In [25]:

```python
import numpy as np
import pandas as pd

import seaborn as sns
sns.set(rc={'figure.figsize':(6,4)})
import matplotlib.pyplot as plt
%matplotlib inline

from tqdm import tqdm
import random
import pickle
import time

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder

from sklearn.preprocessing import MinMaxScaler
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import MaxAbsScaler
from sklearn.preprocessing import RobustScaler
from sklearn.preprocessing import QuantileTransformer
from sklearn.preprocessing import PowerTransformer
from sklearn.preprocessing import Normalizer

from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier

from sklearn.metrics import accuracy_score
from sklearn.metrics import log_loss
from sklearn.metrics import cohen_kappa_score
from sklearn.metrics import confusion_matrix
from sklearn import metrics

# for ignore warnings
import warnings
warnings.filterwarnings("ignore")

plot_data_list = []
```

In [2]:
```python
df = pd.read_csv('Dataset\Pima diabetes_csv.csv')
df.head()
```

Out[2]:

	preg	plas	pres	skin	insu	mass	pedi	age	class
0	6	148	72	35	0	33.6	0.627	50	tested_positive
1	1	85	66	29	0	26.6	0.351	31	tested_negative
2	8	183	64	0	0	23.3	0.672	32	tested_positive
3	1	89	66	23	94	28.1	0.167	21	tested_negative
4	0	137	40	35	168	43.1	2.288	33	tested_positive

In [3]:
```python
df.shape
```

Out[3]:
```
(768, 9)
```

In [4]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   preg    768 non-null    int64  
 1   plas    768 non-null    int64  
 2   pres    768 non-null    int64  
 3   skin    768 non-null    int64  
 4   insu    768 non-null    int64  
 5   mass    768 non-null    float64
 6   pedi    768 non-null    float64
 7   age     768 non-null    int64  
 8   class   768 non-null    object 
dtypes: float64(2), int64(6), object(1)
memory usage: 54.1+ KB
```

In [5]:
```
round(df.describe(),2)
```

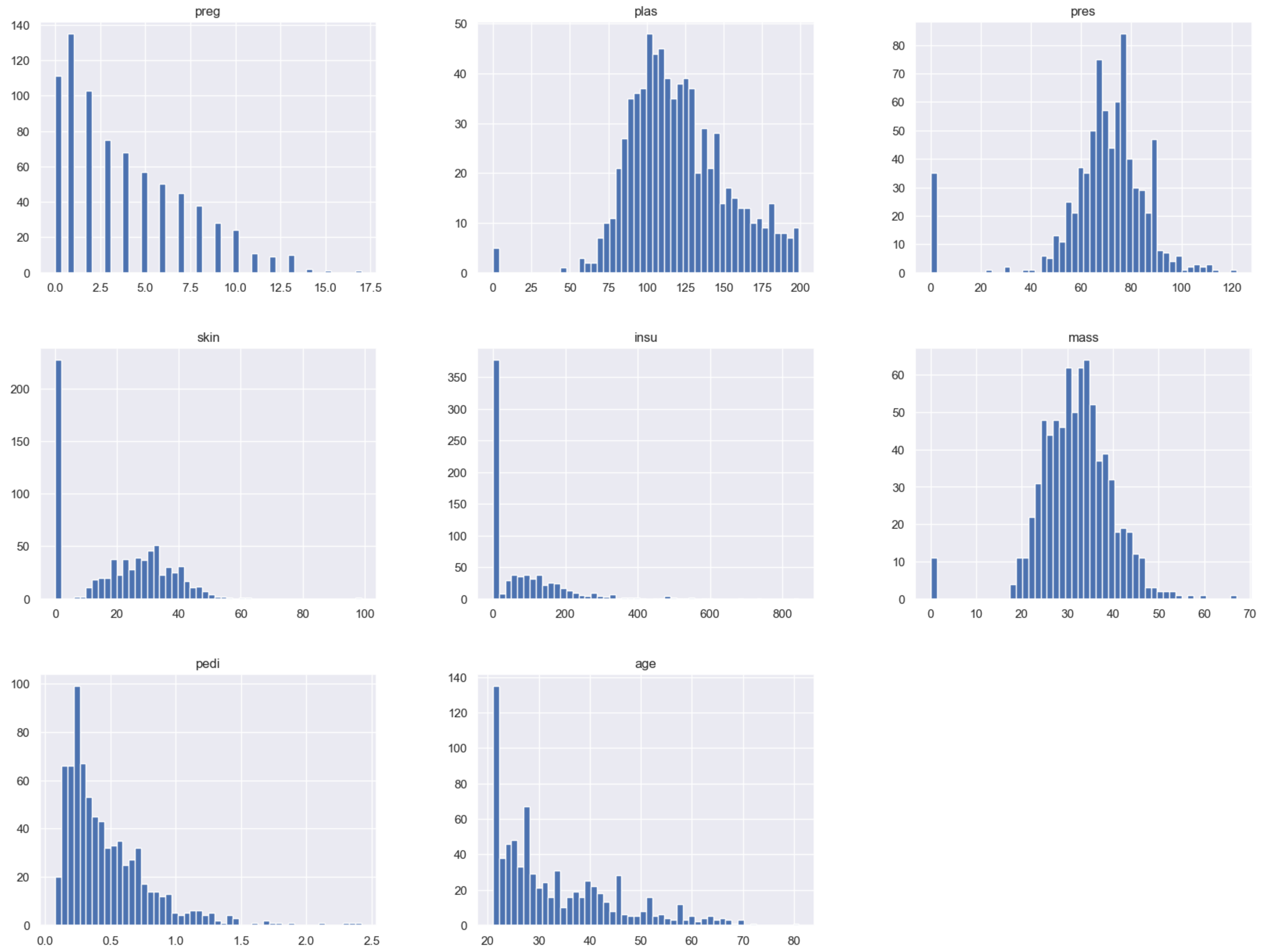
Out[5]:

	preg	plas	pres	skin	insu	mass	pedi	age
count	768.00	768.00	768.00	768.00	768.00	768.00	768.00	768.00
mean	3.85	120.89	69.11	20.54	79.80	31.99	0.47	33.24
std	3.37	31.97	19.36	15.95	115.24	7.88	0.33	11.76
min	0.00	0.00	0.00	0.00	0.00	0.00	0.08	21.00
25%	1.00	99.00	62.00	0.00	0.00	27.30	0.24	24.00
50%	3.00	117.00	72.00	23.00	30.50	32.00	0.37	29.00
75%	6.00	140.25	80.00	32.00	127.25	36.60	0.63	41.00
max	17.00	199.00	122.00	99.00	846.00	67.10	2.42	81.00

In [6]:
```
# check null
df.isnull().sum()
```

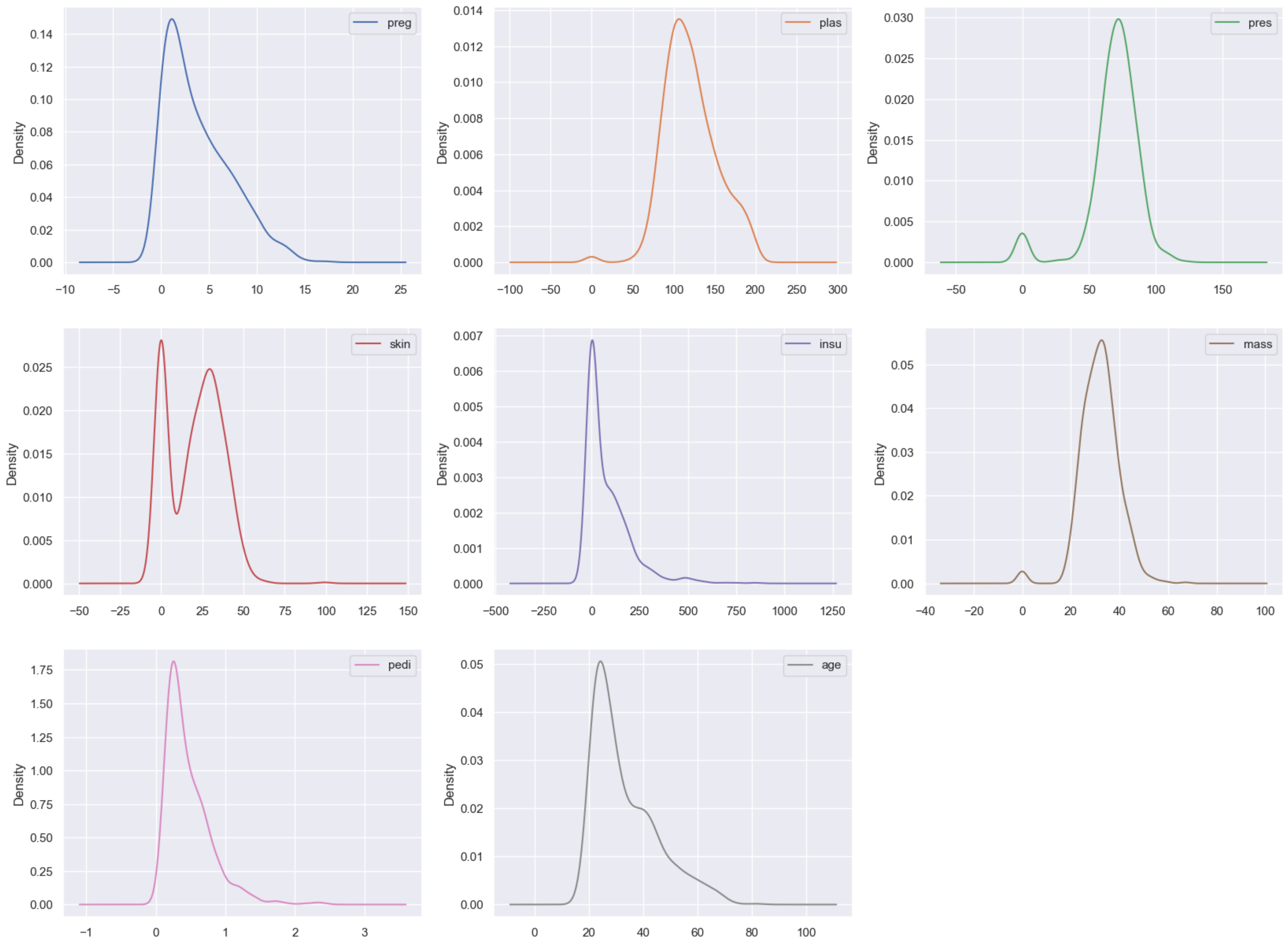
Out[6]:
```
preg     0
plas     0
pres     0
skin     0
insu     0
mass     0
pedi     0
age      0
class    0
dtype: int64
```

In [7]:
```python
df.hist(bins=50, figsize=(20, 15))
plt.show()
```


preg
plas
pres
skin
insu
mass
pedi
age

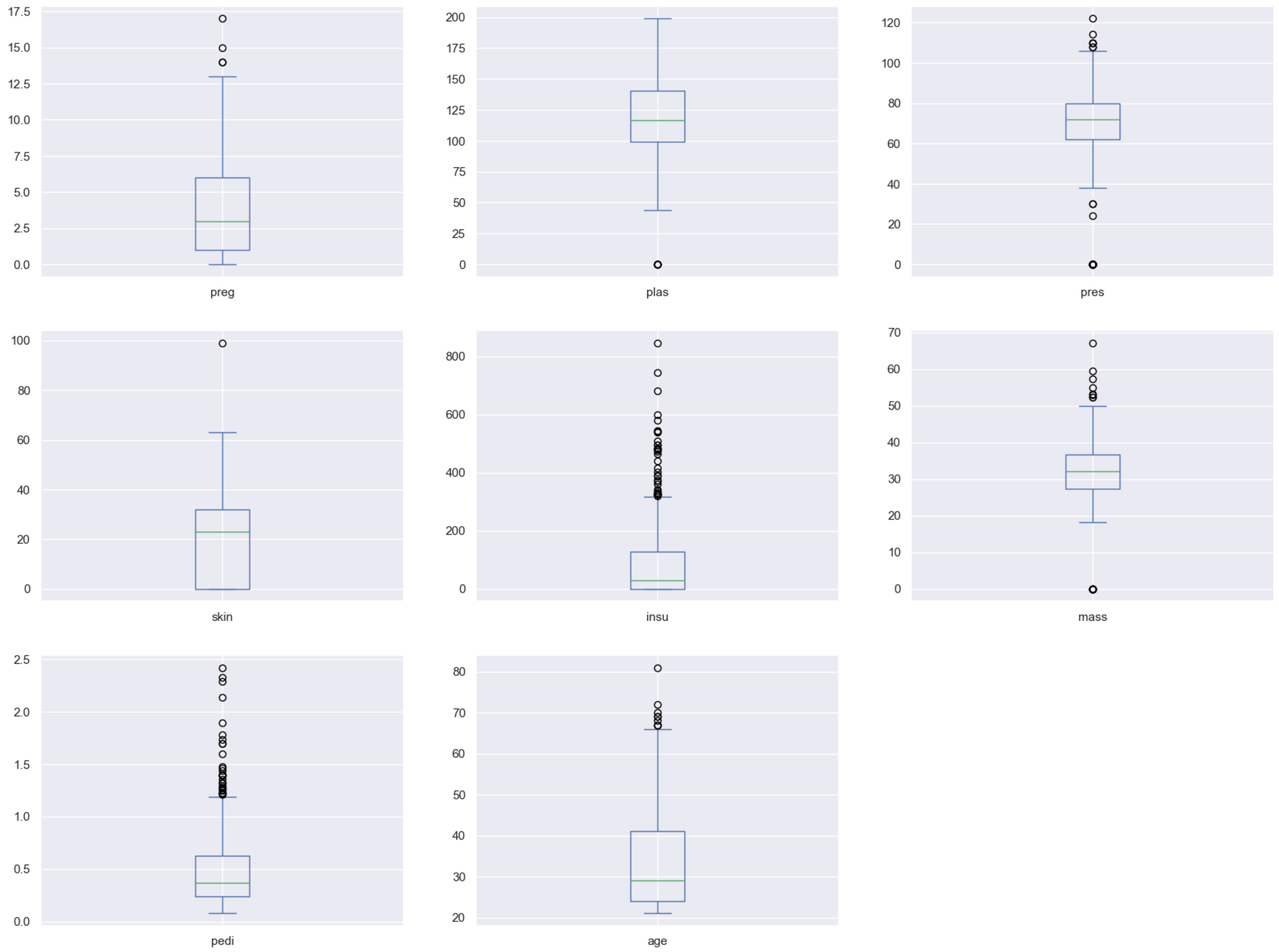
In [8]:

```
# Density plots for all attributes to visualize the distribution of each attribute
df.plot(kind='density', subplots=True, layout=(3,3), figsize=(20, 15), sharex=False)
plt.show()
```


preg
plas
pres
skin
insu
mass
pedi
age
Density

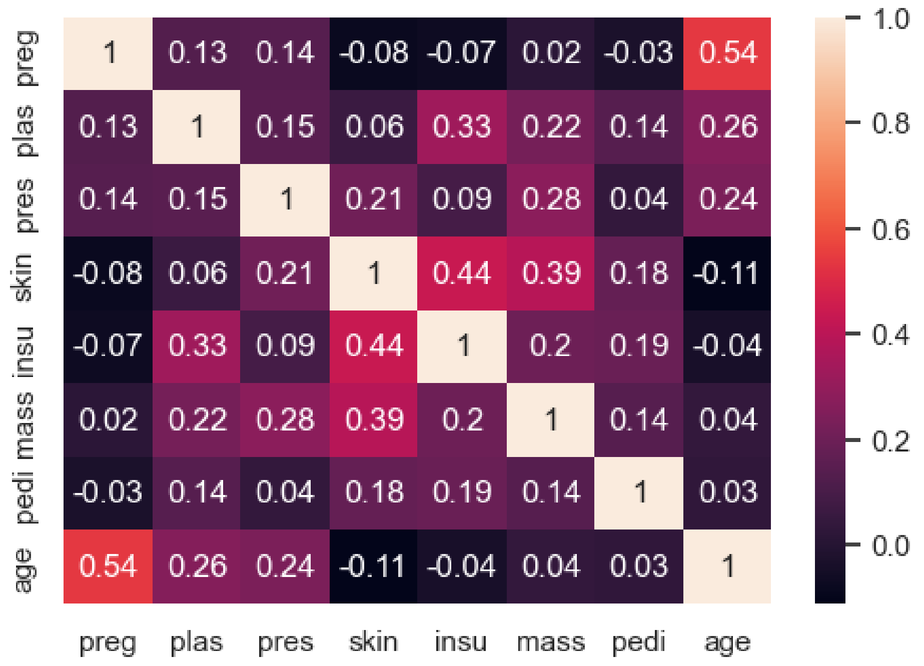
In [9]:

```
# Box and Whisker plot to visualize the distribution of all atributes
df.plot(kind='box', subplots=True, layout=(3,3), sharex=False, sharey=False, figsize=(20,15))
plt.show()
```


preg
plas
pres
skin
insu
mass
pedi
age

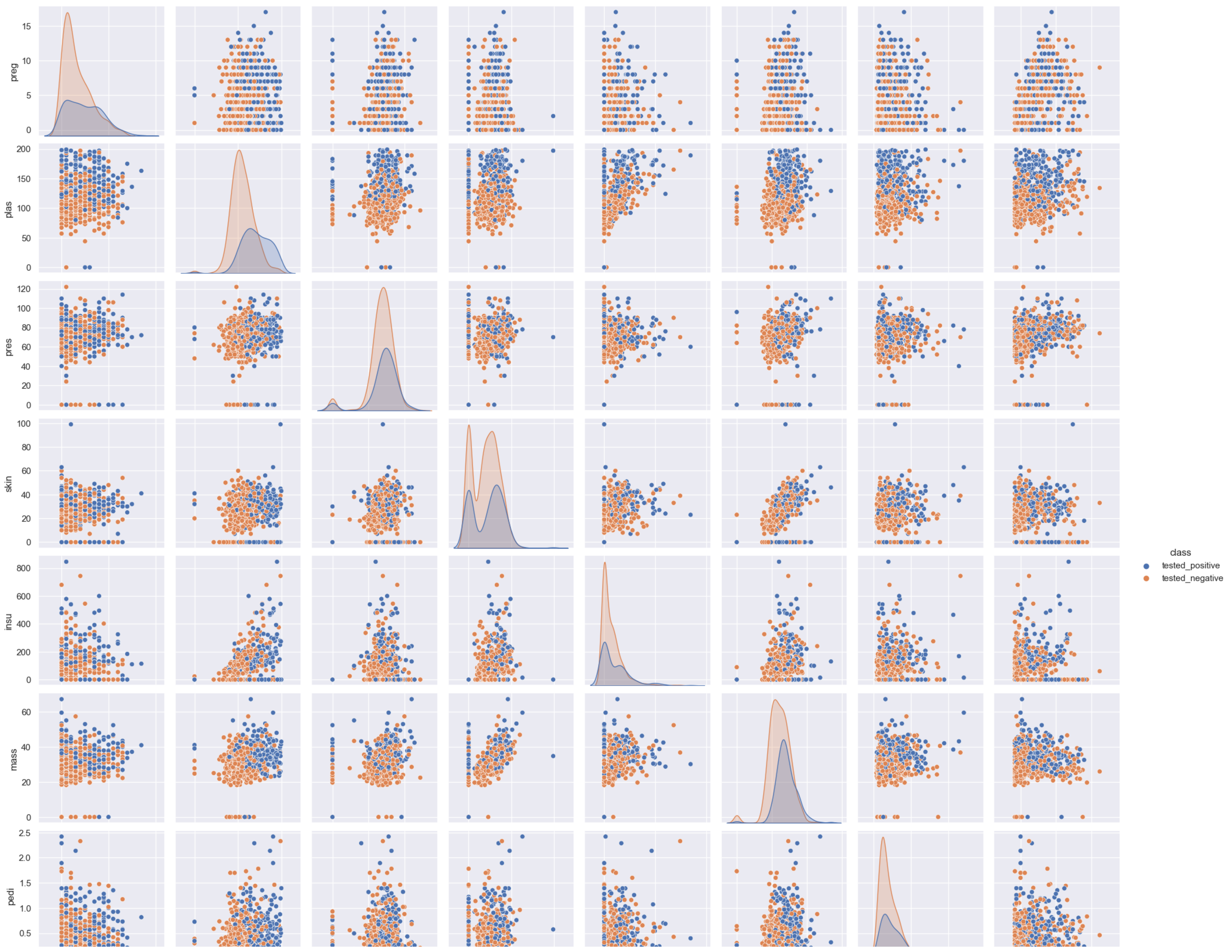
In [14]:

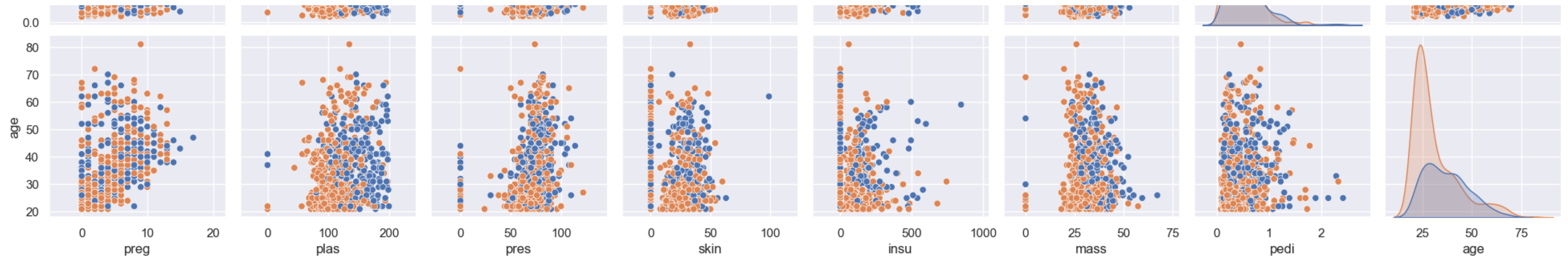
```python
# Correlation between the different characteristics. Closer to 1 better is the correlation.
sns.heatmap(round(df.corr(method='pearson'),2), annot = True)
plt.show()
```



	preg	plas	pres	skin	insu	mass	pedi	age
preg	1	0.13	0.14	-0.08	-0.07	0.02	-0.03	0.54
plas	0.13	1	0.15	0.06	0.33	0.22	0.14	0.26
pres	0.14	0.15	1	0.21	0.09	0.28	0.04	0.24
skin	-0.08	0.06	0.21	1	0.44	0.39	0.18	-0.11
insu	-0.07	0.33	0.09	0.44	1	0.2	0.19	-0.04
mass	0.02	0.22	0.28	0.39	0.2	1	0.14	0.04
pedi	-0.03	0.14	0.04	0.18	0.19	0.14	1	0.03
age	0.54	0.26	0.24	-0.11	-0.04	0.04	0.03	1

In [15]:
```python
# Pairplot
sns.pairplot(df, hue='class')
plt.show()
```


preg
plas
pres
skin
insu
mass
pedi
class
tested_positive
tested_negative



In [20]:
```
df['classification'] = df['class'].apply(lambda x: 1 if x=='tested_negative' else 0)
# Remove two columns name is 'class'
df.drop(['class'], axis=1, inplace=True)
df.head(10)
```

Out[20]:

	preg	plas	pres	skin	insu	mass	pedi	age	classification
0	6	148	72	35	0	33.6	0.627	50	0
1	1	85	66	29	0	26.6	0.351	31	1
2	8	183	64	0	0	23.3	0.672	32	0
3	1	89	66	23	94	28.1	0.167	21	1
4	0	137	40	35	168	43.1	2.288	33	0
5	5	116	74	0	0	25.6	0.201	30	1
6	3	78	50	32	88	31.0	0.248	26	0
7	10	115	0	0	0	35.3	0.134	29	1
8	2	197	70	45	543	30.5	0.158	53	0
9	8	125	96	0	0	0.0	0.232	54	0

Classification

In [21]:
```
# Split data
# X, Y = df.iloc[:,:-1], df.iloc[:,-1]
X, Y = df.drop(['classification'], axis = 1),  df['classification']
X_train, X_test, y_train, y_test = train_test_split(X,Y, test_size = 0.3, random_state = 42, stratify = Y)
```

In [22]:

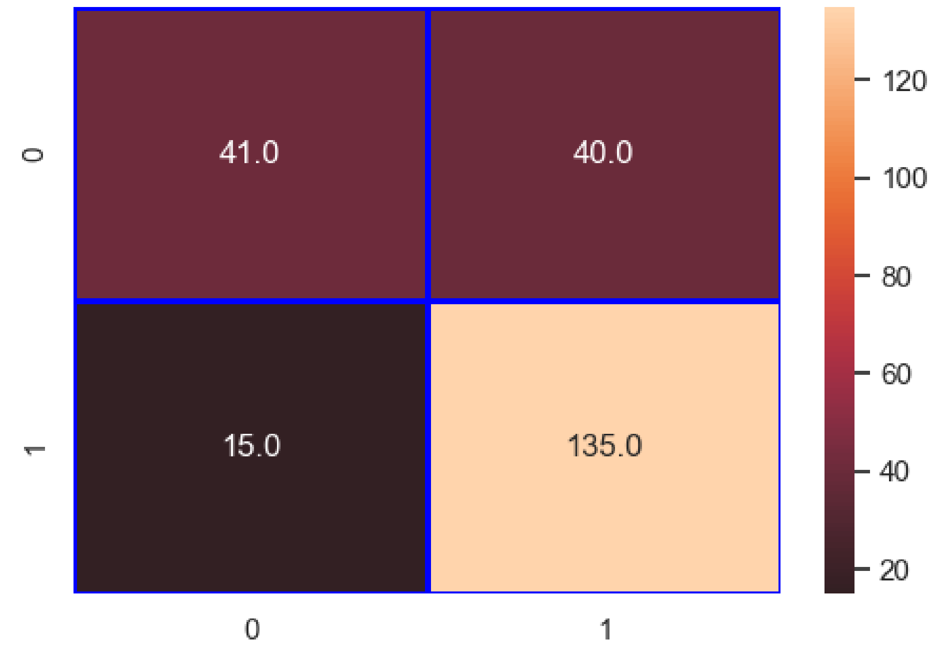
```python
# Model initialization
lr_Classifier = LogisticRegression()
knn_Classifier = KNeighborsClassifier()
gnb_Classifier = GaussianNB()
dt_Classifier = DecisionTreeClassifier()
rf_Classifier = RandomForestClassifier()
model_list = [lr_Classifier, knn_Classifier, gnb_Classifier, dt_Classifier, rf_Classifier]

# Scaler initialization
MinMax_scaler = MinMaxScaler()
Standard_scaler = StandardScaler()
MaxAbs_scaler = MaxAbsScaler()
Robust_scaler = RobustScaler()
Quantile_scaler = QuantileTransformer()
Power_scaler = PowerTransformer()
Normalizer_scaler = Normalizer()
scaler_list = [MinMax_scaler, Standard_scaler, MaxAbs_scaler, Robust_scaler,
               Quantile_scaler, Power_scaler, Normalizer_scaler]
```

In [33]:
```python
def run_pipeline(X_train, X_test, y_train, y_test, scaler, classifier):
    # Model Information
    print(f"Modele name : {type(classifier).__name__}")
    print(f"Scaler name : {type(scaler).__name__}")

    # process 1 : fit and transform X_train data
    scaled_X_train = scaler.fit_transform(X_train)

    # process 2 : train model
    classifier.fit(scaled_X_train, y_train)

    # process 3 : transform X_test data
    scaled_X_test = scaler.transform(X_test)

    # process 4 : test model
    y_pred = classifier.predict(scaled_X_test)
    # print(y_pred, le.inverse_transform(y_pred))

    # process 5 : model evalution
    print("Accuracy_score:", round((accuracy_score(y_test, y_pred))*100,2),'%')
    print("Loss:", round((1-accuracy_score(y_test, y_pred))*100,2),'%')
    print("Cohen_kappa_score:", round((cohen_kappa_score(y_test, y_pred))*100,2),'%')
    print("Classification_report:\n",metrics.classification_report(y_test, y_pred))
    print("confusion_matrix:\n", confusion_matrix(y_test, y_pred))
    # plot confusion_matrix
    fig, ax = plt.subplots()
    fig.set_size_inches(6,4) # WH
    sns.heatmap(confusion_matrix(y_test, y_pred),
                annot=True,
                fmt=".1f",
                linewidths = 2,
                linecolor = "blue",
                center=0)
    plt.show()

    # process 6 : save model in pkl file
    filename = f'Moduls\\{str(type(classifier).__name__)}_{str(type(scaler).__name__)}_03_Disease_Prediction.pkl'
    pickle.dump(classifier, open(filename, 'wb'))

    # collect data for bar plot
    global plot_data_list
    plot_data_list.append([str(type(classifier).__name__),
                           str(type(scaler).__name__),
                           round((accuracy_score(y_test, y_pred))*100,2)])

