karnel
          import sklearn
          from sklearn import svm, preprocessing
          #SVM
          from sklearn import datasets,svm
          from sklearn.cross_validation import train_test_split
          from sklearn import metrics
          #CN Matrix
          from sklearn.metrics import accuracy_score, confusion_matrix

          #Algo
          from sklearn.linear_model import LogisticRegression
          from sklearn.neighbors import KNeighborsClassifier
          from sklearn.naive_bayes import GaussianNB
          from sklearn.naive_bayes import BernoulliNB
          from sklearn.svm import SVC
          from sklearn.svm import LinearSVC
          from sklearn.ensemble import RandomForestClassifier
          from sklearn.tree import DecisionTreeRegressor
          from sklearn import model_selection
```

1.2 Import DataSet

```
In [162]: dataFrame0 = pd.read_csv("F:/python/4.2/project/main/dataset/DATASET_01.csv")
          dataFrame1 = pd.read_csv("F:/python/4.2/project/main/dataset/DATASET_02.csv")
          dataFrame2 = pd.read_csv("F:/python/4.2/project/main/dataset/DATASET_03.csv")
          dataFrame3 = pd.read_csv("F:/python/4.2/project/main/dataset/DATASET_04.csv")
          dataFrame4 = pd.read_csv("F:/python/4.2/project/main/dataset/DATASET_05.csv")
          dataFrame5 = pd.read_csv("F:/python/4.2/project/main/dataset/DATASET_06.csv")

          dataFrame0.head()
          #dataFrame1.head()
          #dataFrame2.head()
          #dataFrame3.head()
          #dataFrame4.head()
          #dataFrame5.head()
```

```
Out[162]:     Unnamed: 0 Current Place  Unnamed: 2  Unnamed: 3 Place of interest  \
          0          NaN    Place Name    Latitude   Longitude        Place Name
          1  151340976.0         Goran    23.75027    90.43413       Cox's Bazar
          2  151340977.0      Banasree   22.513531   88.301537         Sea Beach
          3  151340978.0       Azimpur  23.7270399  90.3846895       Kaptai Lake
          4  151340980.0       Niketon    23.70731    90.41548              home

            Unnamed: 5 Unnamed: 6 Food you like most Leisure time activity  \
          0   Latitude  Longitude                NaN                   NaN
          1   21.41127  91.995891           Biriyani                Movies
          2        NaN        NaN            Kachchi                Sports
          3  22.755208  92.277031      kacchi biryani                Series
          4   23.70731   90.41548                any         movies,music

                               Future plan Typically your days are started at:
          0                            NaN                                 NaN
          1              Software Engineer                                  LR
          2                   BCS/Business                                  LR
          3  Higher Study in North America                                  ER
          4              software Engineer                                  LR
```

1.3 Dataset Concatenate

```
In [165]: #path = "F:/python/4.2/project/main/dataset/"
          #filenames = [path+'DATASET_01.csv', 'dataset/DATASET_02.csv', 'dataset/DATASET_03.c
           #           'dataset/DATASET_05.csv', 'dataset/DATASET_06.csv']

          #dataFrames = []
          #for f in filenames:
```

```
          #    dataFrames.append(pd.read_csv(f))
          #outputFile = "dataset/finalData/finalData.csv"
          #data_dir= glob.glob(os.path.join(path, '*.csv'))
          #print(os.listdir(data_dir))
```

```
In [62]: #filenames = glob('dataset/DATASET*.csv')
         #dataFrames = [pd.read_csv(f) for f in filenames]
```

```
In [201]: def concatenate (indir = "F:/python/4.2/project/main/dataset/", outfile = "F:/python/
              #os.chdir(indir)
              #fileList = glob.glob(indir+"*.csv")
              fileList = [f for f in listdir(indir) if isfile(join(indir, f))]
              dfList = []
              #colnames=["ID"]
              for filename in fileList:
                  print(filename)
                  df = pd.read_csv(filename, header= None)
                  dfList.append(df)
              concateDf= pd.concat(dfList, axis=0)
              concateDf.to_csv(outfile, index = None)
          concatenate()
```

```
DATASET_01.csv
DATASET_02.csv
DATASET_03.csv
DATASET_04.csv
DATASET_05.csv
DATASET_06.csv
```

1.3.1 Column Add from other Dataset

