Perceptron_3_train_3_val

December 13, 2017

```
In [1]: import pandas as pd
        import numpy as np
        from sklearn.linear_model import Perceptron
        from sklearn.model_selection import train_test_split
        from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
        import matplotlib.pyplot as plt
        from pandas.plotting import scatter_matrix
```

```
In [2]: df = pd.read_csv('../FeaturesCsvFile/featuresfile.csv')
        df.shape
```

```
Out[2]: (417, 46)
```

```
In [51]: X = df.values[:, 2:45]
         y = df.values[:, 45] #label : walking/runing
         y_plot = np.where(y == 'walking', 0, 1)
         X_train, X_test, y_train, y_test = train_test_split(X, y_plot, test_size=0.3)
         ppn = Perceptron(max_iter=40, eta0=0.1, random_state=1)
         ppn.fit(X_train, y_train)
         y_pred = ppn.predict(X_test)
         print (type(y_pred))
         print (y_pred)
         print (type(y_test))
         print (y_test)
```

```
<type 'numpy.ndarray'>
[0 0 0 0 0 0 0 1 0 1 1 1 0 0 0 0 0 1 1 1 1 0 0 1 0 0 1 1 1 1 1 1 1 1 0 0 0
 0 1 1 1 0 0 0 1 0 0 0 0 1 0 0 1 0 1 1 0 0 0 1 0 0 0 0 1 1 0 1 1 0 1 0 1 0
 1 0 0 1 1 1 1 1 0 1 0 1 0 1 0 0 0 1 1 0 0 1 0 1 0 1 0 1 0 1 0 0 1 1 1 0 1
 0 1 1 1 0 1 0 0 0 0 0 0 0 0 1]
<type 'numpy.ndarray'>
[0 0 0 0 0 0 0 1 0 1 1 1 0 0 0 0 0 1 1 1 1 0 0 1 0 0 0 1 1 1 0 0 1 1 0 0 0
 0 1 1 1 0 0 0 1 0 0 0 0 1 0 0 1 0 1 1 0 0 0 1 0 0 0 0 1 1 0 1 1 0 1 0 1 0
 1 0 0 1 1 1 1 1 0 1 0 1 0 1 0 0 0 1 0 0 0 1 0 1 0 1 0 1 0 1 0 0 1 1 1 0 1
 0 1 1 1 0 1 0 0 0 0 0 0 0 0 1]
```

```
In [26]: print('Accuracy of Accuracy Score : %.2f' % accuracy_score(y_test,y_pred))
```

```
Accuracy of Accuracy Score : 0.83
```

```
In [25]: print('Accuracy of Perceptron Score: %.2f' % ppn.score(X_test,y_test))