    # end
    print("==="*30)
    print("\n\n")
    time.sleep(0.5)
```

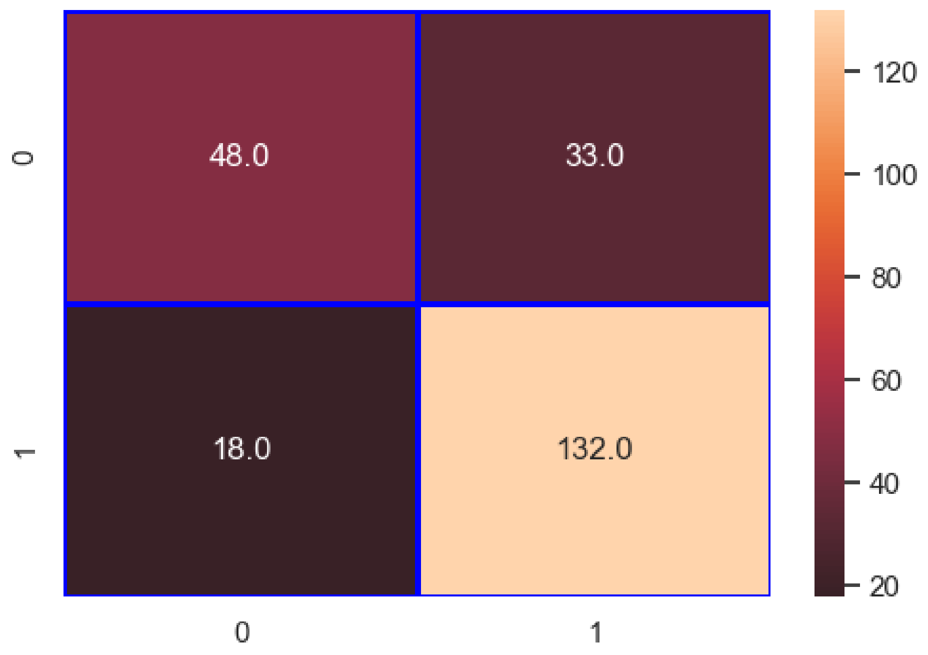
In [34]:

```python
for model in model_list:
    for scaler in scaler_list:
        run_pipeline(X_train, X_test, y_train, y_test, scaler, model)

    # plot data
    plot_df = pd.DataFrame(plot_data_list, columns=['classifier', 'scaler', 'accuracy_score'])
    plot_df.to_csv(f"Dataset\\{str(type(model).__name__)}_accuracy_score_plot_data_03_Disease_Prediction.csv", index=False)
    sns.set(rc={'figure.figsize':(18,6)})
    ax = sns.barplot(data=plot_df, x="classifier", y="accuracy_score", hue="scaler")
    plt.title('Accuracy Score Plot')
    plt.xlabel('Classifier')
    plt.ylabel('Accuracy Score')
    for i in ax.containers:
        ax.bar_label(i,)
    plt.show()

    # empty list
    plot_data_list = []
    print("\n\n")

print("Done...")
```

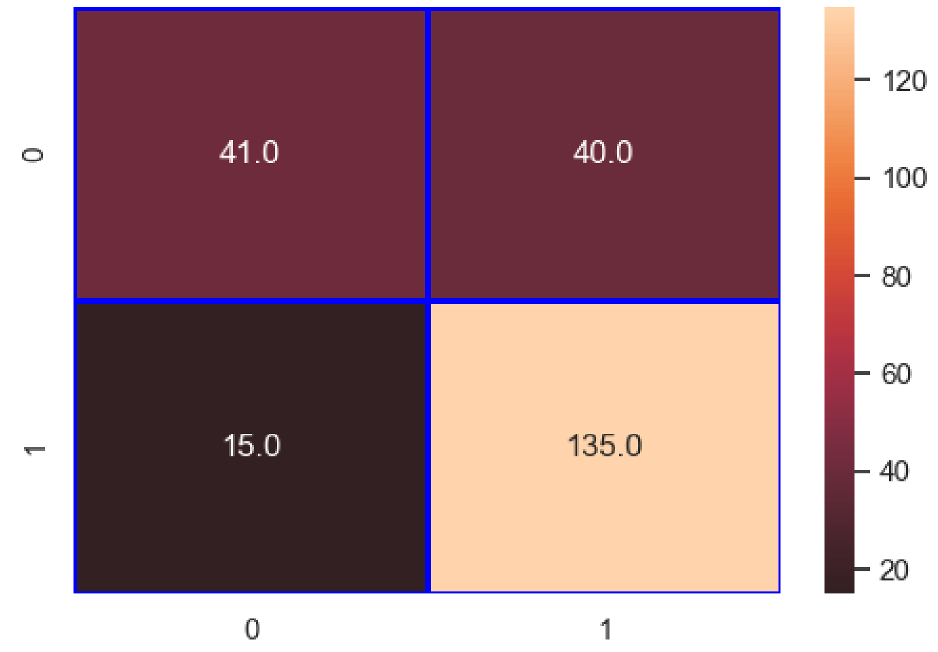
```
Modele name : LogisticRegression
Scaler name : MinMaxScaler
Accuracy_score: 76.19 %
Loss: 23.81 %
Cohen_kappa_score: 43.72 %
Classification_report:
               precision    recall  f1-score   support

           0       0.73      0.51      0.60        81
           1       0.77      0.90      0.83       150

    accuracy                           0.76       231
   macro avg       0.75      0.70      0.71       231
weighted avg       0.76      0.76      0.75       231

confusion_matrix:
 [[ 41  40]
 [ 15 135]]
```



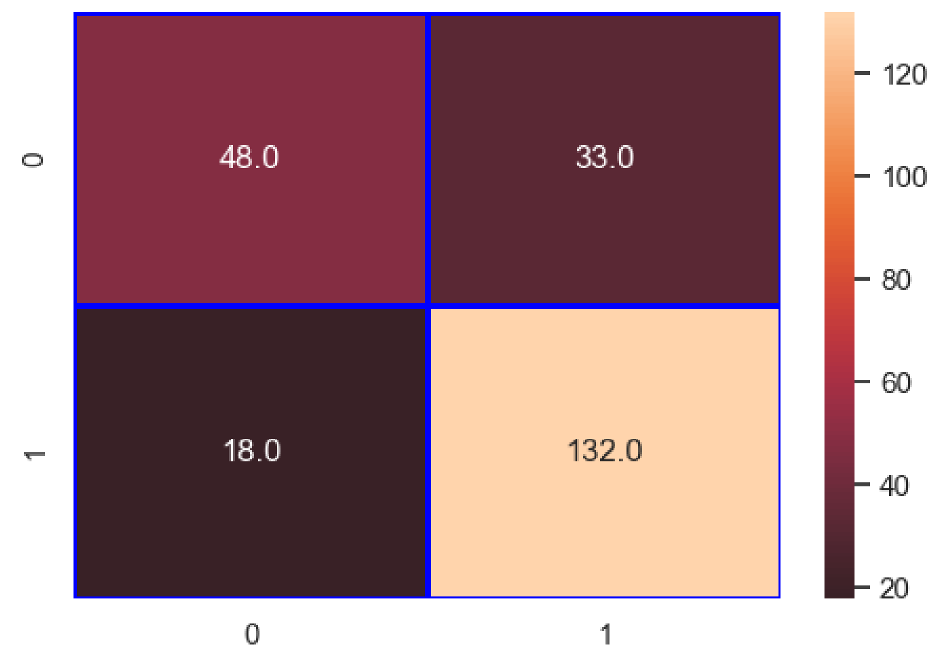
```
=========================================================================================



Modele name : LogisticRegression
Scaler name : StandardScaler
Accuracy_score: 77.92 %
Loss: 22.08 %
Cohen_kappa_score: 49.36 %
Classification_report:
               precision    recall  f1-score   support

           0       0.73      0.59      0.65        81
           1       0.80      0.88      0.84       150

    accuracy                           0.78       231
   macro avg       0.76      0.74      0.75       231
weighted avg       0.77      0.78      0.77       231

confusion_matrix:
 [[ 48  33]
 [ 18 132]]
```



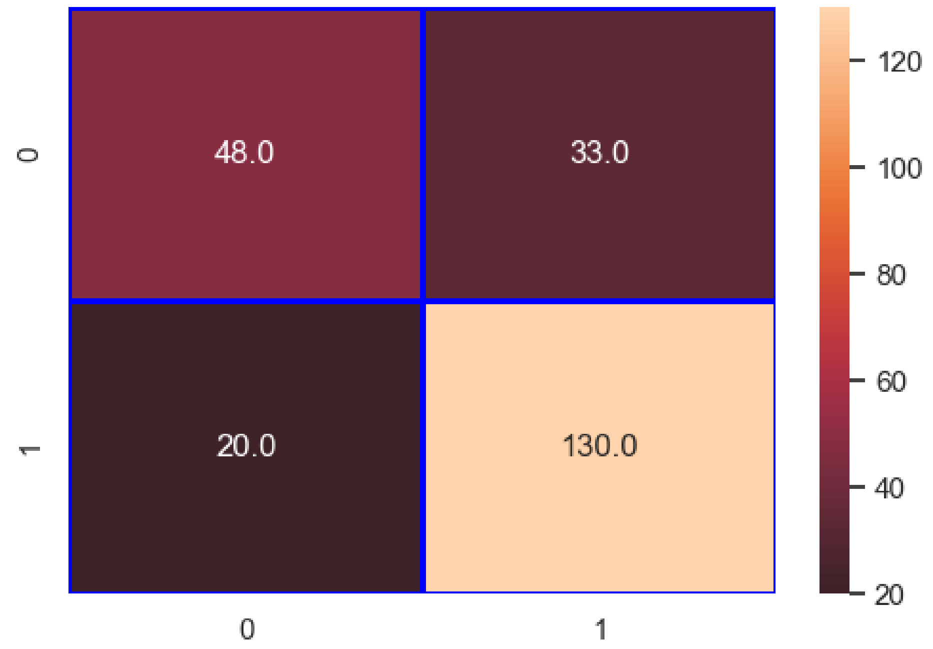
```
===========================================================================================