```
In [212]: # Loading data and preprocessing
          filePath1 = "F:/python/4.2/project/main/dataset/Total/TotalfinalData_1.csv"
          filePath2 = "F:/python/4.2/project/main/extra/EXTENDED_1.csv"
          mergedFile = "F:/python/4.2/project/main/dataset/Total/TotalfinalData_3.csv"

          df1 = pd.read_csv(filePath1)
          df2 = pd.read_csv(filePath2)
          columnsNeed = ["ID", "AcademicResult", "Co_curri", "Skill","Achi","Physical","Higher
          for column in df2.columns:
              dropChecker = True
              for colName in columnsNeed:
                  if column == colName:
                      dropChecker = False
                      break

              if dropChecker == True:
                  df2.drop(column, axis=1, inplace=True)
```

```
        merged = df1.merge(df2, on="ID")
        # for column in df1
        merged.to_csv(mergedFile, index=False)

        data_frame = pd.read_csv("F:/python/4.2/project/main/dataset/Total/TotalfinalData_fi
```

1.4 Dataset Processed

```
In [206]: cols = ["ID", "Name", "OLat", "OLong","PI", "PILat", "PIlong", "Food", "Leisure", "F
          df = pd.read_csv("F:/python/4.2/project/main/dataset/Total/TotalfinalData_final.csv"
          df.columns = [''] * len(df.columns)
          df = df[1:]
          df.reset_index(drop=True)
          df.columns = cols

          df.drop(['Name'], axis = 1, inplace = True)
          df.drop(['ID'], axis = 1, inplace = True)
          df.head()
```

```
Out[206]:          OLat       OLong           PI       PILat     PIlong      Food  \
          1    23.75027    90.43413  Cox's Bazar    21.41127  91.995891  Biriyani
          2   22.513531   88.301537  Cox's Bazar     20.9232    92.2676  Biriyani
          3  23.7270399  90.3846895  Kaptai Lake   22.755208  92.277031  Biriyani
          4    23.70731    90.41548         home    23.70731   90.41548       any
          5   22.301411   70.822357         home   22.301411  70.822357  Sea food

                   Leisure                             FP  LR  AcademicResult  \
          1         Movies              Software Engineer  LR            3.13
          2         Sports                   BCS/Business  LR            2.71
          3         Series  Higher Study in North America  ER            3.59
          4  Movies, Music              Software Engineer  LR            2.92
          5          Music                    Businessman  LR            2.53

                  Co_curri            Skill  Achi Physical Higher
          1           None             None   1.0      Yes     No
          2           None  Web Development   5.0      Yes    Yes
          3  Club committee            None   2.0      Yes     No
          4           None             None   1.0      Yes     No
          5           None             Java   3.0       No    Yes
```

1.5 Label the Dataset

```
In [238]: df.dropna(axis = 0, inplace = True)
          lb_make = LabelEncoder()
          df["PI"] = lb_make.fit_transform(df["PI"])
          df["Food"] = lb_make.fit_transform(df["Food"])
          df["Leisure"] = lb_make.fit_transform(df["Leisure"])
```

```
         df["FP"] = lb_make.fit_transform(df["FP"])
         df["LR"] = lb_make.fit_transform(df["LR"])
         df["Co_curri"] = lb_make.fit_transform(df["Co_curri"])
         df["Skill"] = lb_make.fit_transform(df["Skill"])
         df["Physical"] = lb_make.fit_transform(df["Physical"])
         df["Higher"] = lb_make.fit_transform(df["Higher"])
         df.head()
```

```
Out[238]:            OLat        OLong  PI        PILat       PIlong  Food  Leisure  FP  \
         29    23.828959    90.375672  33    48.856613     2.352222    44        4  35
         105  23.7325976   90.4025838  45    40.463669     -3.74922    38       42  31
         108   23.738078    90.372485   9     21.43392     91.98703    47       39  14
         43     20.53829     86.30937   1      21.8311    92.368629    20       20  27
         57     20.53829     86.30937  36   20.6237016   92.3233948     9       45  33

