



Learn the AI/ML Project on:
Pima-Diabetes Detection



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★ AI / ML Project - Pima Indian Diabetes Detection ★



Description:

This dataset is originally from the National Institute of Diabetes and Digestive and Kidney Diseases. The objective of the dataset is to diagnostically predict whether or not a patient has diabetes, based on certain diagnostic measurements included in the dataset. Several constraints were placed on the selection of these instances from a larger database. In particular, all patients here are females at least 21 years old of Pima Indian heritage.

The datasets consists of several medical predictor variables and one target variable, Outcome. Predictor variables includes the number of pregnancies the patient has had, their BMI, insulin level, age, and so on. Can you build a machine learning model to accurately predict whether or not the patients in the dataset have diabetes or not?

Objective:

- Understand the Dataset & cleanup (if required).
- Build classification models to predict whether or not the patients have diabetes.
- Compare the evaluation metrics of various classification algorithms.

1. Data Exploration

In [298]:

```
#Importing the basic libraries
```

```
import numpy as np
import pandas as pd
import seaborn as sns
from IPython.display import display

import matplotlib.pyplot as plt
plt.rcParams['figure.figsize'] = [10,6]

import warnings
warnings.filterwarnings('ignore')
```

In [299]:

```
#Importing the dataset
```

```
df = pd.read_csv('pima-indians-diabetes.csv')
df.reset_index(drop=True, inplace=True)
original_dataset = df.copy(deep=True)
display(df.head())

print('\n\nInference: The Datset consists of {} features & {} samples.'.format(
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	
0	6	148	72	35	0	33.6		0.62
1	1	85	66	29	0	26.6		0.35
2	8	183	64	0	0	23.3		0.67
3	1	89	66	23	94	28.1		0.16
4	0	137	40	35	168	43.1		2.28

Inference: The Datset consists of 9 features & 768 samples.

In [300]:

```
#Checking the dtypes of all the columns
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Pregnancies      768 non-null    int64  
 1   Glucose          768 non-null    int64  
 2   BloodPressure    768 non-null    int64  
 3   SkinThickness    768 non-null    int64  
 4   Insulin          768 non-null    int64  
 5   BMI              768 non-null    float64 
 6   DiabetesPedigreeFunction 768 non-null    float64 
 7   Age              768 non-null    int64  
 8   Outcome          768 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

In [301]:

```
#Checking the stats of all the columns
```

```
display(df.describe())
print('\n \033[1mInference:\033[0m The stats seem to be unrealistic for few samples, \
let us visualize the dataset to gain better understanding...')
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction
count	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000
mean	3.845052	120.894531	69.105469	20.536458	79.799479	31.992578	307.873459
std	3.369578	31.972618	19.355807	15.952218	115.244002	7.884160	326.990574
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	1.000000	99.000000	62.000000	0.000000	0.000000	27.300000	244.093550
50%	3.000000	117.000000	72.000000	23.000000	30.500000	32.000000	314.763750
75%	6.000000	140.250000	80.000000	32.000000	127.250000	36.600000	393.884600
max	17.000000	199.000000	122.000000	99.000000	846.000000	67.100000	437.000000

Inference: The stats seem to be unrealistic for few samples, let us visualize the dataset to gain better understanding... .

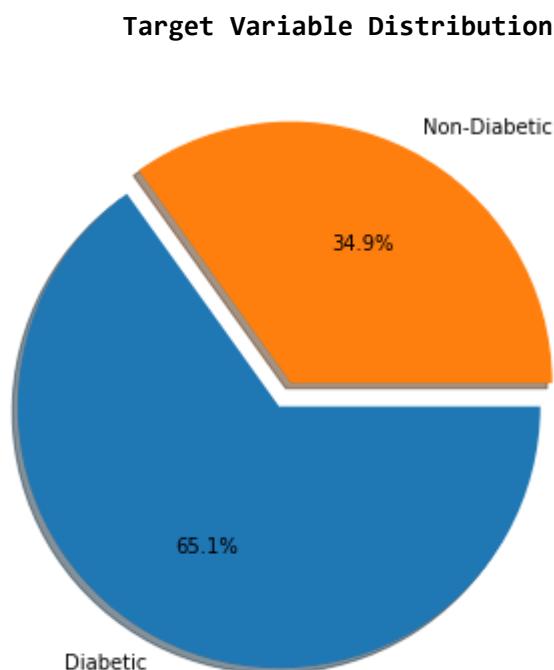
2. Exploratory Data Analysis (EDA)

In [302]:

```
#Let us first analyze the distribution of the target variable
```

```
print('\033[1mTarget Variable Distribution'.center(55))
plt.pie(df.Outcome.value_counts(), labels=['Diabetic', 'Non-Diabetic'], counterclock=False,
         explode=[0,0.1], autopct='%1.1f%%', radius=1)
plt.show()
```

```
print('\n\033[1mInference:\033[0m The Target Variable seems to be slightly imbalanced! We c
```



Inference: The Target Variable seems to be slightly imbalanced! We can try to fix this later on...

In [303]:

#Understanding the feature set

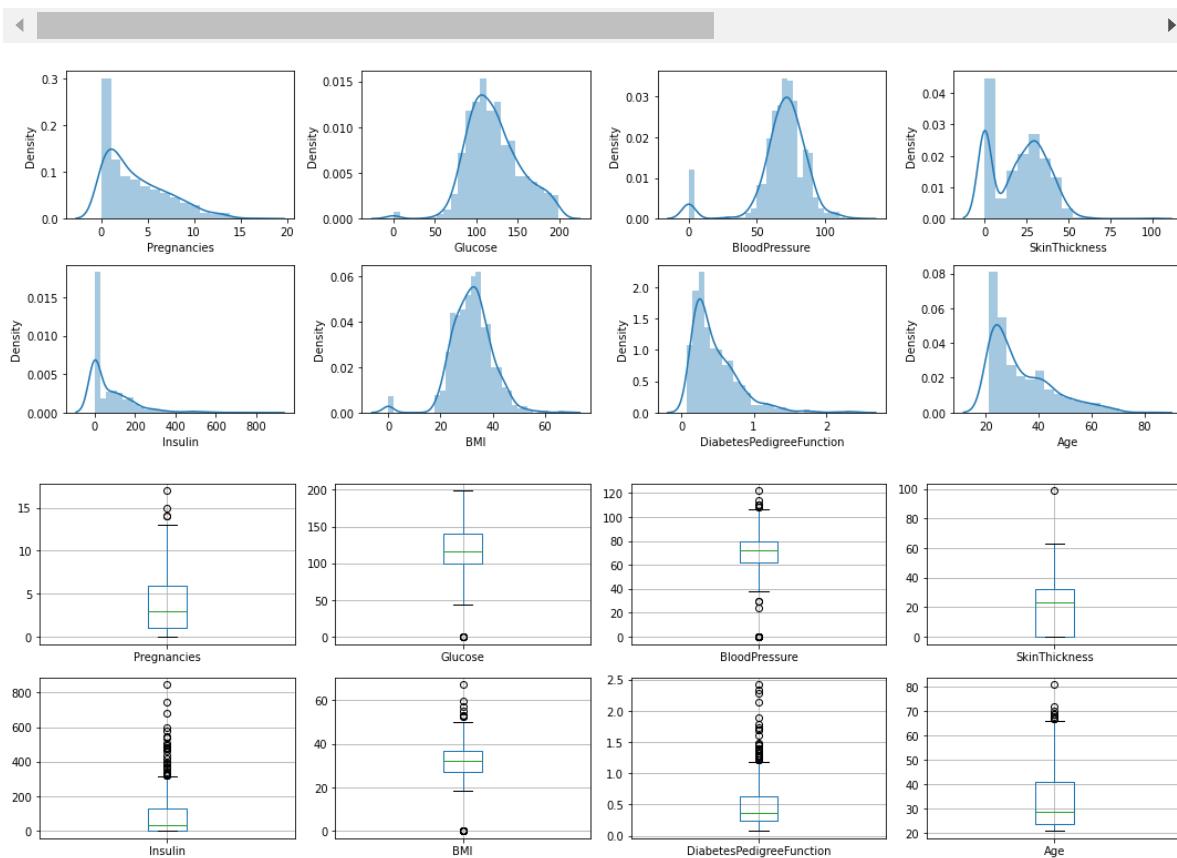
```
print('\033[1mFeatures Distribution'.center(130))
```