Modele name : LogisticRegression
Scaler name : MaxAbsScaler
Accuracy_score: 76.19 %
Loss: 23.81 %
Cohen_kappa_score: 43.72 %
Classification_report:
               precision    recall  f1-score   support

           0       0.73      0.51      0.60        81
           1       0.77      0.90      0.83       150

    accuracy                           0.76       231
   macro avg       0.75      0.70      0.71       231
weighted avg       0.76      0.76      0.75       231

confusion_matrix:
 [[ 41  40]
 [ 15 135]]
```



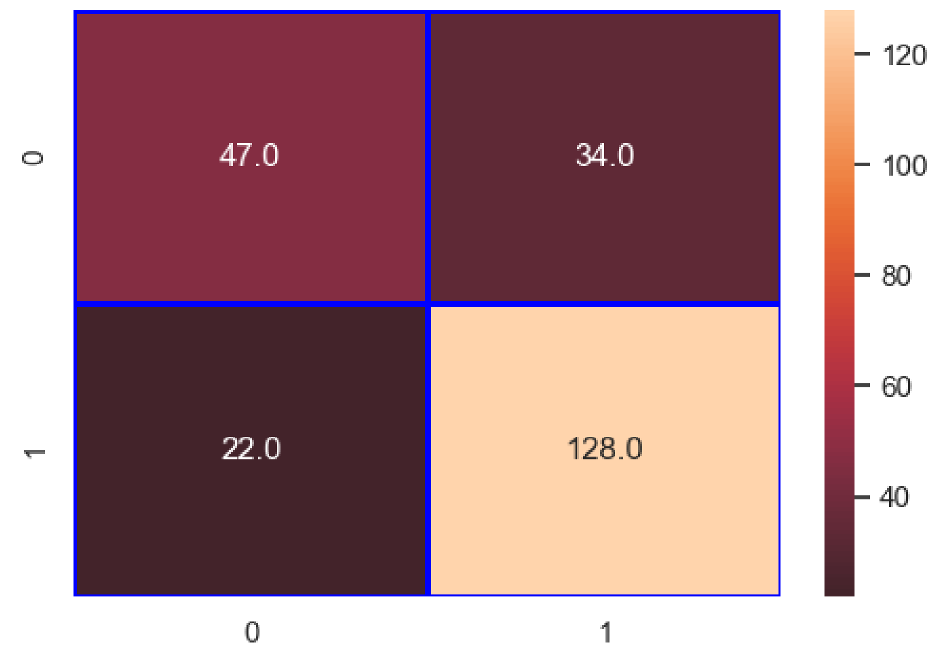
```
==========================================================================================



Modele name : LogisticRegression
Scaler name : RobustScaler
Accuracy_score: 77.92 %
Loss: 22.08 %
Cohen_kappa_score: 49.36 %
Classification_report:
               precision    recall  f1-score   support

           0       0.73      0.59      0.65        81
           1       0.80      0.88      0.84       150

    accuracy                           0.78       231
   macro avg       0.76      0.74      0.75       231
weighted avg       0.77      0.78      0.77       231

confusion_matrix:
 [[ 48  33]
 [ 18 132]]
```



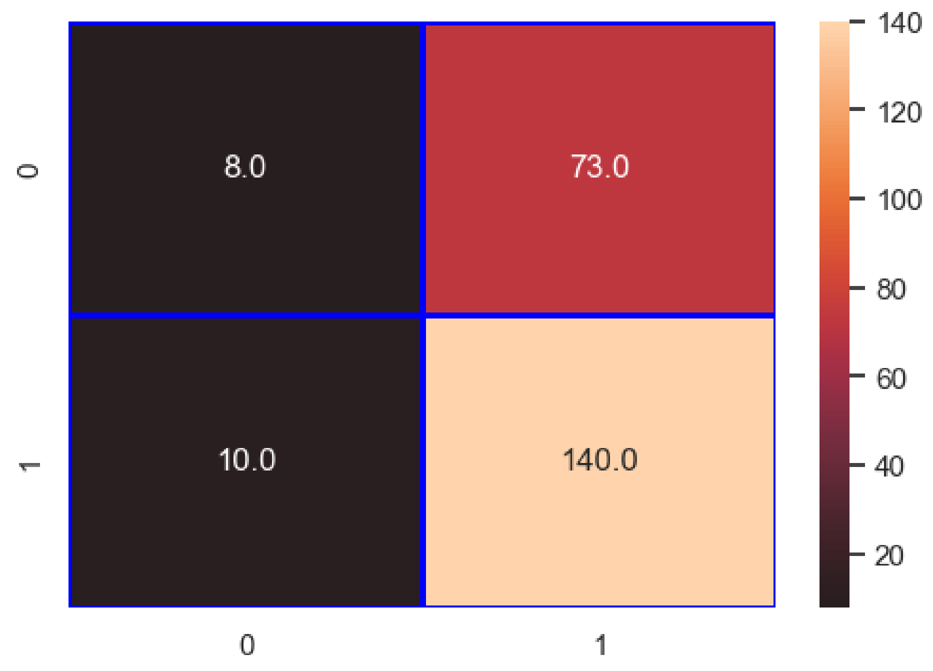
```
==========================================================================================



Modele name : LogisticRegression
Scaler name : QuantileTransformer
Accuracy_score: 77.06 %
Loss: 22.94 %
Cohen_kappa_score: 47.69 %
Classification_report:
               precision    recall  f1-score   support

           0       0.71      0.59      0.64        81
           1       0.80      0.87      0.83       150

    accuracy                           0.77       231
   macro avg       0.75      0.73      0.74       231
weighted avg       0.77      0.77      0.77       231

confusion_matrix:
 [[ 48  33]
 [ 20 130]]
```



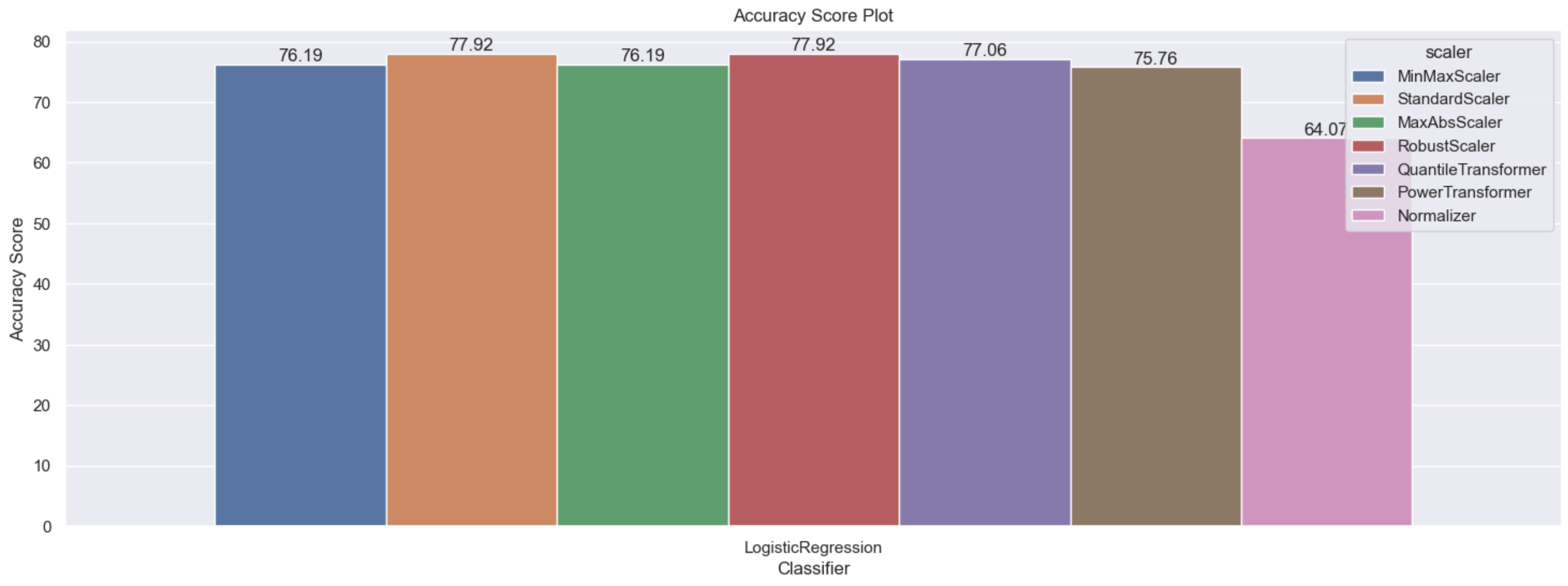
```
=========================================================================================