              LR  AcademicResult  Co_curri  Skill  Achi  Physical  Higher
         29    1            3.41         1      2   3.0         1       1
         105   1            3.36         1      0   3.0         1       1
         108   1            3.07         1      0   1.0         0       0
         43    1            2.89         1      1   2.0         0       0
         57    1            3.07         1      4   2.0         0       0
```

1.6 Classifier - Problem 1

```
In [239]: df = sklearn.utils.shuffle(df)
          x = df.drop("Higher",axis = 1).values
          y = df["Higher"].values
```

1.6.1 Decision Tree - Accuracy Test

```
In [253]: test_size = int(0.2*len(x))
          train_x = x[:-test_size]
          train_y = y[:-test_size]
          test_x = x[-test_size:]
          test_y = y[-test_size:]

          clf = DecisionTreeClassifier()
          clf.fit(train_x, train_y)
          clf.score(test_x, test_y)

          #print(clf.predict([train_x[7]]))
```

```
Out[253]: 0.46153846153846156
```

1.6.2 Test single Data - Decision Tree

```
In [225]: print(clf.predict([train_x[6]]))
          #1-Yes, 0 -No
```

```
[1]
```

1.6.3 Gaussian Naive Bayes - Accuracy Test

```
In [231]: #Gaussian Naive bayes
          clf = GaussianNB()
          clf.fit(train_x, train_y)
          clf.score(test_x, test_y)

Out[231]: 0.65384615384615385
```

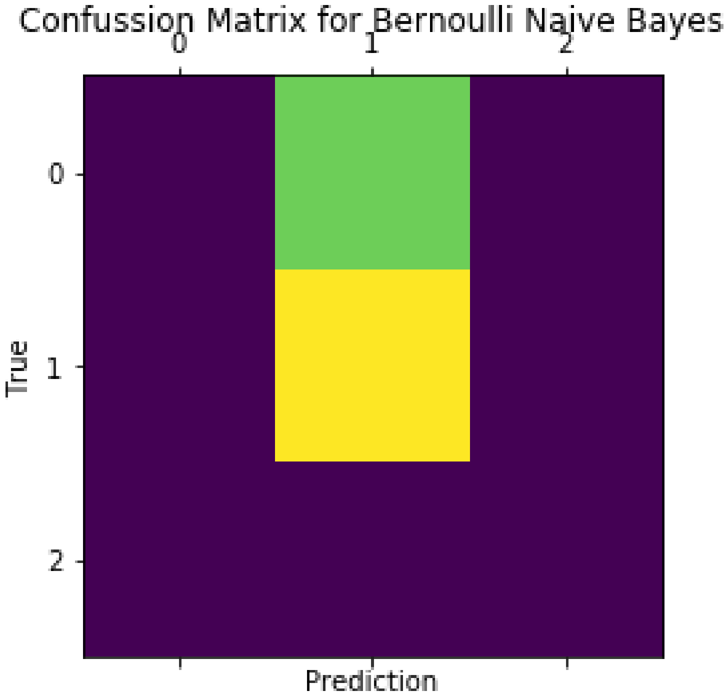
1.6.4 Bernouli Naive Bayes

```
In [332]: from sklearn.naive_bayes import BernoulliNB
          model1=BernoulliNB()
          model1.fit(X_train,y_train)
          predict1=model1.predict(X_test)
          x=y_test.iloc[:].values

          length1=len(predict1)
          correct1=0
          for i in range(length1):
              if(x[i]==predict1[i]):
                  correct1=correct1+1
          print(correct1)

          accuracy1=correct1*100/len(x)
          print(accuracy1)
```

```
9
56.25
```

```
In [333]: print(metrics.confusion_matrix(y_test,predict1,labels=[0,1,2]))
          cm=metrics.confusion_matrix(y_test,predict1,labels=[0,1,2])
          fig = plt.figure()
          ax = fig.add_subplot(111)
          cax = ax.matshow(cm)
          plt.title('Confussion Matrix for Bernoulli Naive Bayes')
          plt.xlabel('Prediction')
          plt.ylabel('True')
          plt.show()
```

