DecisionTree_3_train_10_val

November 26, 2017

In [284]:
```
%matplotlib inline
```

In [285]:
```
from pathlib import Path
from pandas import DataFrame,Series
from pandas.plotting import scatter_matrix
from sklearn.model_selection import train_test_split
from sklearn import tree
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score
import pandas as pd
from matplotlib.colors import ListedColormap
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix
import numpy as np
import scipy.stats as stats
import pylab as pl
from random import sample
```

In [286]:
```
#Description of features
#Average[3]: Average acceleration (for each axis)
#Standard Deviation[3]: Standard deviation (for each axis)
#Average Absolute Difference[3]: Average absolute
#difference between the value of each of the 200 readings
#within the ED and the mean value over those 200 values
#(for each axis)
#Average Resultant Acceleration[1]: Average of the square
#roots of the sum of the values of each axis squared
#over the ED
#Time Between Peaks[3]: Time in milliseconds between
#peaks in the sinusoidal waves associated with most
#activities (for each axis)
#Binned Distribution[30]: We determine the range of values
#for each axis (maximum  minimum), divide this range into
#10 equal sized bins, and then record what fraction of the
#200 values fell within each of the bins.
```

In [287]:
```
my_file = Path("/Users/bharu/CS690-PROJECTS/ActivityAnalyzer/activity_analyzer/Decisi
df = pd.read_csv(my_file)
```

```
          df.head()
          df.shape#(no of rows, no of columns)
```

```
Out[287]: (417, 46)
```

```
In [288]: df['color'] = Series([(0 if x == "walking" else 1) for x in df['Label']])
          my_color_map = ListedColormap(['r','g'],'mycolormap')
          #0,red,walking
          #1,green,running

          df_unique = df.drop_duplicates(subset=['User', 'Timestamp'])
          df_unique.head()
          df_unique.shape
```

```
Out[288]: (406, 47)
```

```
In [289]: X_train = df_unique.values[:,2:45]
```

```
In [290]: Y_train = df_unique.values[:,45]
```

```
In [291]: test_file = Path("/Users/bharu/CS690-PROJECTS/ActivityAnalyzer/activity_analyzer/Dec
          df_test = pd.read_csv(test_file)
          df_test.head()
          df_test.shape#(no of rows, no of columns)
```

```
Out[291]: (518, 46)
```

```
In [292]: df_test['color'] = Series([(0 if x == "walking" else 1) for x in df_test['Label']])
          #0,red,walking
          #1,green,running
```

```
In [293]: df_unique_test = df_test.drop_duplicates(subset=['User', 'Timestamp'])
          df_unique_test.head()
          df_unique_test.shape
```

```
Out[293]: (415, 47)
```

```
In [294]: X_test = df_unique_test.values[:,2:45]
```

```
In [295]: Y_test = df_unique_test.values[:,45]
```

```
In [296]: df_gini = DecisionTreeClassifier(criterion = 'gini')
```

```
In [297]: df_gini.fit(X_train, Y_train)
```

```
Out[297]: DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=None,
                      max_features=None, max_leaf_nodes=None,
                      min_impurity_decrease=0.0, min_impurity_split=None,
                      min_samples_leaf=1, min_samples_split=2,
                      min_weight_fraction_leaf=0.0, presort=False, random_state=None,
                      splitter='best')
```