Modele name : LogisticRegression
Scaler name : PowerTransformer
Accuracy_score: 75.76 %
Loss: 24.24 %
Cohen_kappa_score: 44.89 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.58      0.63        81
           1       0.79      0.85      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.72      0.72       231
weighted avg       0.75      0.76      0.75       231

confusion_matrix:
 [[ 47  34]
 [ 22 128]]
```



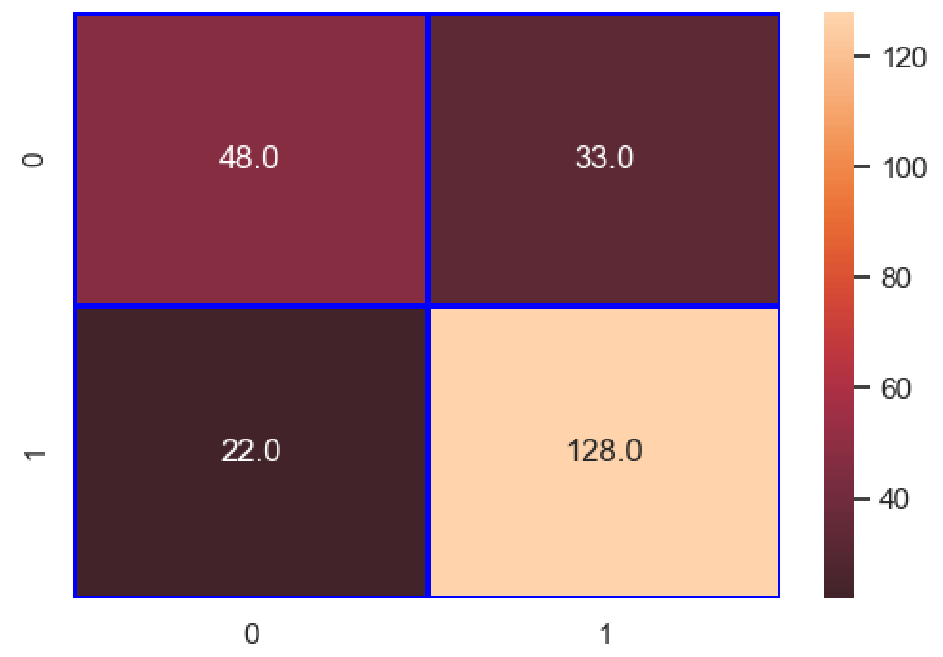
```
=========================================================================================



Modele name : LogisticRegression
Scaler name : Normalizer
Accuracy_score: 64.07 %
Loss: 35.93 %
Cohen_kappa_score: 3.91 %
Classification_report:
               precision    recall  f1-score   support

           0       0.44      0.10      0.16        81
           1       0.66      0.93      0.77       150

    accuracy                           0.64       231
   macro avg       0.55      0.52      0.47       231
weighted avg       0.58      0.64      0.56       231

confusion_matrix:
 [[  8  73]
 [ 10 140]]
```


8.0
73.0
10.0
140.0
0
1
0
1
140
120
100
80
60
40
20

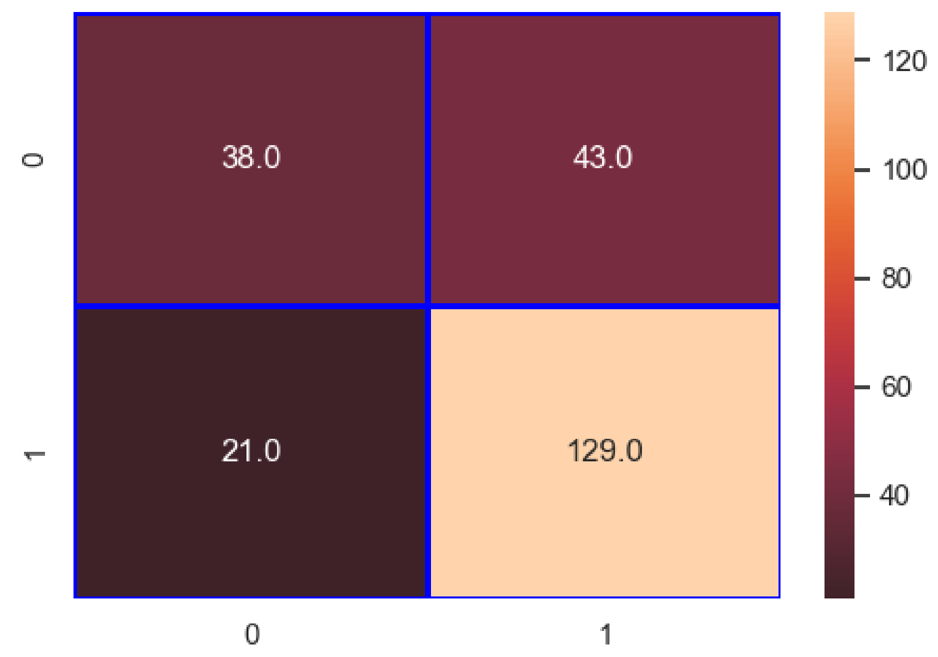
```
================================================================================
```



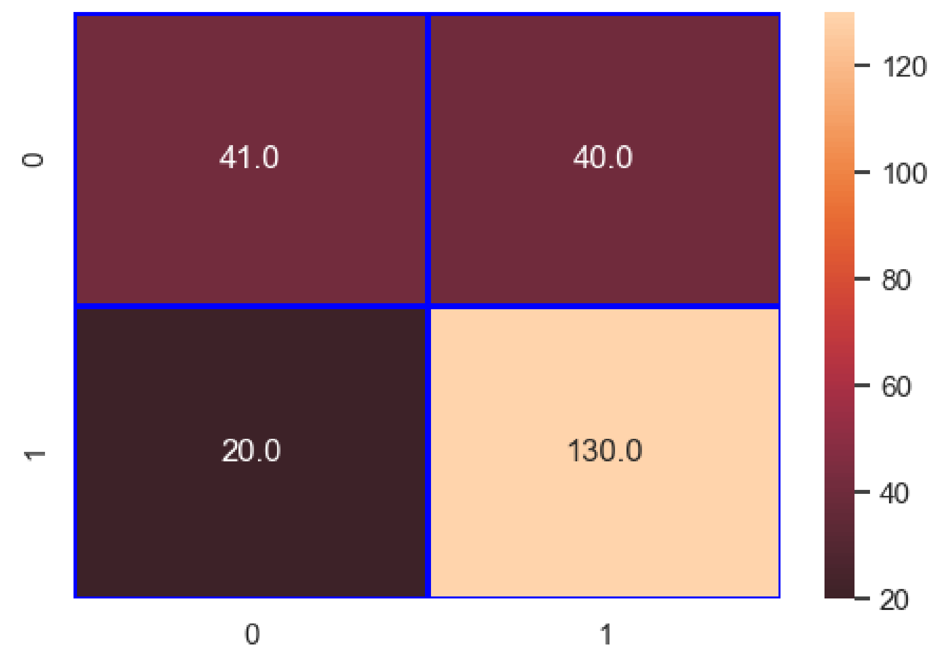
```
Modele name : KNeighborsClassifier
Scaler name : MinMaxScaler
Accuracy_score: 76.19 %
Loss: 23.81 %
Cohen_kappa_score: 46.03 %
Classification_report:
               precision    recall  f1-score   support

           0       0.69      0.59      0.64        81
           1       0.80      0.85      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.72      0.73       231
weighted avg       0.76      0.76      0.76       231

confusion_matrix:
 [[ 48  33]
 [ 22 128]]
```



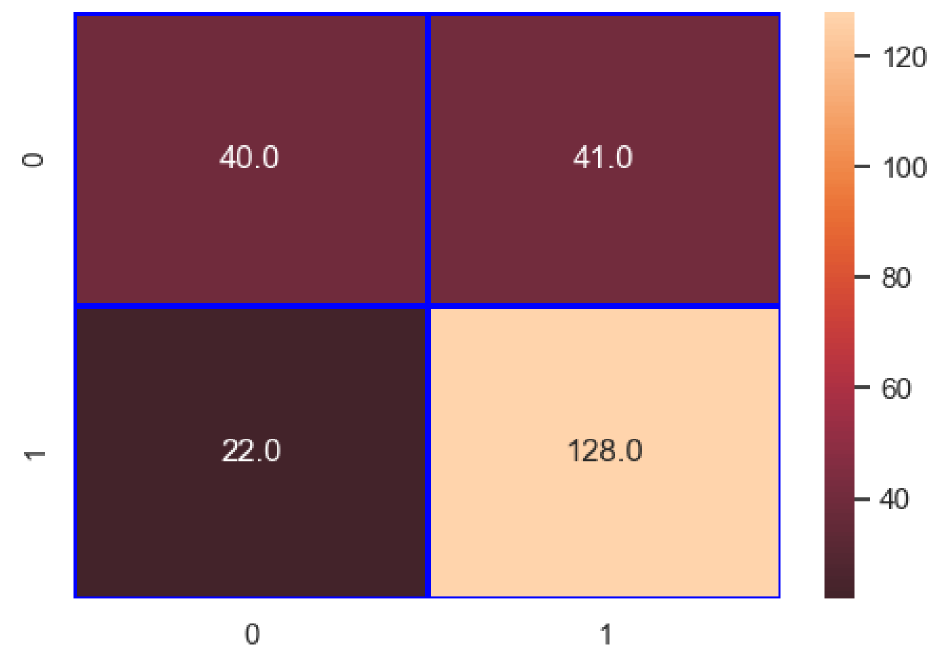
```
==========================================================================================



Modele name : KNeighborsClassifier
Scaler name : StandardScaler
Accuracy_score: 72.29 %
Loss: 27.71 %
Cohen_kappa_score: 35.11 %
Classification_report:
               precision    recall  f1-score   support