```
[[0 7 0]
 [0 9 0]
 [0 0 0]]
```



1.6.5 svm with rbf kernel

```
In [261]: #svm with rbf karnel
          df = sklearn.utils.shuffle(df)
          x = df.drop("Higher",axis = 1).values
          y = df["Higher"].values

          x = preprocessing.scale(x)
          test_size = int(0.2*len(x))
          train_x = x[:-test_size]
          train_y = y[:-test_size]
          test_x = x[-test_size:]
          test_y = y[-test_size:]

          clf = svm.SVR(kernel = "rbf")
          clf.fit(train_x, train_y)
          abs(clf.score(test_x, test_y))
```

```
C:\Users\nasim\Anaconda3\envs\workshop\lib\site-packages\sklearn\utils\validation.py:475: DataC
  warnings.warn(msg, DataConversionWarning)
```

```
Out[261]: 0.40339571140762054
```

1.6.6 SVM

```
In [325]: X=df.drop('Higher',axis=1)
          y=df['Higher']
          X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.12)

          model=svm.SVC(kernel='linear')
          model.fit(X_train,y_train)
```

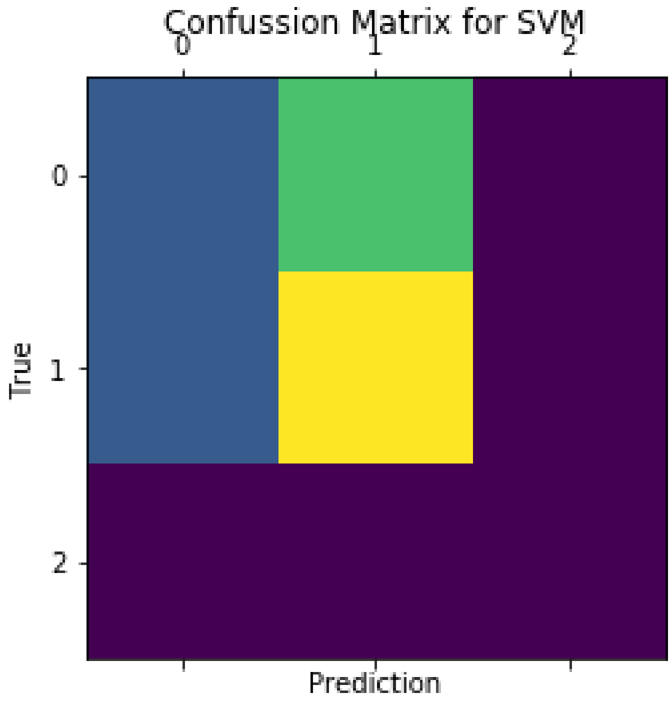
```
Out[325]: SVC(C=1.0, cache_size=200, class_weight=None, coef0=0.0,
            decision_function_shape='ovr', degree=3, gamma='auto', kernel='linear',
            max_iter=-1, probability=False, random_state=None, shrinking=True,
            tol=0.001, verbose=False)
```

```
In [330]: predict=model.predict(X_test)
          x=y_test.iloc[:].values
          length=len(predict)

          correct=0
          for i in range(length):
              if(predict[i]==x[i]):
                  correct+=1
          print(correct)

          accuracy=correct*100/len(x)
          print(accuracy)
```

```
9
56.25
```

```
In [331]: #print("{0}".format(metrics.confusion_matrix(y_test,predict,labels=[0,1,2])))
          print(metrics.confusion_matrix(y_test,predict,labels=[0,1,2]))
          cm=metrics.confusion_matrix(y_test,predict,labels=[0,1,2])
          fig = plt.figure()
          ax = fig.add_subplot(111)
          cax = ax.matshow(cm)
          plt.title('Confussion Matrix for SVM')
          plt.xlabel('Prediction')
          plt.ylabel('True')
          plt.show()
```