```
plt.figure(figsize=[15,5])
for c in range(8):
    plt.subplot(2,4,c+1)
    sns.distplot(df[df.columns[c]])
plt.tight_layout()
plt.show()
```

```
plt.figure(figsize=[15,5])
for c in range(8):
    plt.subplot(2,4,c+1)
    df.boxplot(df.columns[c])
plt.tight_layout()
plt.show()
```

```
print('\n\033[1mInference:\033[0m The data distribution revealed the multiple samples are inaccurate, like glucose, bloodpressure, BMI, which are not supposed to be zero. We shall try to fix these in the upcoming cleanup stage...')
```

Features Distribution



Inference: The data distribution revealed the multiple samples are inaccurate, like glucose, bloodpressure, BMI, which are not supposed to be zero. We shall try to fix these in the upcoming cleanup stage...

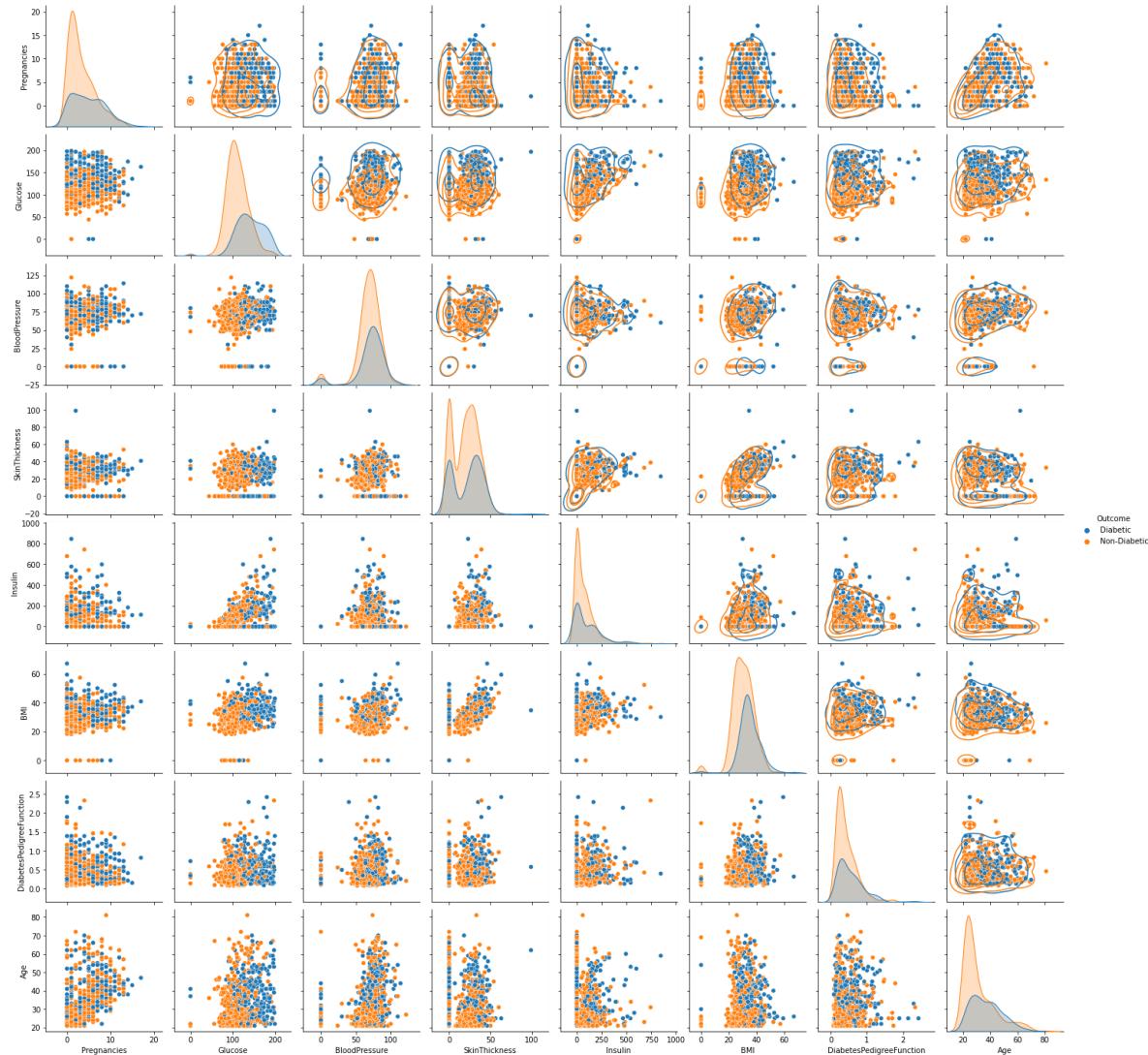
In [73]:

```
#Understanding the relationship between all the features
```

```
df1 = df.copy()
df1.Outcome = df.Outcome.map({0:'Non-Diabetic',1:'Diabetic'})
```

```
g=sns.pairplot(df1, hue="Outcome")
g.map_upper(sns.kdeplot, levels=4, color=".2")
plt.show()
```

```
print('\n\nInference: The data samples of most of the features don\'t show an exact pattern. Also they seem to have lot of overlap for the outcome classes, making it difficult to be distinguishable.'
```



Inference: The data samples of most of the features don't show an exact pattern. Also they seem to have lot of overlap for the outcome classes, making it difficult to be distinguishable.

3. Data Preprocessing

In [304]:

```
#Check for empty elements

print(df.isnull().sum())
print('\n\nInference:\n The dataset doesn\'t have any null elements')
```

```
Pregnancies      0
Glucose          0
BloodPressure    0
SkinThickness    0
Insulin          0
BMI              0
DiabetesPedigreeFunction 0
Age              0
Outcome          0
dtype: int64
```

Inference: The dataset doesn't have any null elements

In [305]:

```
#Removal of any Duplicate rows (if any)

counter = 0
r,c = df1.shape

df.drop_duplicates(inplace=True)

if df.shape==(r,c):
    print('\n\nInference:\n The dataset doesn\'t have any duplicates')
else:
    print(f'\n\nInference:\n Number of duplicates dropped/fixed ---> {r-df.shape[0]}
```

Inference: The dataset doesn't have any duplicates

In [306]:

```
xf = df.columns.to_list()
xf.remove('Outcome')
xf
```

Out[306]:

```
['Pregnancies',
 'Glucose',
 'BloodPressure',
 'SkinThickness',
 'Insulin',
 'BMI',
 'DiabetesPedigreeFunction',
 'Age']
```

In [307]:

```
#Removal of outlier:
```

```
for i in df.columns:  
    Q1 = df[i].quantile(0.25)  
    Q3 = df[i].quantile(0.75)  
    IQR = Q3 - Q1  
    df = df[df[i] <= (Q3+(1.5*IQR))]  
    df = df[df[i] >= (Q1-(1.5*IQR))]  
    df = df.reset_index(drop=True)  
display(df)  
df2 = df.copy()  
print('\nInference: After removal of outliers, The dataset now has {} features')
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	
0	6	148	72	35	0	33.6	0.	
1	1	85	66	29	0	26.6	0.	
2	8	183	64	0	0	23.3	0.	
3	1	89	66	23	94	28.1	0.	
4	5	116	74	0	0	25.6	0.	
...	
631	10	101	76	48	180	32.9	0.	
632	2	122	70	27	0	36.8	0.	
633	5	121	72	23	112	26.2	0.	
634	1	126	60	0	0	30.1	0.	
635	1	93	70	31	0	30.4	0.	