           0       0.64      0.47      0.54        81
           1       0.75      0.86      0.80       150

    accuracy                           0.72       231
   macro avg       0.70      0.66      0.67       231
weighted avg       0.71      0.72      0.71       231

confusion_matrix:
 [[ 38  43]
 [ 21 129]]
```



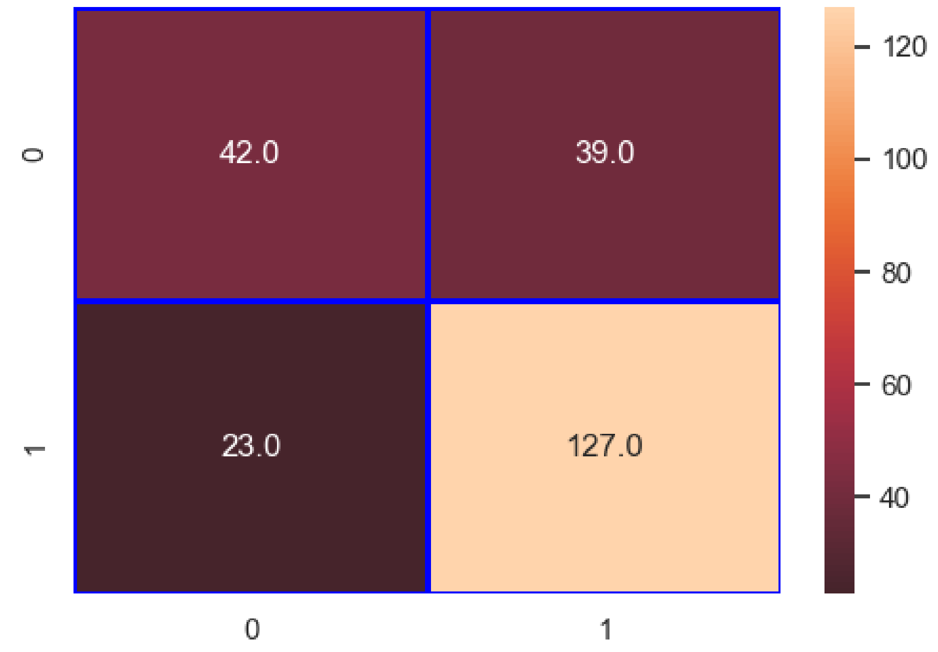
```
==========================================================================================



Modele name : KNeighborsClassifier
Scaler name : MaxAbsScaler
Accuracy_score: 74.03 %
Loss: 25.97 %
Cohen_kappa_score: 39.53 %
Classification_report:
               precision    recall  f1-score   support

           0       0.67      0.51      0.58        81
           1       0.76      0.87      0.81       150

    accuracy                           0.74       231
   macro avg       0.72      0.69      0.69       231
weighted avg       0.73      0.74      0.73       231

confusion_matrix:
 [[ 41  40]
 [ 20 130]]
```



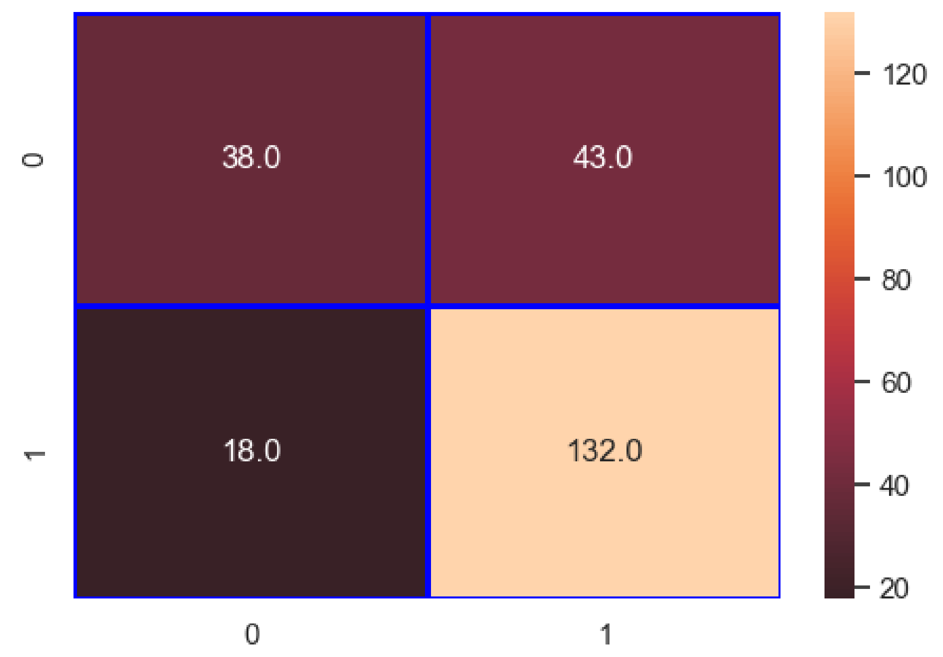
```
==========================================================================================



Modele name : KNeighborsClassifier
Scaler name : RobustScaler
Accuracy_score: 72.73 %
Loss: 27.27 %
Cohen_kappa_score: 36.7 %
Classification_report:
               precision    recall  f1-score   support

           0       0.65      0.49      0.56        81
           1       0.76      0.85      0.80       150

    accuracy                           0.73       231
   macro avg       0.70      0.67      0.68       231
weighted avg       0.72      0.73      0.72       231

confusion_matrix:
 [[ 40  41]
 [ 22 128]]
```



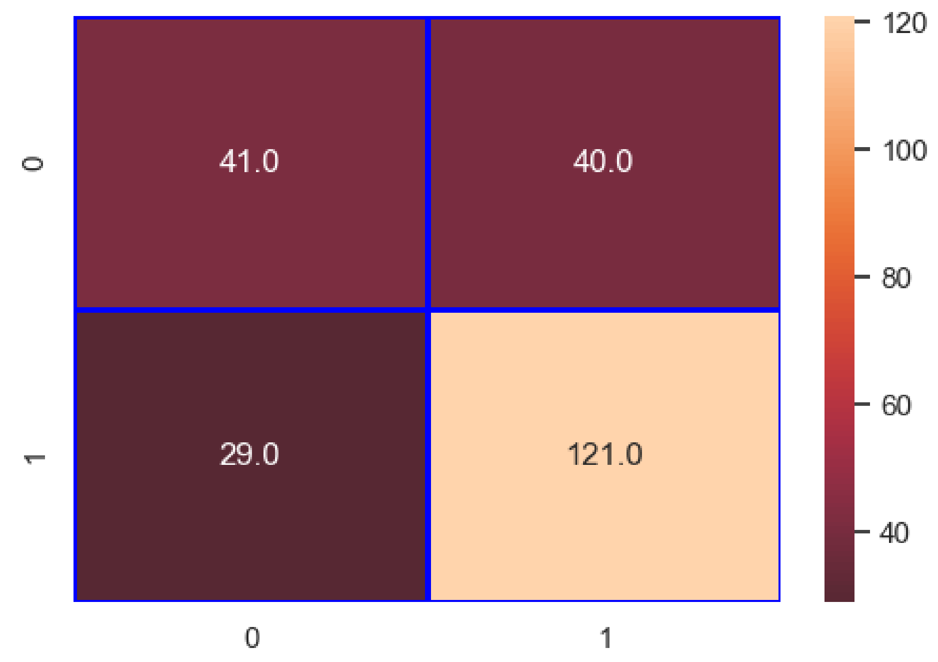
```
==========================================================================================



Modele name : KNeighborsClassifier
Scaler name : QuantileTransformer
Accuracy_score: 73.16 %
Loss: 26.84 %
Cohen_kappa_score: 38.26 %
Classification_report:
              precision    recall  f1-score   support

           0       0.65      0.52      0.58        81
           1       0.77      0.85      0.80       150

    accuracy                           0.73       231
   macro avg       0.71      0.68      0.69       231
weighted avg       0.72      0.73      0.72       231

confusion_matrix:
 [[ 42  39]
 [ 23 127]]
```



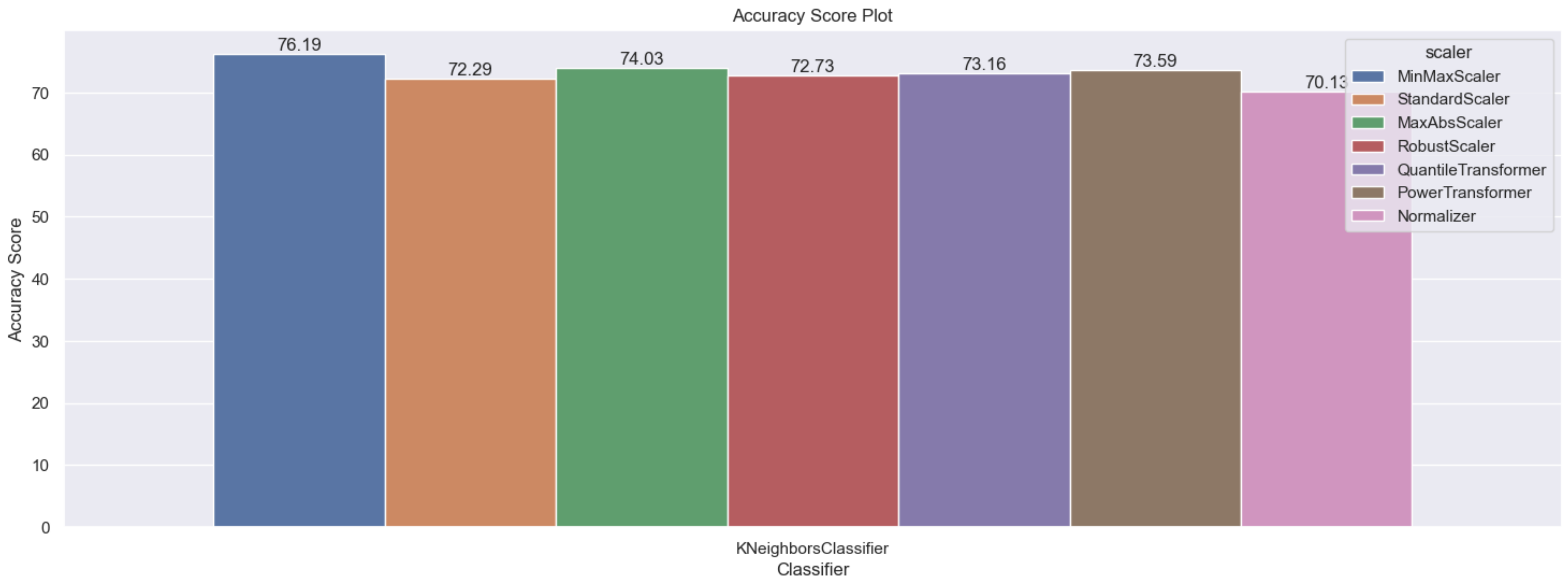
```
==========================================================================================