```
[[2 5 0]
 [2 7 0]
 [0 0 0]]
```



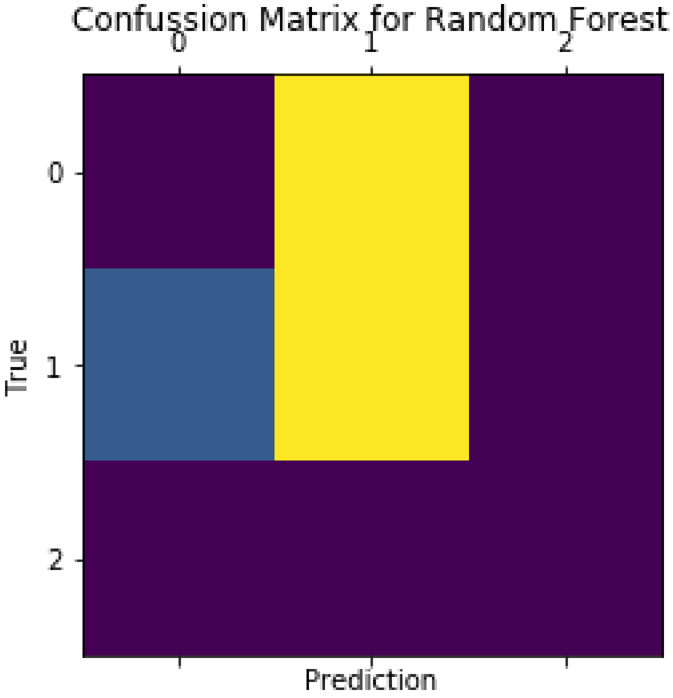
1.6.7 Random Forest Classifier

```
In [356]: model=RandomForestClassifier()
          mode2=DecisionTreeRegressor()

          model.fit(X_train,y_train)
          mode2.fit(X_train,y_train)

          predict3=model3.predict(X_test)
          predict4=model4.predict(X_test)

          length3=len(predict3)
          correct3=0
          for i in range(length3):
              if(x[i]==predict3[i]):
                  correct3=correct3+1
          print(correct3)
          accuracy3=correct3*100/len(x)
          print(accuracy3)
```

```
9
56.25
```

```
In [335]: print(metrics.confusion_matrix(y_test,predict3,labels=[0,1,2]))
          cm=metrics.confusion_matrix(y_test,predict3,labels=[0,1,2])
          fig = plt.figure()
          ax = fig.add_subplot(111)
          cax = ax.matshow(cm)
          plt.title('Confussion Matrix for Random Forest')
          plt.xlabel('Prediction')
          plt.ylabel('True')
          plt.show()
```

```
[[0 7 0]
 [2 7 0]
 [0 0 0]]
```

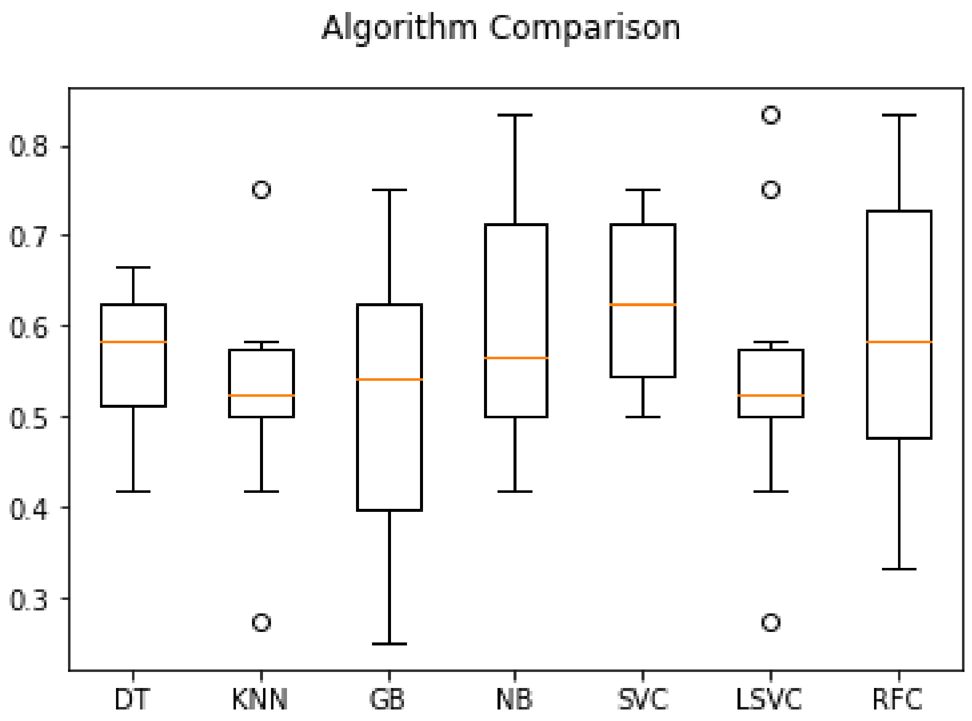


1.6.8 Box Plot for Algorithm Comparison