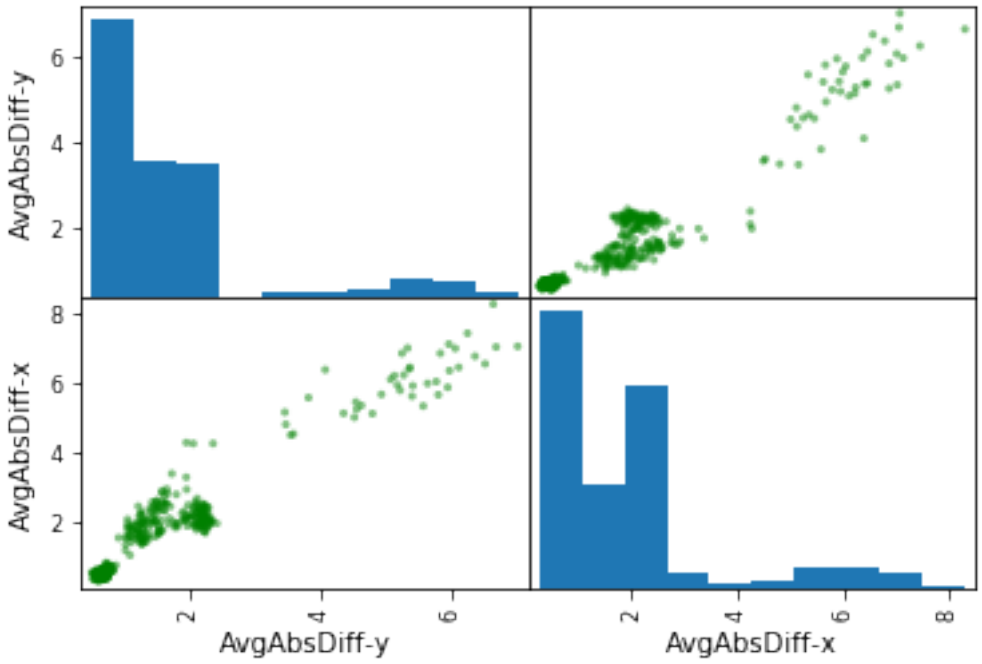
```
In [298]: feature_imp = df_gini.feature_importances_
          feature_imp

Out[298]: array([ 0.        ,  0.        ,  0.0198219 ,  0.        ,  0.        ,
                  0.        ,  0.        ,  0.        ,  0.        ,  0.03028083,
                  0.        ,  0.        ,  0.        ,  0.        ,  0.        ,
                  0.        ,  0.        ,  0.        ,  0.        ,  0.        ,
                  0.        ,  0.        ,  0.        ,  0.        ,  0.        ,
                  0.        ,  0.        ,  0.        ,  0.        ,  0.        ,
                  0.        ,  0.00802372,  0.11739899,  0.00988926,  0.77710611,
                  0.        ,  0.00998256,  0.00979727,  0.        ,  0.        ,
                  0.        ,  0.01769937,  0.        ])

In [299]: #Predicting using test data
          Y_predict_gini = df_gini.predict(X_test)

In [300]: #Calculating accuracy score
          score = accuracy_score(Y_test,Y_predict_gini)
          score

Out[300]: 0.70843373493975903

In [301]: cm = confusion_matrix(Y_test,Y_predict_gini)
          cm

Out[301]: array([[169,  20],
                 [101, 125]])

In [302]: #Predicting using test data
          #taking size of test data 10% of training data
          test_small = df_unique_test.iloc[sample(range(len(df_unique_test)), 40), :]
          X_test_small = test_small.values[:,2:45]
          Y_test_small = test_small.values[:,45]
          Y_predict_gini_small = df_gini.predict(X_test_small)

In [303]: #Calculating accuracy score
          score_small = accuracy_score(Y_test_small,Y_predict_gini_small)
          score_small

Out[303]: 0.625

In [304]: cm_small = confusion_matrix(Y_test_small,Y_predict_gini_small)
          cm_small

Out[304]: array([[10,  3],
                 [12, 15]])

In [305]: main_features = []
          for i in range(0,len(feature_imp)):
              if feature_imp[i] > 0:
```

```
                entry = []
                entry.append(df.columns.values[i+2])
                entry.append(feature_imp[i])
                main_features.append(entry)
        main_features
```

```
Out[305]: [['Bin3,x', 0.019821900507519204],
           ['Bin10,x', 0.030280831919711874],
           ['TimeDiffPeaks-y', 0.0080237154150197606],
           ['TimeDiffPeaks-z', 0.1173989852329813],
           ['AvgAbsDiff-x', 0.0098892618142206977],
           ['AvgAbsDiff-y', 0.77710610745347142],
           ['AvgAcc-x', 0.0099825567369964639],
           ['AvgAcc-y', 0.0097972686810651813],
           ['StdDev-z', 0.017699372239014181]]
```