```

```
Accuracy of Perceptron Score: 0.83
```

```
In [19]: print ('Confusion_matrix')
         print(confusion_matrix(y_test,y_pred))
```

```
Confusion_matrix
[[71  1]
 [ 1 53]]
```

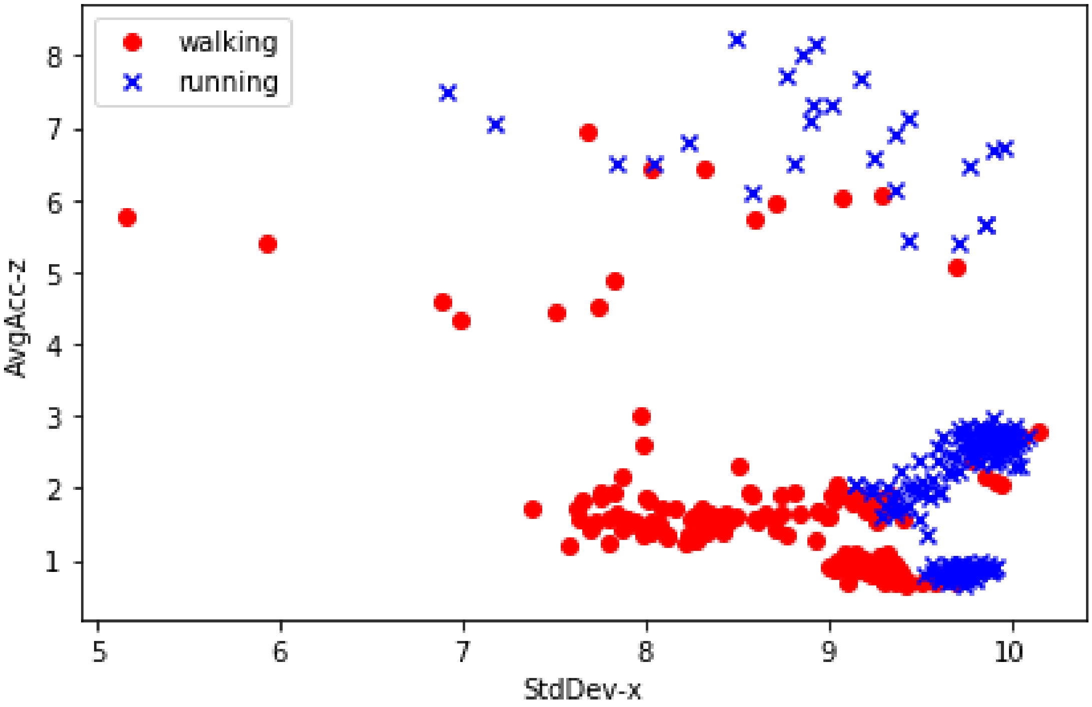
```
In [7]: print ('Important features (featureName, weigh of important, #column)')
        header = list(df.head(1))
        important_feature = []
        for i in range(0,len(ppn.coef_[0])):
            important_feature.append((header[i+2],ppn.coef_[0][i],i+2))
        sorted_list = sorted(important_feature,key=lambda important_feature: important_feature
        for j in range(0,len(sorted_list)):
                first_imp_fea = sorted_list[0]
                second_imp_fea = sorted_list[1]
                print sorted_list[j]
```

```
Important features (featureName, weigh of important, #column)
('StdDev-x', 134.54573382624937, 41)
('AvgAcc-z', 121.16392564828185, 40)
('StdDev-z', 116.06279584422469, 43)
('AvgAbsDiff-x', 114.84830617437348, 35)
('StdDev-y', 101.90904747311946, 42)
('AvgAbsDiff-z', 92.537781344373869, 37)
('AvgAbsDiff-y', 84.633640577981595, 36)
('TimeDiffPeaks-x', 23.589932453530086, 32)
('AvgResAcc', 7.8475955164305402, 44)
('Bin9,x', 3.4432528817298822, 10)
('Bin8,x', 2.9039789942786016, 9)
('Bin6,z', 2.8997102932648904, 27)
('Bin6,y', 2.6880899121395085, 17)
('Bin5,z', 2.6803970054451676, 26)
('Bin3,y', 2.4554512650171301, 14)
('Bin2,y', 2.213842420628966, 13)
('Bin4,z', 2.1742780864727096, 25)
('Bin3,x', 1.8151982129778814, 4)
('Bin4,y', 1.4627023342434773, 15)
('Bin10,x', 1.454554836074029, 11)
('Bin7,y', 1.4418092310188133, 18)
```

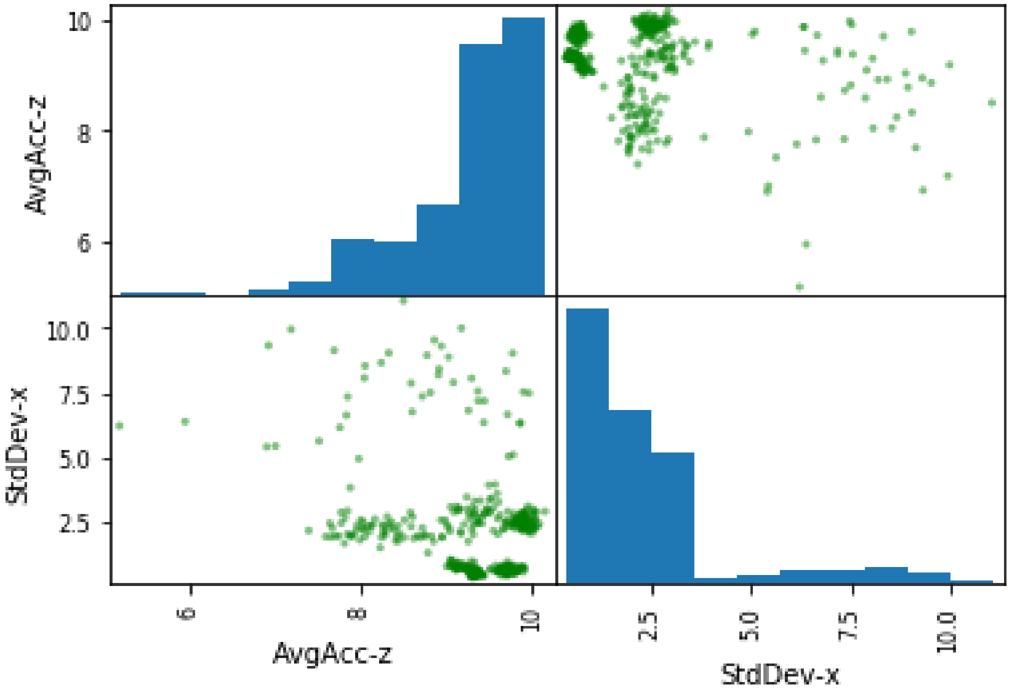
```
('Bin5,y', 1.4363673411264102, 16)
('Bin7,z', 1.3117573834461895, 28)