636 rows × 9 columns

Inference: After removal of outliers, The dataset now has 9 features & 636 samples.

In [308]:

```
#Fixing the imbalance using SMOTE Technique
from imblearn.over_sampling import SMOTE

print('Original class distribution:')
print(df.Outcome.value_counts())

X = df.drop(['Outcome'],axis=1)
Y = df.Outcome

smote = SMOTE()
X, Y = smote.fit_resample(X, Y)

df3 = pd.DataFrame(X, columns=xf)
df3['Outcome'] = Y
df = df3.copy()

print('\nClass distribution after applying SMOTE Technique:,')
print(Y.value_counts())
```

Original class distribution:

0 439
1 197

Name: Outcome, dtype: int64

Class distribution after applying SMOTE Technique:

1 439
0 439

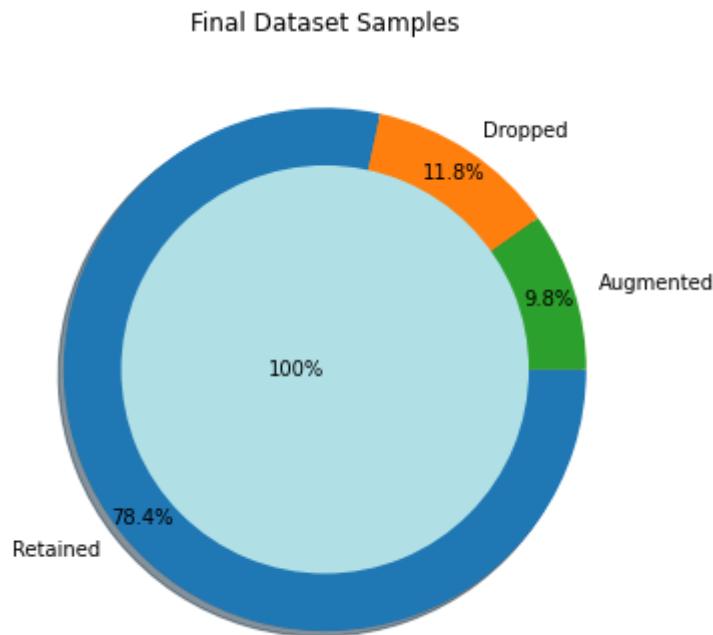
Name: Outcome, dtype: int64

In [309]:

```
#Final Dataset size after performing Preprocessing
```

```
plt.title('Final Dataset Samples')
plt.pie([df.shape[0], df1.shape[0]-df2.shape[0], df.shape[0]-df1.shape[0]], radius = 1, sha
       labels=['Retained', 'Dropped', 'Augmented'], counterclock=False, autopct='%.1f%%', p
plt.pie([df.shape[0]], labels=['100%'], labeldistance=-0, radius=0.78, shadow=True, colors=
plt.show()
```

```
print('\n\033[1mInference:\033[0mThe final dataset after cleanup has {} samples & {} rows.'
```



Inference:The final dataset after cleanup has 9 samples & 878 rows.

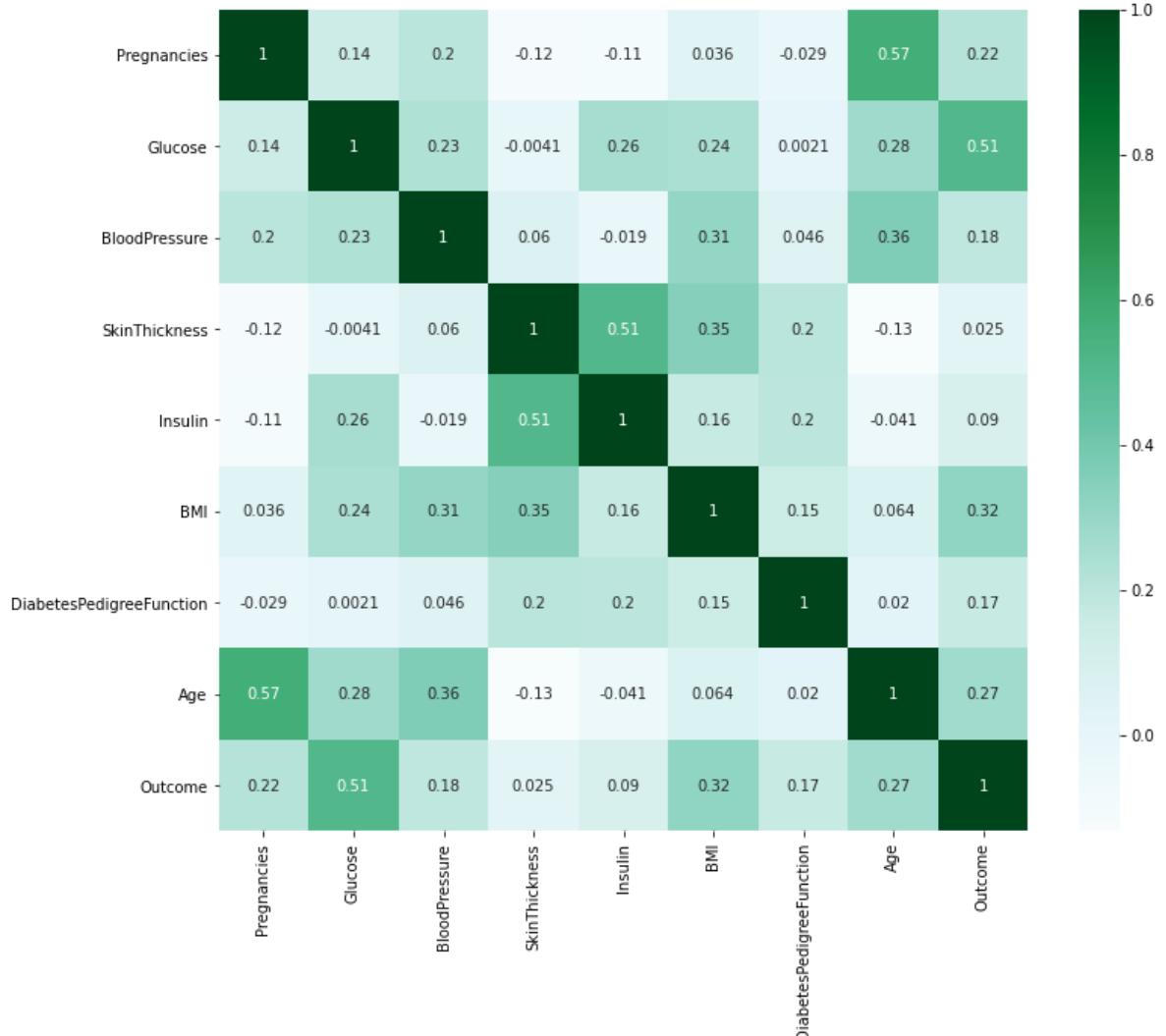
4. Feature Selection/Extraction

In [310]:

```
#Checking the correlation
```

```
plt.figure(figsize=[12,10])
sns.heatmap(df.corr(), annot=True, cmap='BuGn')#, vmin=-1, vmax=1)
plt.show()
```

print('\n\nInference:\nCorrelation plt between the variables convey lot of info between them.\nSome of them are obvious like relationship between number of pregnancies. It is fine to drop any one of the variable either age, or pregnancies. But for our problem features and the correlation is also not too strong, we can proceed without dropping any feature...\n')



Inference:

Correlation plt between the variables convey lot of information about the relationship between them.

Some of them are obvious like relationship between number of pregnancies & age, glucose & diabetes, etc. It is fine to drop any one of the variable either age, or pregnancies. But for our problem since we are having less features and the correlation is also not too strong, we can proceed without dropping any feature. Feel free to compare the results with dropping any feature...