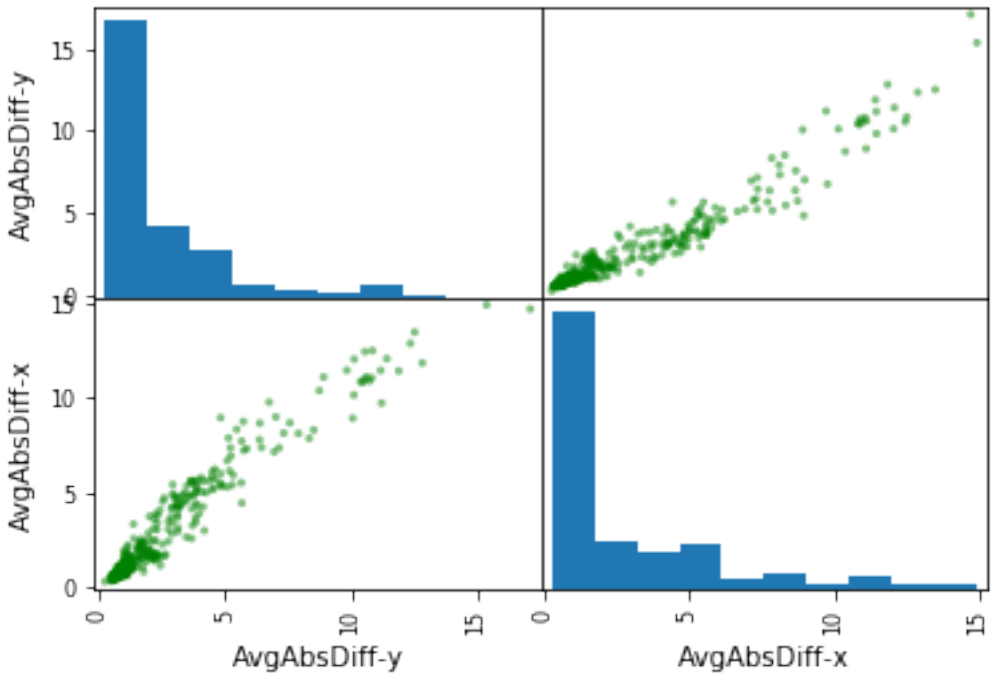
```
In [306]: frame = df_unique.loc[:,['AvgAbsDiff-y','AvgAbsDiff-x']]
```

```
In [307]: scatter_matrix(frame,color='g')
          plt.savefig('./Data-Visualization/images/scatter_matrix_AvgAbsDiffxy_dt_train_3.png'
```

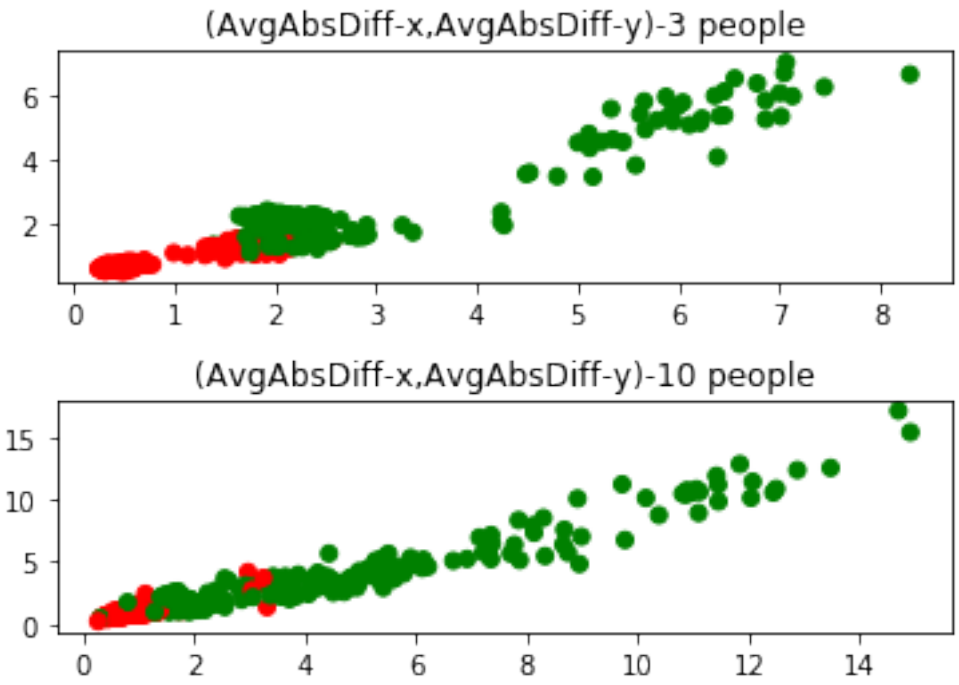



```
In [308]: frame_test = df_unique_test.loc[:,['AvgAbsDiff-y','AvgAbsDiff-x']]
```

```
In [309]: scatter_matrix(frame_test,color='g')
          plt.savefig('./Data-Visualization/images/scatter_matrix_AvgAbsDiffxy_dt_val_10.png',
```



