Diabetes prediction Logistic Regression Model

Build a model predict diabetes using Logistic Regression Classifier.

Working on DataSet Pima Indian Diabetes dataset from Kaggle and Using Logistic Regression to predict Diabetics

Target : Activities to be classified into walking , walking upstairs , walking downstairs, sitting , standing and laying . Features : Sensors of smart phones .

In [121]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
warnings.simplefilter('ignore')
```

In [122]:

```
col_names = ['pregnant', 'glucose', 'bp', 'skin', 'insulin', 'bmi', 'pe
data = pd.read_csv("data/pima-indians-diabetes.csv",header=None, names=
```

In [123]:

```
print(data.shape)
```

```
(768, 9)
```

In [124]:

```
#Print no of integers, floats and strings
data.dtypes.value_counts()
```

Out[124]:

```
int64      7
float64    2
dtype: int64
```

In [125]:

```
data.head()
```

Out[125]:

	pregnant	glucose	bp	skin	insulin	bmi	pedigree	age	label
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

Preprocessing Steps

1. Select Features .
2. Split the data into train and test sets.

1. Select Features .

In [126]:

```
#split dataset in features and target variable
feature_cols = ['pregnant', 'insulin', 'bmi', 'age','glucose','bp','ped
# Features
X = data[feature_cols]
# Target variable
y = data.label
```

2. Split Data to Train and Test sets

In [127]:

```
# split X and y into training and testing sets
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.25,rando
```

Modeling with Logisitc Regression

In [128]:

```
from sklearn.linear_model import LogisticRegression

# Standard logistic regression
lr = LogisticRegression(solver='liblinear').fit(X_train, y_train)
```

In [129]:

```
coeffs = lr.coef_
print(coeffs.T)
```

```
[[ 8.44e-02]
 [-2.41e-04]
 [ 5.81e-02]
 [ 1.12e-02]
 [ 2.51e-02]
 [-1.58e-02]
 [ 6.16e-01]]
```

In [130]:

```
#making Predictions
y_hat = lr.predict(X_test)
```

In [131]:

```
# Use score method to get accuracy of model
score = lr.score(X_test, y_test)
print(score)
```

```
0.8072916666666666
```

Confusion Matrix and Plotting

In [132]:

```
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn import metrics
cnf_matrix = metrics.confusion_matrix(y_test, y_hat)
print(cnf_matrix)
```

```
[[119  11]
 [ 26  36]]
```

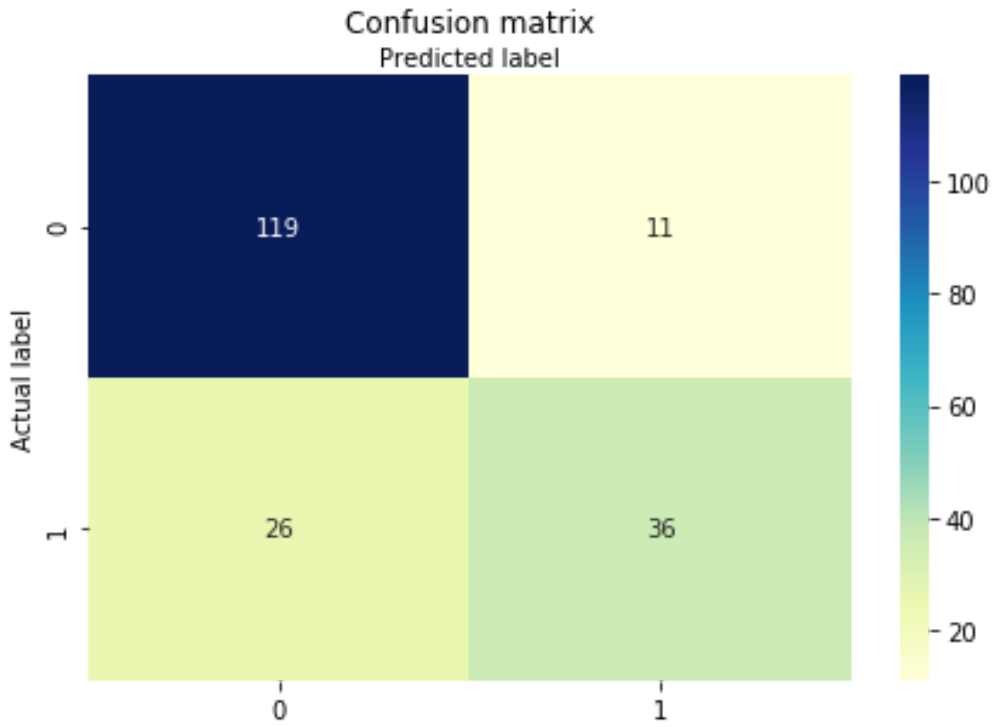
Confusion Matrix shows models ability to correctly predict or seperate classes .119 and 36 are actual predictions, and 26 and 11 are incorrect predictions.

In [133]:

```
# import required modules
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
class_names=[0,1] # name  of classes
fig, ax = plt.subplots()
tick_marks = np.arange(len(class_names))
plt.xticks(tick_marks, class_names)
plt.yticks(tick_marks, class_names)
# create heatmap
sns.heatmap(pd.DataFrame(cnf_matrix), annot=True, cmap="YlGnBu" ,fmt='g
ax.xaxis.set_label_position("top")
plt.tight_layout()
plt.title('Confusion matrix', y=1.1)
plt.ylabel('Actual label')
plt.xlabel('Predicted label')
```

Out[133]:

```
Text(0.5, 257.44, 'Predicted label')
```



Precison /Recall and F1- score

In [134]:

```
print (classification_report(y_test, y_hat))
```

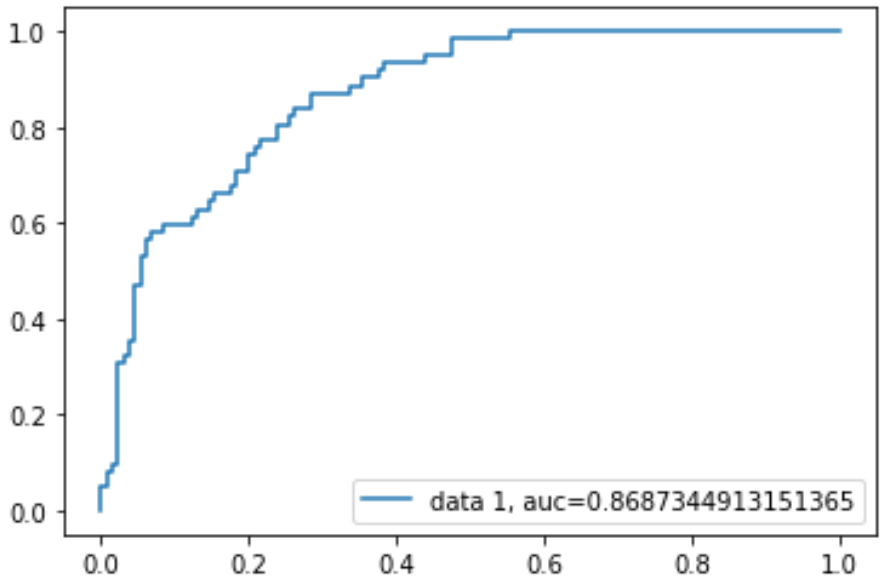
```
              precision    recall  f1-score   support

           0       0.82      0.92      0.87       130
           1       0.77      0.58      0.66        62

    accuracy                           0.81       192
   macro avg       0.79      0.75      0.76       192
weighted avg       0.80      0.81      0.80       192
```

ROC Curve

Receiver Operating Characteristic(ROC) curve is a plot of the true positive rate against the false positive rate. It shows the tradeoff between sensitivity and specificity.

In [135]:

```
y_pred_proba = lr.predict_proba(X_test)[::,1]
fpr, tpr, _ = metrics.roc_curve(y_test,  y_pred_proba)
auc = metrics.roc_auc_score(y_test, y_pred_proba)
plt.plot(fpr,tpr,label="data 1, auc="+str(auc))
plt.legend(loc=4)
plt.show()
```



Summary

Logistic Classifier could predict with 80 % accuracy.

Precison - If Logistic Regression model predicted patients are going to suffer from diabetes, that patients will be 76% correct. Recall - If there are patients who have diabetes in the test set , Logistic Regression model can identify it 58% of the time. AUC score for the case is 0.86. AUC score 1 represents perfect classifier,