5. Feature Scaling

In [311]:

```
#Splitting the data into training & testing sets

from sklearn.model_selection import train_test_split

X = df.drop(['Outcome'],axis=1)
Y = df.Outcome
Train_X, Test_X, Train_Y, Test_Y = train_test_split(X, Y, train_size=0.8, test_size=0.2, random_state=42)

print('Original set ---> ',X.shape,Y.shape,'\nTraining set ---> ',Train_X.shape,Train_Y.shape)
```

Original set ---> (878, 8) (878,)
Training set ---> (702, 8) (702,)
Testing set ---> (176, 8) (176,)

In [312]:

```
#Feature Scaling (Standardization)

from sklearn.preprocessing import StandardScaler

std = StandardScaler()

Train_X_std = std.fit_transform(Train_X)
Test_X_std = std.transform(Test_X)
```

6. Predictive Modeling

In [313]:

```
#Let us create first create a table to store the results of various models
```

```
Evaluation_Results = pd.DataFrame(np.zeros((8,5)), columns=['Accuracy', 'Precision', 'Recall',  
Evaluation_Results.index=['Logistic Regression (LR)', 'Decision Tree Classifier (DT)', 'Random Forest Classifier (RF)',  
'Support Vector Machine (SV)', 'K Nearest Neighbours (KNN)', 'Gradient Boosting (GB)',  
'Extreme Gradient Boosting (XGB)'])  
Evaluation_Results
```

Out[313]:

	Accuracy	Precision	Recall	F1-score	AUC-ROC score
Logistic Regression (LR)	0.0	0.0	0.0	0.0	0.0
Decision Tree Classifier (DT)	0.0	0.0	0.0	0.0	0.0
Random Forest Classifier (RF)	0.0	0.0	0.0	0.0	0.0
Naïve Bayes Classifier (NB)	0.0	0.0	0.0	0.0	0.0
Support Vector Machine (SV)	0.0	0.0	0.0	0.0	0.0
K Nearest Neighbours (KNN)	0.0	0.0	0.0	0.0	0.0
Gradient Boosting (GB)	0.0	0.0	0.0	0.0	0.0
Extreme Gradient Boosting (XGB)	0.0	0.0	0.0	0.0	0.0

In [314]:

```
#Let us define functions to summarise the Prediction's scores .  
  
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report, f1_sco  
  
#Classification Summary Function  
def Classification_Summary(pred,i):  
    Evaluation_Results.iloc[i]['Accuracy']=round(accuracy_score(Test_Y, pred),3)*100  
    Evaluation_Results.iloc[i]['Precision']=round(precision_score(Test_Y, pred, average='we  
    Evaluation_Results.iloc[i]['Recall']=round(recall_score(Test_Y, pred, average='weighted'))  
    Evaluation_Results.iloc[i]['F1-score']=round(f1_score(Test_Y, pred, average='weighted'))  
    Evaluation_Results.iloc[i]['AUC-ROC score']=round(roc_auc_score(Test_Y, pred, average='  
    print('{})\n'.format('<'*3,'-'*35,Evaluation_Results.index[i], '-'  
    print('Accuracy = {}%'.format(round(accuracy_score(Test_Y, pred),3)*100))  
    print('F1 Score = {}%'.format(round(f1_score(Test_Y, pred, average='weighted'),3)*100))  
    print('\n Confusion Matrix:\n',confusion_matrix(Test_Y, pred))  
    print('\nClassification Report:\n',classification_report(Test_Y, pred))  
  
#Visualising Function  
def AUC_ROC_plot(Test_Y, pred):  
    ref = [0 for _ in range(len(Test_Y))]  
    ref_auc = roc_auc_score(Test_Y, ref)  
    lr_auc = roc_auc_score(Test_Y, pred)  
  
    ns_fpr, ns_tpr, _ = roc_curve(Test_Y, ref)  
    lr_fpr, lr_tpr, _ = roc_curve(Test_Y, pred)  
  
    plt.plot(ns_fpr, ns_tpr, linestyle='--')  
    plt.plot(lr_fpr, lr_tpr, marker='.', label='AUC = {}'.format(round(roc_auc_score(Test_Y,  
    plt.xlabel('False Positive Rate')  
    plt.ylabel('True Positive Rate')  
    plt.legend()  
    plt.show()
```

1. Logistic Regression:

In [315]:

```
#Logistic Regression

from sklearn.linear_model import LogisticRegression

LR = LogisticRegression().fit(Train_X_std, Train_Y)
pred = LR.predict(Test_X_std)
Classification_Summary(pred,0)

pred_prob = LR.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

```
<<<-----Logistic Regression (LR)----->>>
```

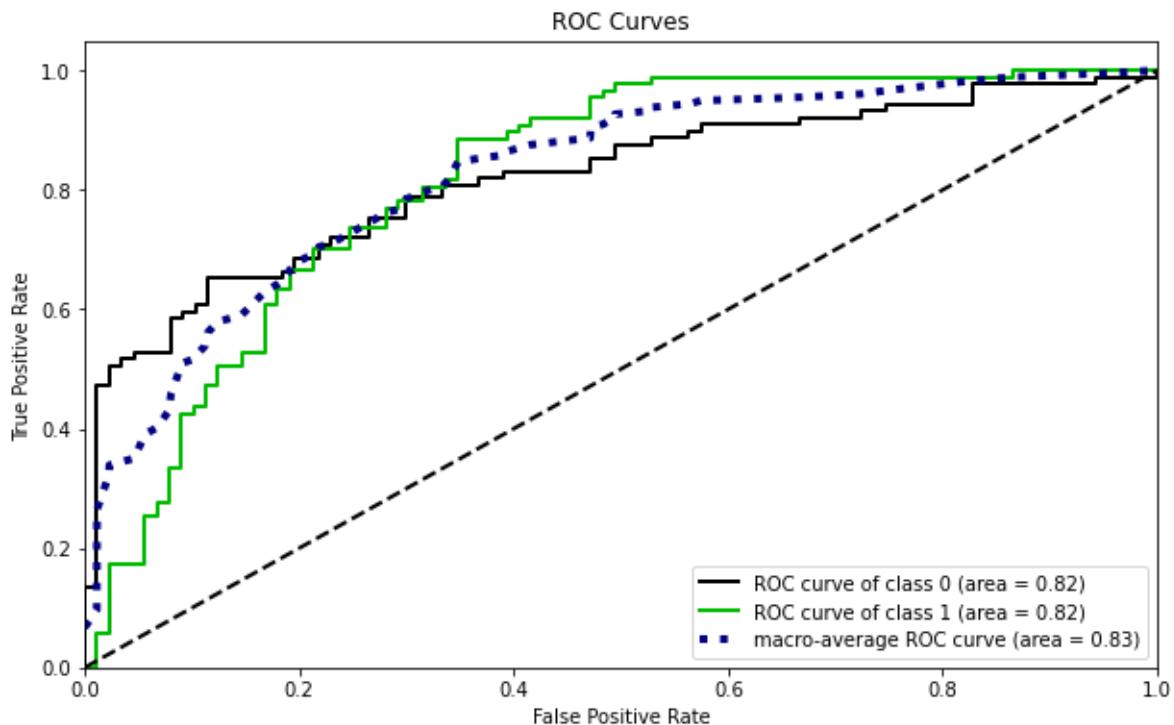
Accuracy = 71.6%
F1 Score = 71.3%

Confusion Matrix:

```
[[73 16]
 [34 53]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.68	0.82	0.74	89
1	0.77	0.61	0.68	87
accuracy			0.72	176
macro avg	0.73	0.71	0.71	176
weighted avg	0.72	0.72	0.71	176