```
In [345]: models = []
          models.append(('DT', LogisticRegression()))
          models.append(('KNN', KNeighborsClassifier()))
          models.append(('GB', GaussianNB()))
          models.append(('NB', BernoulliNB()))
          models.append(('SVC', SVC()))
          models.append(('LSVC', LinearSVC()))
          models.append(('RFC', RandomForestClassifier()))

          seed = 7
          results = []
          names = []
          X = X_train
          Y = y_train

          for name, model in models:
              kfold = model_selection.KFold(
                  n_splits=10, random_state=seed)
              cv_results = model_selection.cross_val_score(
                  model, X, Y, cv=kfold, scoring='accuracy')
              results.append(cv_results)
              names.append(name)
              msg = "%s: %f " % (name, cv_results.mean()*100)
              print(msg)
```

```
DT: 56.363636
KNN: 51.969697
GB: 51.363636
NB: 59.772727
SVC: 62.348485
LSVC: 54.469697
RFC: 58.636364
```

```
In [346]: fig = plt.figure()
          fig.suptitle('Algorithm Comparison')
          ax = fig.add_subplot(111)
          plt.boxplot(results)
          ax.set_xticklabels(names)
          plt.show()
```



1.7 Classifier - Problem 2

```
In [263]: df = sklearn.utils.shuffle(df)
          x = df.drop("Physical",axis = 1).values
          y = df["Physical"].values
```

```
In [283]: #Decision Tree
          test_size = int(0.2*len(x))
          train_x = x[:-test_size]
          train_y = y[:-test_size]
          test_x = x[-test_size:]
          test_y = y[-test_size:]

          clf = DecisionTreeClassifier()
          clf.fit(train_x, train_y)
          #clf.score(test_x, test_y)
          print('Accuracy:', clf.score(test_x, test_y))

          #print(clf.predict([train_x[7]]))
```

```
Accuracy: 0.384615384615
```

```
In [295]: #Gaussian Naive bayes
          clf = GaussianNB()
          clf.fit(train_x, train_y)
          #clf.score(test_x, test_y)
          print('Accuracy:', clf.score(test_x, test_y))

Accuracy: 0.461538461538
```

```
In [297]: #svm with rbf karnel
          df = sklearn.utils.shuffle(df)
          x = df.drop("Higher",axis = 1).values
          y = df["Higher"].values

          x = preprocessing.scale(x)
          test_size = int(0.2*len(x))
          train_x = x[:-test_size]
          train_y = y[:-test_size]
          test_x = x[-test_size:]
          test_y = y[-test_size:]

          clf = svm.SVR(kernel = "rbf")
          clf.fit(train_x, train_y)
          #abs(clf.score(test_x, test_y))
          print('Accuracy:', abs(clf.score(test_x, test_y)))

Accuracy: 0.588040596803


C:\Users\nasim\Anaconda3\envs\workshop\lib\site-packages\sklearn\utils\validation.py:475: Data
  warnings.warn(msg, DataConversionWarning)
```

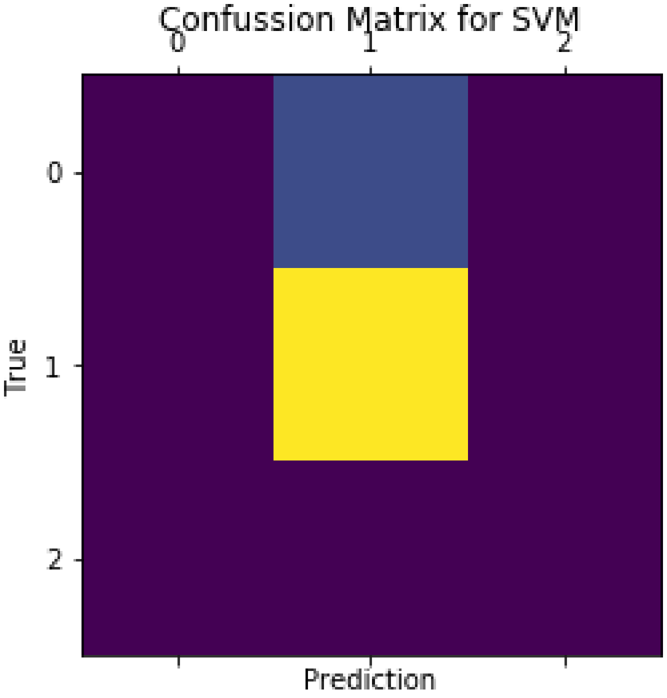
1.7.1 SVM