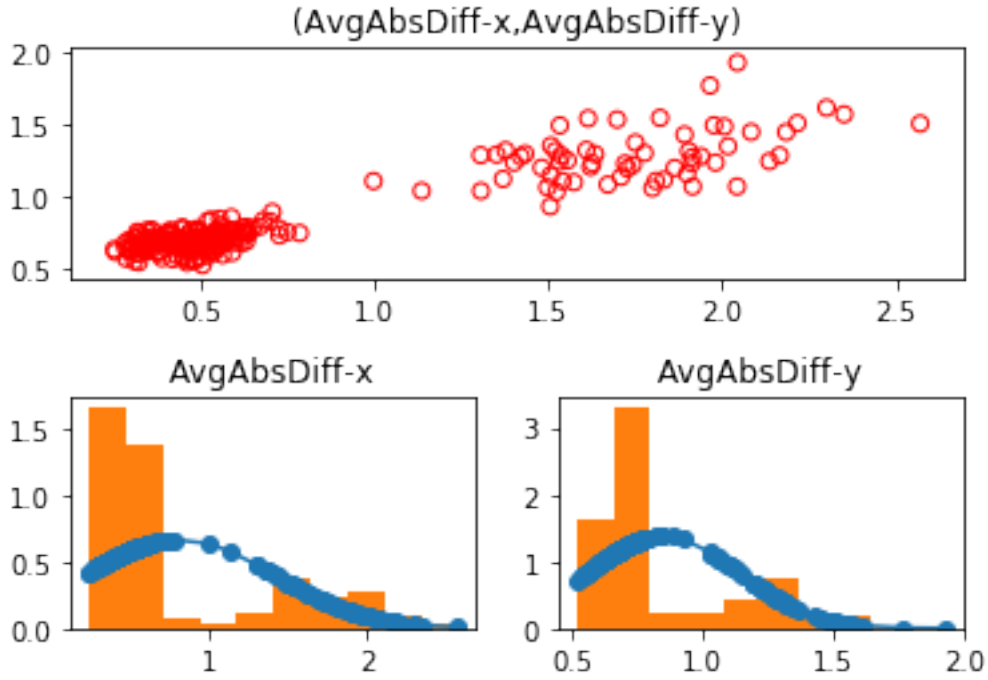

```
In [310]: #walking and running data points for training set(3 people data)
          plt.subplot(2,1,1)
          plt.scatter(df_unique['AvgAbsDiff-x'],df_unique['AvgAbsDiff-y'],c = df_unique['color
                      ,marker='o',facecolors='none',edgecolors=None)
          plt.title("(AvgAbsDiff-x,AvgAbsDiff-y)-3 people")

          #walking and running data points for test set(10 people data)
          plt.subplot(2,1,2)
          plt.scatter(df_unique_test['AvgAbsDiff-x'],df_unique_test['AvgAbsDiff-y'],c = df_unic
                      ,marker='o',facecolors='none',edgecolors=None)
          plt.title("(AvgAbsDiff-x,AvgAbsDiff-y)-10 people")
          plt.subplots_adjust(hspace=0.5)
          plt.show()
          plt.savefig('./Data-Visualization/images/scatter_AvgAbsDiffxy_dt_train_3_val_10.png'
```




```
<matplotlib.figure.Figure at 0x1a0c4994a8>
```

```
In [ ]: #walking points
        walk_points = df_unique.loc[df_unique['Label'] == 'walking']
        plt.subplot(2,2,(1,2))
        plt.scatter(walk_points['AvgAbsDiff-x'],walk_points['AvgAbsDiff-y'],color = 'r'
                    ,marker='o',facecolors='none',edgecolors=None)
        plt.title("(AvgAbsDiff-x,AvgAbsDiff-y)")

        #distribution of walking points using AvgAbsDiff-x
        walk_points_AvgAbsDiffx = np.array(walk_points['AvgAbsDiff-x'])
        sorted_values_AvgAbsDiffx = sorted(walk_points_AvgAbsDiffx)
        fit = stats.norm.pdf(sorted_values_AvgAbsDiffx, np.mean(sorted_values_AvgAbsDiffx), np
        plt.subplot(2,2,3)
        plt.plot(sorted_values_AvgAbsDiffx,fit,'-o')
        plt.hist(sorted_values_AvgAbsDiffx,normed=True)
        plt.title("AvgAbsDiff-x")

        #distribution of walking points using AvgAbsDiff-y
        walk_points_AvgAbsDiffy = np.array(walk_points['AvgAbsDiff-y'])