2. Decision Tree Classifier:

In [316]:

```
from sklearn.tree import DecisionTreeClassifier

DT = DecisionTreeClassifier().fit(Train_X_std, Train_Y)
pred = DT.predict(Test_X_std)
Classification_Summary(pred,1)

pred_prob = DT.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

<<-----Decision Tree Classifier (DT)-----
----->>>

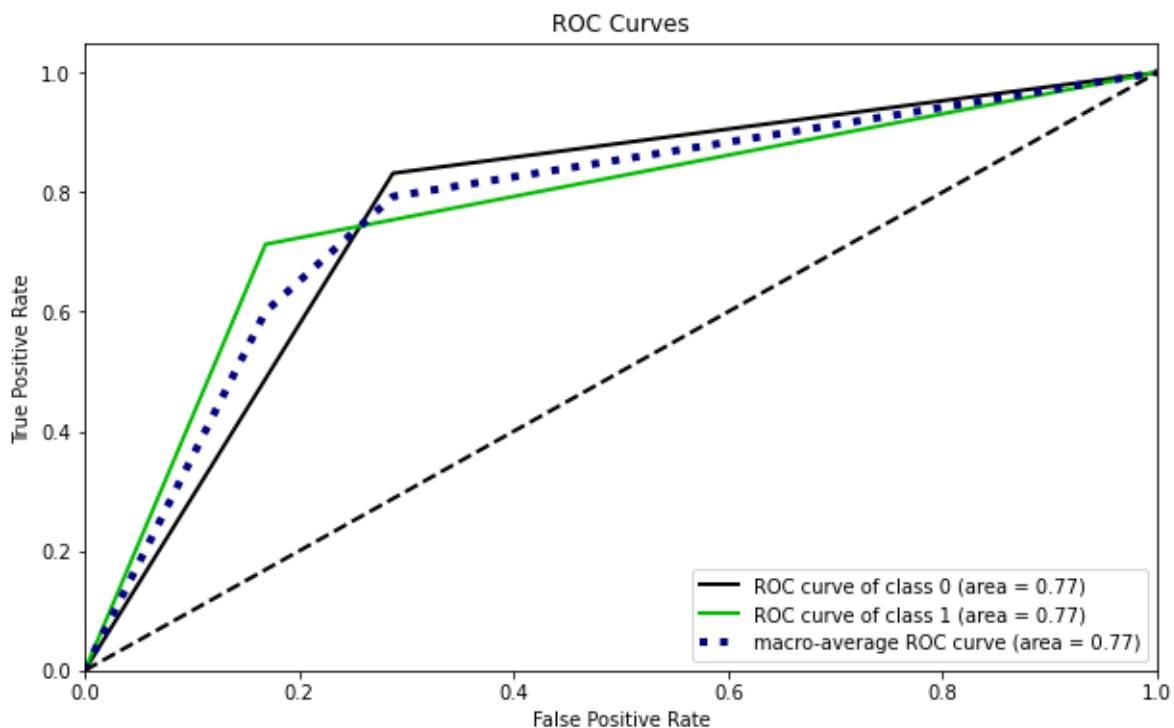
Accuracy = 77.3%
F1 Score = 77.2%

Confusiton Matrix:

```
[[74 15]
 [25 62]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.75	0.83	0.79	89
1	0.81	0.71	0.76	87
accuracy			0.77	176
macro avg	0.78	0.77	0.77	176
weighted avg	0.78	0.77	0.77	176



3. Random Forest Classifier:

In [317]:

```
from sklearn.ensemble import RandomForestClassifier

RF = RandomForestClassifier().fit(Train_X_std, Train_Y)
pred = RF.predict(Test_X_std)
Classification_Summary(pred,2)

pred_prob = RF.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

<<<-----Random Forest Classifier (RF)-----
----->>>

Accuracy = 80.10000000000001%

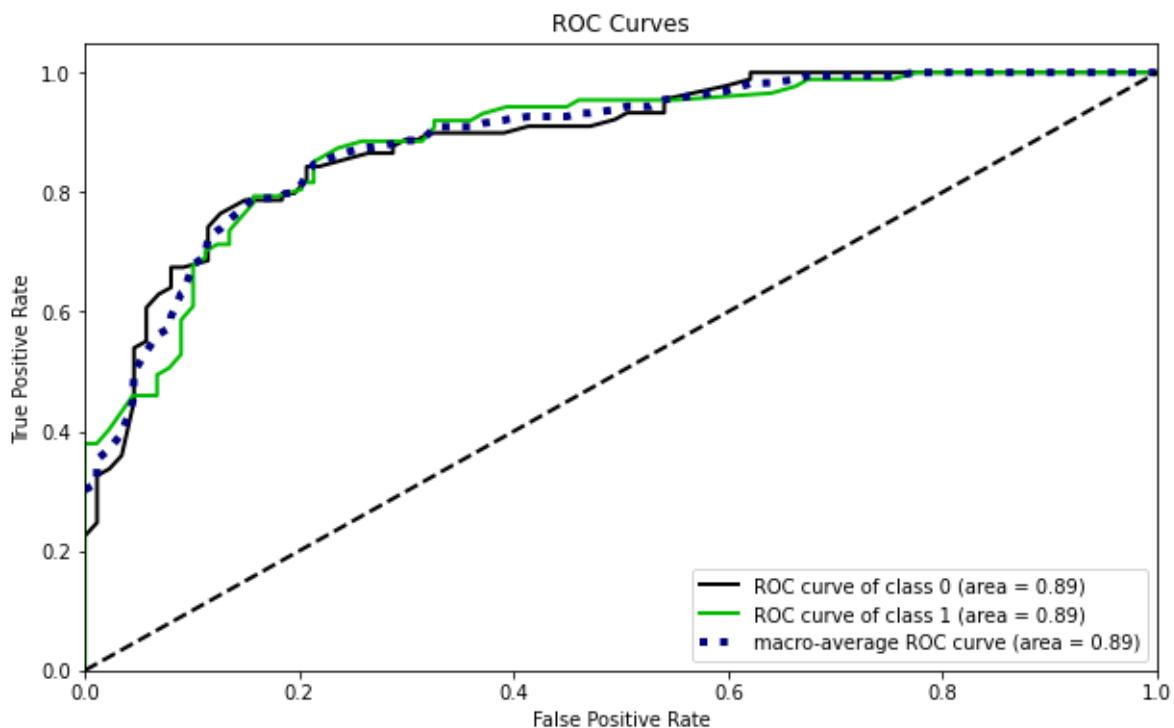
F1 Score = 80.0%

Confusiton Matrix:

```
[[77 12]
 [23 64]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.77	0.87	0.81	89
1	0.84	0.74	0.79	87
accuracy			0.80	176
macro avg	0.81	0.80	0.80	176
weighted avg	0.81	0.80	0.80	176