```
In [363]: X=df.drop('LR',axis=1)
          y=df['LR']
          X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.12)

          model=svm.SVC(kernel='linear')
          model.fit(X_train,y_train)

Out[363]: SVC(C=1.0, cache_size=200, class_weight=None, coef0=0.0,
            decision_function_shape='ovr', degree=3, gamma='auto', kernel='linear',
            max_iter=-1, probability=False, random_state=None, shrinking=True,
            tol=0.001, verbose=False)

In [364]: predict=model.predict(X_test)
          x=y_test.iloc[:].values
          length=len(predict)
          correct=0
          for i in range(length):
              if(predict[i]==x[i]):
                  correct+=1
          print(correct)

          accuracy=correct*100/len(x)
          print(accuracy)
```

```
13
81.25
```

```
In [366]: #print("{0}".format(metrics.confusion_matrix(y_test,predict,labels=[0,1,2])))
          print(metrics.confusion_matrix(y_test,predict,labels=[0,1,2]))
          cm=metrics.confusion_matrix(y_test,predict,labels=[0,1,2])
          fig = plt.figure()
          ax = fig.add_subplot(111)
          cax = ax.matshow(cm)
          plt.title('Confussion Matrix for SVM')
          plt.xlabel('Prediction')
          plt.ylabel('True')
          plt.show()
```

```
[[ 0  3  0]
 [ 0 13  0]
 [ 0  0  0]]
```



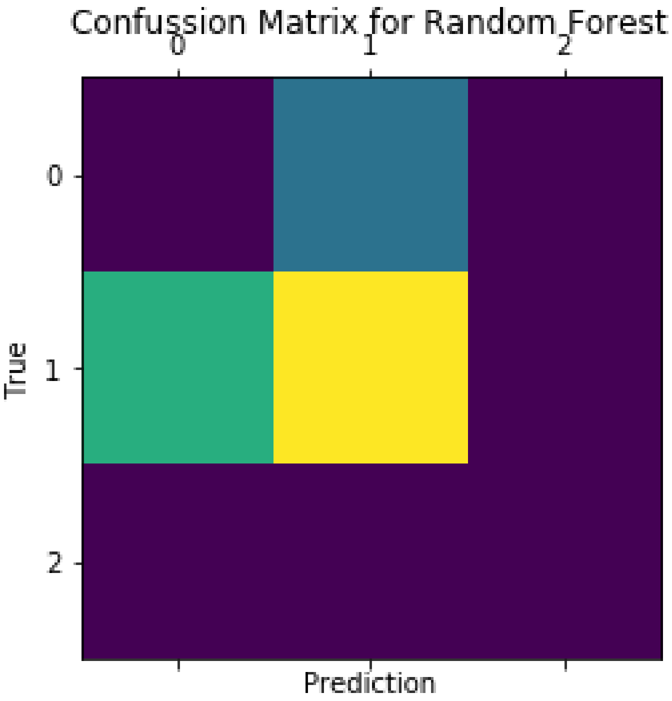
1.7.2 Random Forest Classifier

```
In [367]: model=RandomForestClassifier()
          mode2=DecisionTreeRegressor()

          model.fit(X_train,y_train)
          mode2.fit(X_train,y_train)

          predict3=model3.predict(X_test)
          predict4=model4.predict(X_test)

          length3=len(predict3)
          correct3=0
          for i in range(length3):
              if(x[i]==predict3[i]):
                  correct3=correct3+1
          print(correct3)
          accuracy3=correct3*100/len(x)
          print(accuracy3)
```