('Bin4,x', 1.1749455303083742, 5)
('Bin2,x', 1.1522514372212231, 3)
('Bin1,y', 0.59870900151330642, 12)
('Bin3,z', 0.42387591935611851, 24)
('Bin2,z', 0.40715538821629738, 23)
('Bin1,z', 0.37178370428444613, 22)
('Bin10,z', 0.32220035245003409, 31)
('Bin1,x', 0.19713827896163244, 2)
('Bin7,x', -0.0055298906161624431, 8)
('Bin8,y', -0.094698781181239616, 19)
('Bin9,z', -0.17195660296054488, 30)
('Bin8,z', -0.32157539323024908, 29)
('Bin5,x', -0.51522106230655329, 6)
('Bin10,y', -0.81650463928040729, 21)
('Bin9,y', -0.83680467298146655, 20)
('Bin6,x', -1.6598371787165587, 7)
('AvgAcc-x', -24.528596902513023, 38)
('TimeDiffPeaks-z', -30.417487393970031, 34)
('TimeDiffPeaks-y', -31.034208379510083, 33)
('AvgAcc-y', -41.687412958544023, 39)
```

```
In [26]: #get data first 100 rows
         y = df.iloc[:, 45].values
         y = np.where(y == 'walking', -1, 1)
         #use AvgAbsDiff-x and AvgAbsDiff-y
         X = df.iloc[:, [40,42]].values
         # plot data
         plt.scatter(X[:len(df)/2, 0], X[:len(df)/2, 1],
                     color='red', marker='o', label='walking')
         plt.scatter(X[len(df)/2:len(df), 0], X[len(df)/2:len(df), 1],
                     color='blue', marker='x', label='running')

         plt.xlabel('%s'%first_imp_fea[0])
         plt.ylabel('%s'%second_imp_fea[0])
         plt.legend(loc='upper left')
         plt.tight_layout()
         plt.show()
```



```
In [43]: frame = df.loc[:,['AvgAcc-z','StdDev-x']]
         test=scatter_matrix(frame,color='g')
         plt.show()
```



```
In [52]: import numpy as np
         from sklearn import metrics
         import matplotlib.pyplot as plt
         import pandas as pd
         from pandas import DataFrame,Series