4. Naive Bayes Classifier:

In [318]:

```
from sklearn.naive_bayes import GaussianNB

NB = GaussianNB().fit(Train_X_std, Train_Y)
pred = NB.predict(Test_X_std)
Classification_Summary(pred,3)

pred_prob = NB.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

<<<-----Naïve Bayes Classifier (NB)-----
----->>>

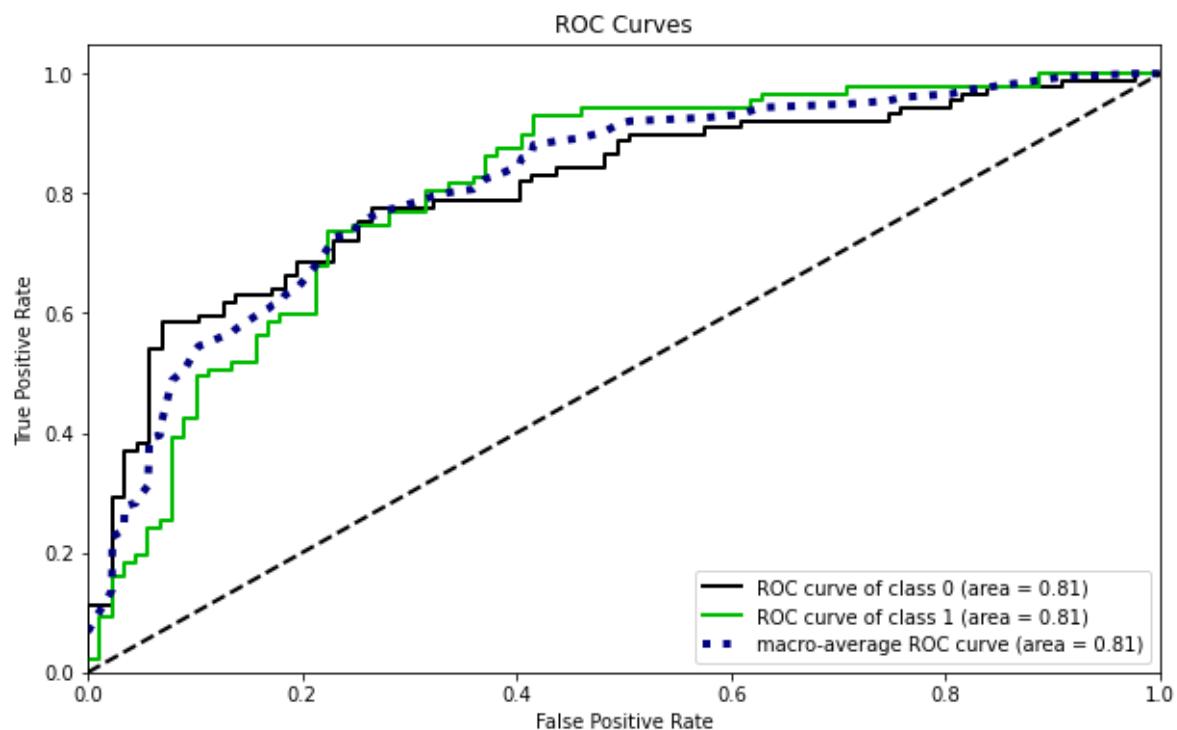
Accuracy = 71.0%
F1 Score = 70.6%

Confusiton Matrix:

```
[[73 16]
 [35 52]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.68	0.82	0.74	89
1	0.76	0.60	0.67	87
accuracy			0.71	176
macro avg	0.72	0.71	0.71	176
weighted avg	0.72	0.71	0.71	176



5. Support Vector Machine Classifier:

In [319]:

```
from sklearn.svm import SVC

SV = SVC(probability=True).fit(Train_X_std, Train_Y)
pred = SV.predict(Test_X_std)
Classification_Summary(pred,4)

pred_prob = SV.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

<<<-----Support Vector Machine (SV)-----
----->>>

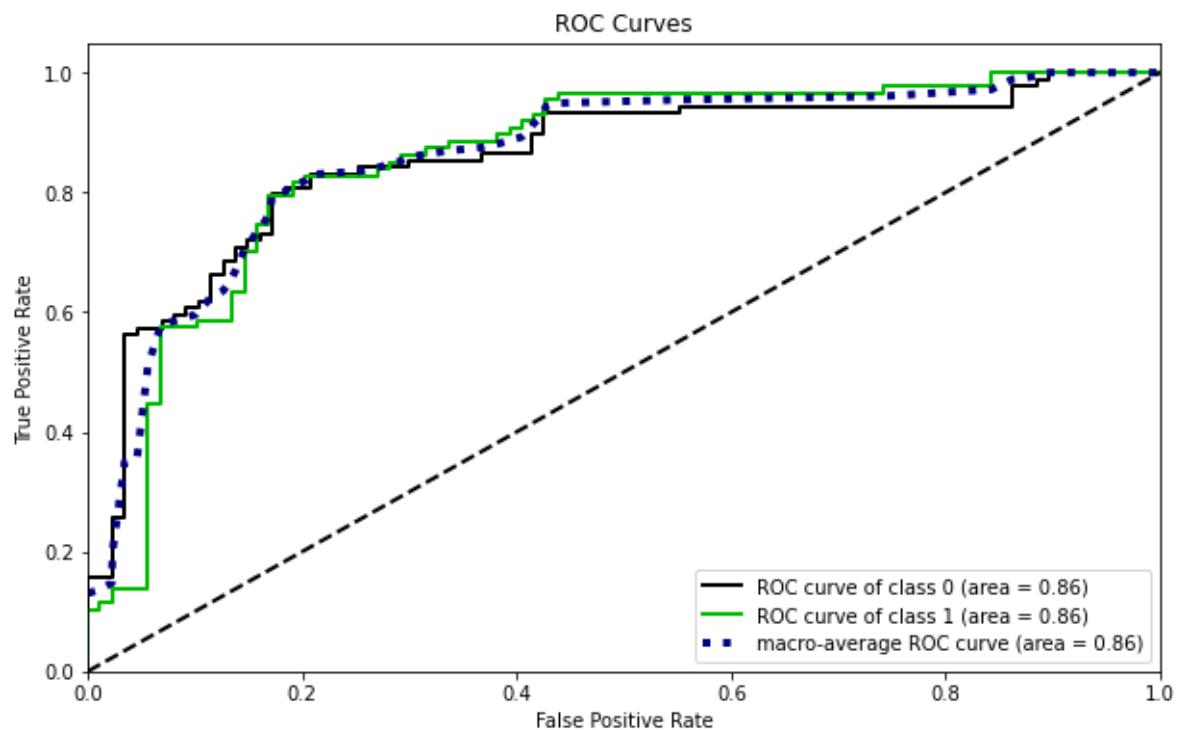
Accuracy = 79.5%
F1 Score = 79.5%

Confusiton Matrix:

```
[[75 14]
 [22 65]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.77	0.84	0.81	89
1	0.82	0.75	0.78	87
accuracy			0.80	176
macro avg	0.80	0.79	0.79	176
weighted avg	0.80	0.80	0.79	176



6. K-Nearest Neighbours Classifier:

In [320]:

```
from sklearn.neighbors import KNeighborsClassifier

KNN = KNeighborsClassifier().fit(Train_X_std, Train_Y)
pred = KNN.predict(Test_X_std)
Classification_Summary(pred,5)

pred_prob = KNN.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

<<-----K Nearest Neighbours (KNN)----->>

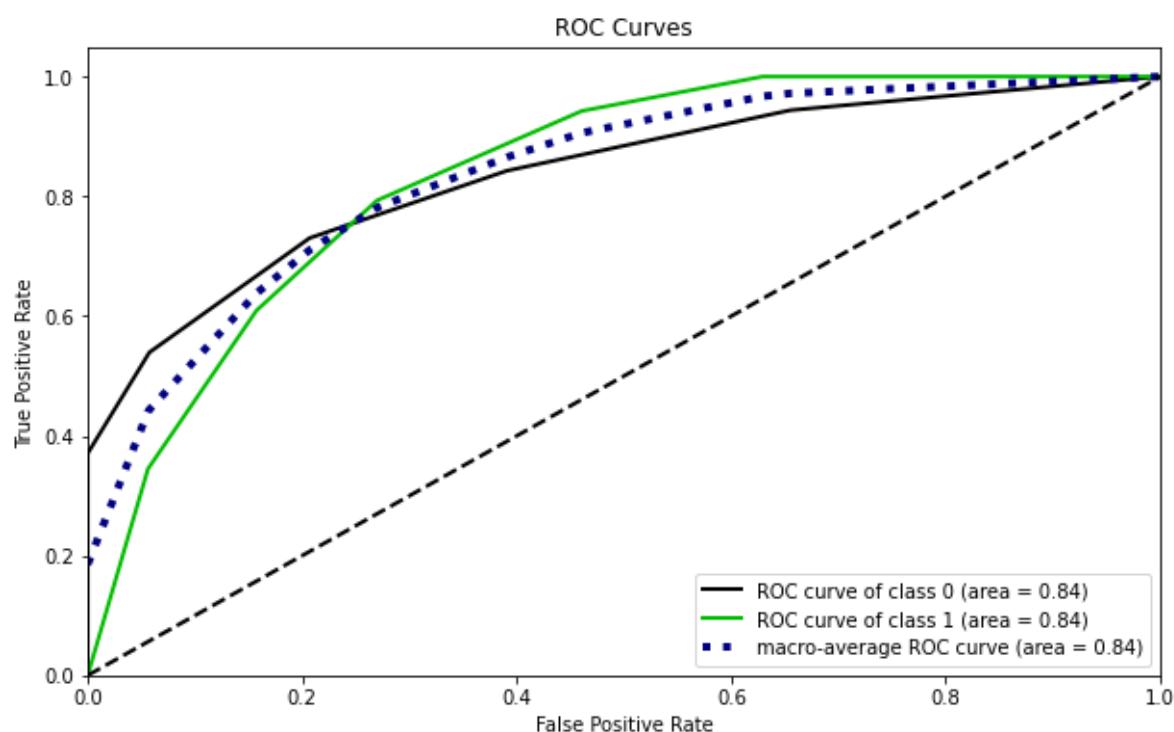
Accuracy = 76.1%
F1 Score = 76.1%

Confusiton Matrix:

```
[[65 24]
 [18 69]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.78	0.73	0.76	89
1	0.74	0.79	0.77	87
accuracy			0.76	176
macro avg	0.76	0.76	0.76	176
weighted avg	0.76	0.76	0.76	176



7. Gradient Boosting Classifier:

In [321]:

```
from sklearn.ensemble import GradientBoostingClassifier

GB = GradientBoostingClassifier().fit(Train_X_std, Train_Y)
pred = GB.predict(Test_X_std)
Classification_Summary(pred,6)

pred_prob = GB.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro','each_class'])
plt.show()
```

<<<-----Gradient Boosting (GB)-----
----->>>

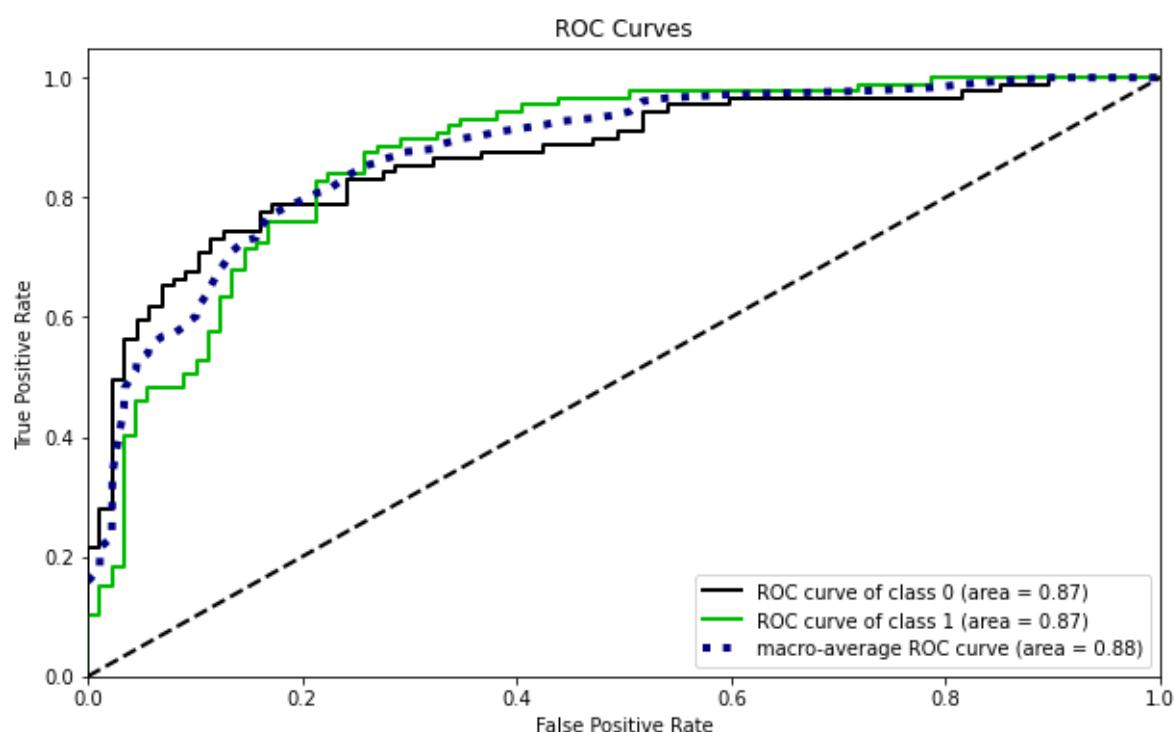
Accuracy = 79.0%
F1 Score = 79.0%

Confusion Matrix:

```
[[73 16]
 [21 66]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.78	0.82	0.80	89
1	0.80	0.76	0.78	87
accuracy			0.79	176
macro avg	0.79	0.79	0.79	176
weighted avg	0.79	0.79	0.79	176



8. Extreme Gradient Boosting Classifier:

In [322]:

```
from xgboost import XGBClassifier

XGB = XGBClassifier().fit(Train_X_std, Train_Y)
pred = XGB.predict(Test_X_std)
Classification_Summary(pred, 7)

pred_prob = XGB.predict_proba(Test_X_std)
auc(Test_Y, pred_prob, curves=['macro', 'each_class'])
plt.show()
```

[22:00:45] WARNING: C:/Users/Administrator/workspace/xgboost-win64_release_1.4.0/src/learner.cc:1095: Starting in XGBoost 1.3.0, the default evaluation metric used with the objective 'binary:logistic' was changed from 'error' to 'logloss'. Explicitly set eval_metric if you'd like to restore the old behavior.

<<-----Extreme Gradient Boosting (XGB)----->>

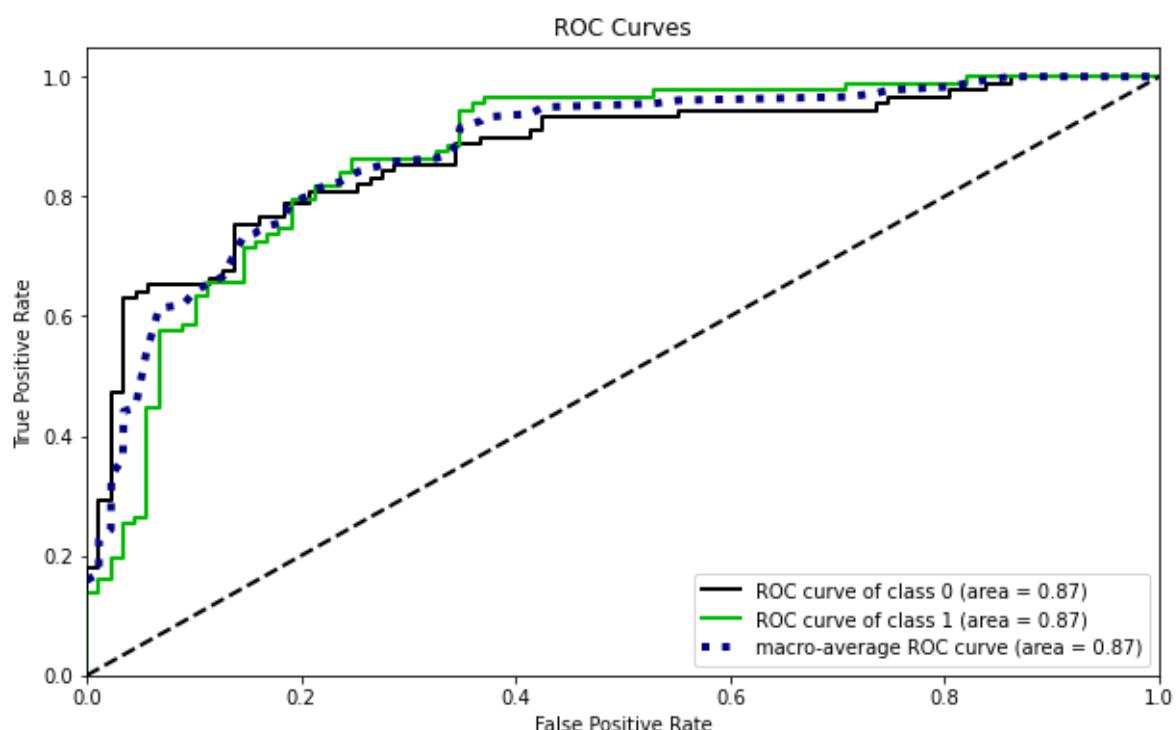
Accuracy = 78.4%
F1 Score = 78.4%

Confusiton Matrix:

```
[[72 17]
 [21 66]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.77	0.81	0.79	89
1	0.80	0.76	0.78	87
accuracy			0.78	176
macro avg	0.78	0.78	0.78	176
weighted avg	0.78	0.78	0.78	176



In [323]:

```
#Plotting Confusion-Matrix of all the predictive Models
```

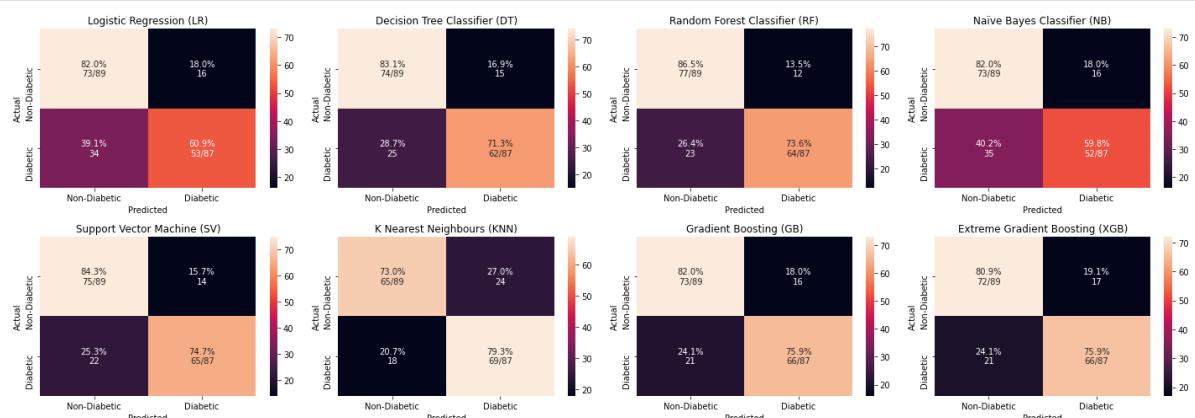
```
labels=['Non-Diabetic','Diabetic']

def plot_cm(y_true, y_pred):
    cm = confusion_matrix(y_true, y_pred, labels=np.unique(y_true))
    cm_sum = np.sum(cm, axis=1, keepdims=True)
    cm_perc = cm / cm_sum.astype(float) * 100
    annot = np.empty_like(cm).astype(str)
    nrows, ncols = cm.shape
    for i in range(nrows):
        for j in range(ncols):
            c = cm[i, j]
            p = cm_perc[i, j]
            if i == j:
                s = cm_sum[i]
                annot[i, j] = '%.1f%%\n%d/%d' % (p, c, s)
            elif c == 0:
                annot[i, j] = ''
            else:
                annot[i, j] = '%.1f%%\n%d' % (p, c)
    cm = pd.DataFrame(cm, index=np.unique(y_true), columns=np.unique(y_true))
    cm.columns=labels
    cm.index=labels
    cm.index.name = 'Actual'
    cm.columns.name = 'Predicted'
    #fig, ax = plt.subplots()
    sns.heatmap(cm, annot=annot, fmt='')# cmap= "GnBu"
```

```
def conf_mat_plot(all_models):
    plt.figure(figsize=[20,7])
```

```
for i in range(len(all_models)):
    plt.subplot(2,4,i+1)
    pred = all_models[i].predict(Test_X_std)
    plot_cm(Test_Y, pred)
    plt.title(Evaluation_Results.index[i])
plt.tight_layout()
plt.show()
```

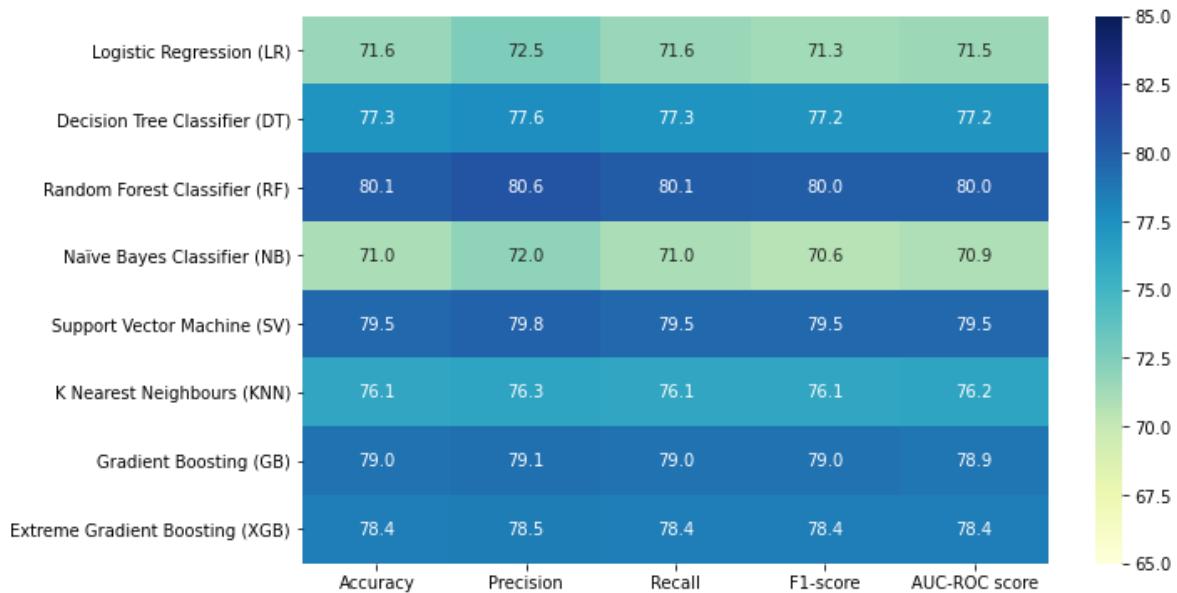
```
conf_mat_plot([LR,DT,RF,NB,SV,KNN,GB,XGB])
```



In [327]:

```
#Comparing all the models Scores
```

```
#plt.figure(figsize=[12,5])
sns.heatmap(Evaluation_Results, annot=True, vmin=65.0, vmax=85.0, cmap='YlGnBu', fmt='.1f')
plt.show()
```



7. Project Outcomes & Conclusions

Here are some of the key outcomes of the project:

- The Dataset was quiet small totally just 768 samples & after preprocessing 17.2% of the datasamples were dropped.
- The diabetic samples were 30% more than non-diabetic ones, hence SMOTE Technique was applied on the data to balance the classes, adding 11.8% more samples to the dataset.
- Visualising the distribution of data & their relationships, helped us to get some insights on the class seperability.
- Feature selection or feature extracting was not exercised, as there were only 8 features, which overall contributed towards the right prediction.
- Testing multiple algorithms with default hyperparamters gave us some understanding for various models performance on this specific dataset.
- Random Forest perform the best on the current dataset, followed by Support Vector Machines & Boosting Algorithms
- Yet it wise to also consider simpler models as they are more generalisable & take lesser training time.

In []:

<<<----- THE END ----->>>