        sorted_values_AvgAbsDiffy = sorted(walk_points_AvgAbsDiffy)
        fit = stats.norm.pdf(sorted_values_AvgAbsDiffy, np.mean(sorted_values_AvgAbsDiffy), np
        plt.subplot(2,2,4)
        plt.plot(sorted_values_AvgAbsDiffy,fit,'-o')
```

```
        plt.hist(sorted_values_AvgAbsDiffy,normed=True)
        plt.subplots_adjust(hspace=.5)
        plt.title("AvgAbsDiff-y")
        plt.show()
        plt.savefig('./Data-Visualization/images/walk_AvgAbsDiffxy_dt.png',dpi=1000)
```




```
<matplotlib.figure.Figure at 0x1a189564e0>
```

```
In [ ]: #running points
        run_points = df_unique.loc[df_unique['Label'] == 'running']
        plt.subplot(2,2,(1,2))
        plt.scatter(run_points['AvgAbsDiff-x'],run_points['AvgAbsDiff-y'],color='g'
                    ,marker='o',facecolors='none',edgecolors=None)
        plt.title("(AvgAbsDiff-x,AvgAbsDiff-y)")

        #distribution of running points using AvgAbsDiff-x
        run_points_AvgAbsDiffx = np.array(run_points['AvgAbsDiff-x'])
        sorted_values_run_AvgAbsDiffx = sorted(run_points_AvgAbsDiffx)
        fit = stats.norm.pdf(sorted_values_run_AvgAbsDiffx, np.mean(sorted_values_run_AvgAbsDi
        plt.subplot(2,2,3)
        plt.plot(sorted_values_run_AvgAbsDiffx,fit,'-o')
        plt.hist(sorted_values_run_AvgAbsDiffx,normed=True)
        plt.title("AvgAbsDiff-x")
```

```
#distribution of running points using AvgAbsDiff-y
run_points_AvgAbsDiffy = np.array(run_points['AvgAbsDiff-y'])
sorted_values_run_AvgAbsDiffy = sorted(run_points_AvgAbsDiffy)
fit = stats.norm.pdf(sorted_values_run_AvgAbsDiffy, np.mean(sorted_values_run_AvgAbsDi
plt.subplot(2,2,4)
plt.plot(sorted_values_run_AvgAbsDiffy,fit,'-o')
plt.hist(sorted_values_run_AvgAbsDiffy,normed=True)
plt.title("AvgAbsDiff-y")
plt.subplots_adjust(hspace=.5)
plt.show()
plt.savefig('./Data-Visualization/images/run_AvgAbsDiffxy_dt.png',dpi=1000)
```