         from matplotlib.colors import ListedColormap
         import numpy as np
         from sklearn.linear_model import Perceptron
         from sklearn.model_selection import train_test_split
         from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
         import matplotlib.pyplot as plt
         from pandas.plotting import scatter_matrix
         from random import sample

         num_predns = []

         for i in range(0,len(y_pred)):
             if y_pred[i] is "walking":
                 num_predns.append(0)
             else:
                 num_predns.append(1)

         num_labels = []

         for i in range(0,len(y_test)):
             if y_test[i] is "walking":
                 num_labels.append(0)
             else:
                 num_labels.append(1)
```

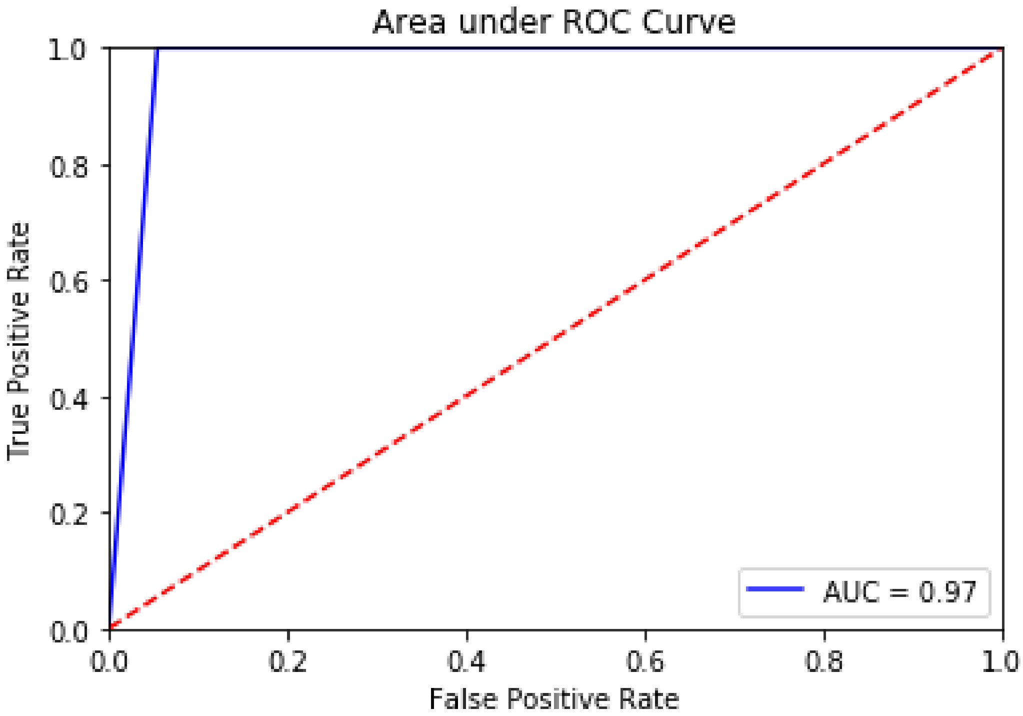
```
In [55]: predns = np.array(num_predns)
         print (predns)
         labels = np.array(num_labels)
         print (labels)
         fpr, tpr, thresholds = metrics.roc_curve(y_test, y_pred)
```

```
[1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1]
[1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1]
```

```
In [56]: print (fpr)
         print (tpr)
         roc_auc = metrics.auc(fpr, tpr)
```

```
[ 0.          0.05479452  1.        ]
[ 0.  1.  1.]
```

```
In [57]: plt.title('Area under ROC Curve')
         plt.plot(fpr, tpr, 'b', label = 'AUC = %0.2f' % roc_auc)
         plt.legend(loc = 'lower right')
         plt.plot([0, 1], [0, 1],'r--')
         plt.xlim([0, 1])
         plt.ylim([0, 1])
         plt.ylabel('True Positive Rate')
         plt.xlabel('False Positive Rate')
         plt.show()
```


Area under ROC Curve
True Positive Rate
AUC = 0.97
False Positive Rate