```
8
50.0
```

```
In [368]: print(metrics.confusion_matrix(y_test,predict3,labels=[0,1,2]))
          cm=metrics.confusion_matrix(y_test,predict3,labels=[0,1,2])
          fig = plt.figure()
          ax = fig.add_subplot(111)
          cax = ax.matshow(cm)
          plt.title('Confussion Matrix for Random Forest')
          plt.xlabel('Prediction')
          plt.ylabel('True')
          plt.show()
```

```
[[0 3 0]
 [5 8 0]
 [0 0 0]]
```



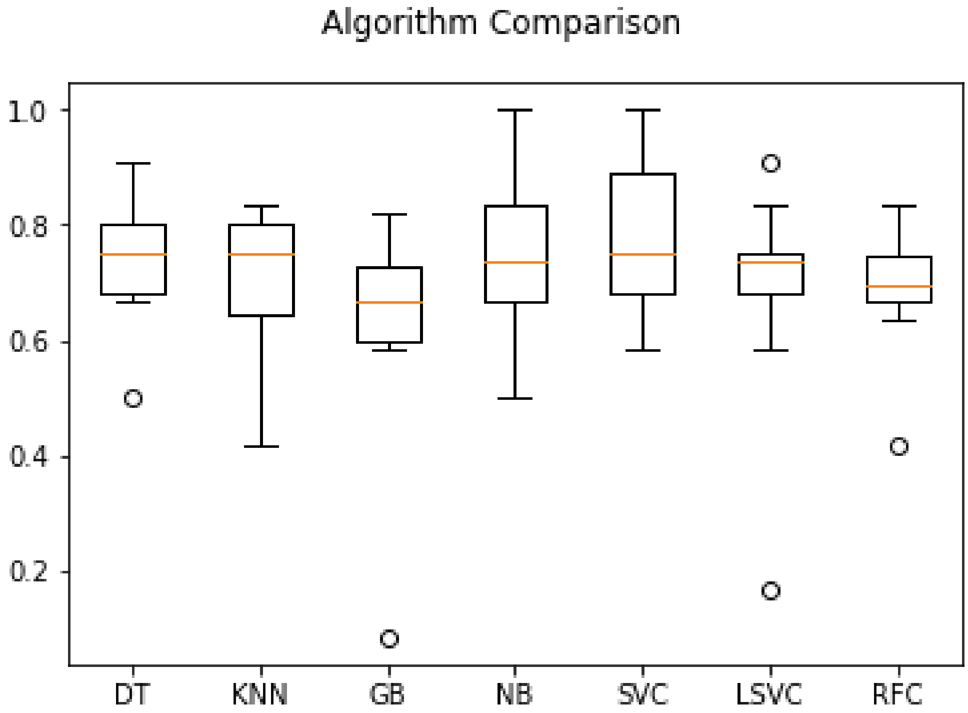
1.7.3 Boxplot for algorithm comparison

```
In [369]: models = []
          models.append(('DT', LogisticRegression()))
          models.append(('KNN', KNeighborsClassifier()))
          models.append(('GB', GaussianNB()))
          models.append(('NB', BernoulliNB()))
          models.append(('SVC', SVC()))
          models.append(('LSVC', LinearSVC()))
          models.append(('RFC', RandomForestClassifier()))

          seed = 7
          results = []
          names = []
          X = X_train
          Y = y_train

          for name, model in models:
              kfold = model_selection.KFold(
                  n_splits=10, random_state=seed)
              cv_results = model_selection.cross_val_score(
                  model, X, Y, cv=kfold, scoring='accuracy')
              results.append(cv_results)
              names.append(name)
```

```
            msg = "%s: %f " % (name, cv_results.mean()*100)
            print(msg)
```

```
DT: 73.712121
KNN: 70.227273
GB: 62.727273
NB: 75.227273
SVC: 77.727273
LSVC: 68.636364
RFC: 69.242424
```

```
In [370]: fig = plt.figure()
          fig.suptitle('Algorithm Comparison')
          ax = fig.add_subplot(111)
          plt.boxplot(results)
          ax.set_xticklabels(names)
          plt.show()
```



1.7.4 Error Rate Calculation

```
In [351]: #error rate = (1 - (test_y / train_y)) * 100
```

```
In [ ]:
```