Modele name : KNeighborsClassifier
Scaler name : PowerTransformer
Accuracy_score: 73.59 %
Loss: 26.41 %
Cohen_kappa_score: 37.58 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.47      0.55        81
           1       0.75      0.88      0.81       150

    accuracy                           0.74       231
   macro avg       0.72      0.67      0.68       231
weighted avg       0.73      0.74      0.72       231

confusion_matrix:
 [[ 38  43]
 [ 18 132]]
```



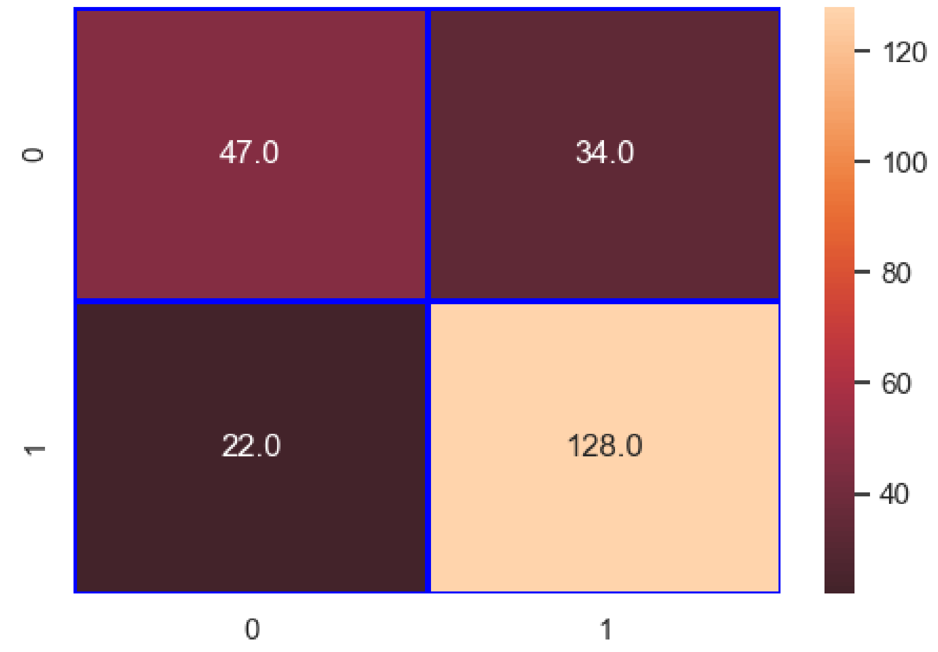
```
=========================================================================================



Modele name : KNeighborsClassifier
Scaler name : Normalizer
Accuracy_score: 70.13 %
Loss: 29.87 %
Cohen_kappa_score: 32.29 %
Classification_report:
               precision    recall  f1-score   support

           0       0.59      0.51      0.54        81
           1       0.75      0.81      0.78       150

    accuracy                           0.70       231
   macro avg       0.67      0.66      0.66       231
weighted avg       0.69      0.70      0.70       231

confusion_matrix:
 [[ 41  40]
 [ 29 121]]
```


41.0
40.0
29.0
121.0
0
1
0
1
120
100
80
60
40

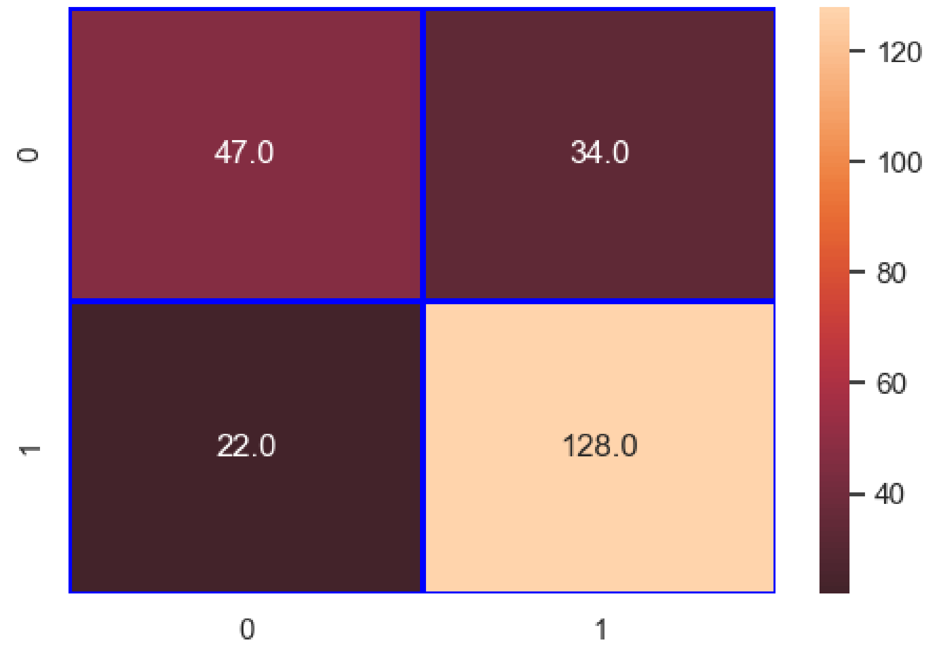
```
==========================================================================================
```



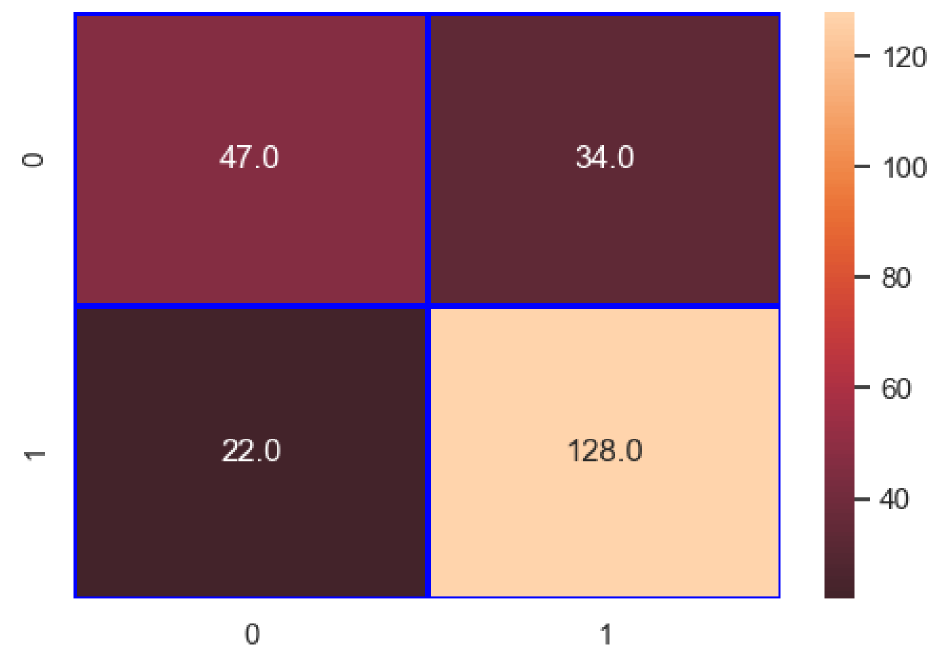
```
Modele name : GaussianNB
Scaler name : MinMaxScaler
Accuracy_score: 75.76 %
Loss: 24.24 %
Cohen_kappa_score: 44.89 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.58      0.63        81
           1       0.79      0.85      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.72      0.72       231
weighted avg       0.75      0.76      0.75       231

confusion_matrix:
 [[ 47  34]
 [ 22 128]]
```



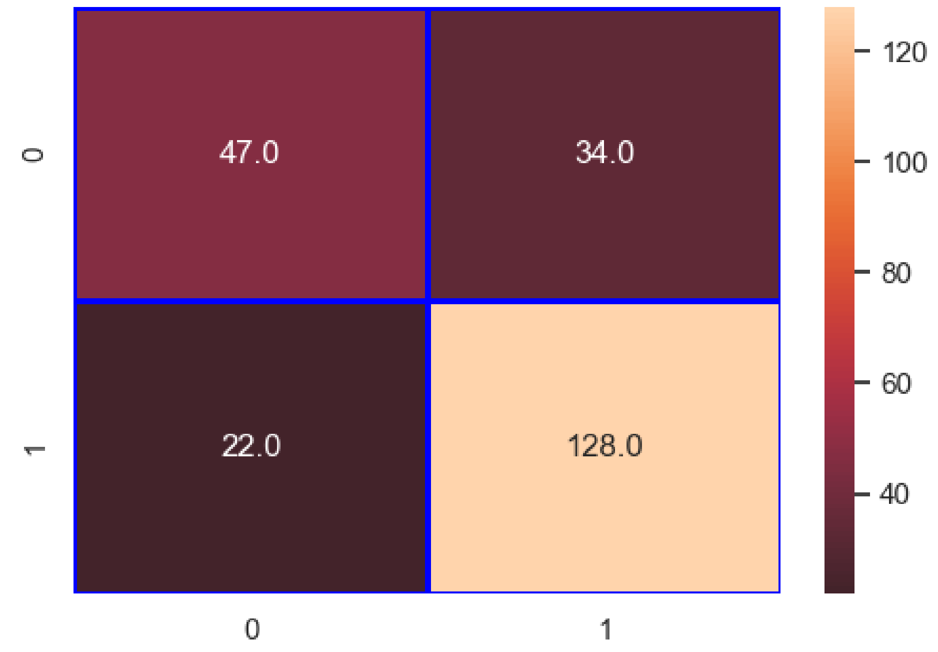
```
==========================================================================================



Modele name : GaussianNB
Scaler name : StandardScaler
Accuracy_score: 75.76 %
Loss: 24.24 %
Cohen_kappa_score: 44.89 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.58      0.63        81
           1       0.79      0.85      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.72      0.72       231
weighted avg       0.75      0.76      0.75       231

confusion_matrix:
 [[ 47  34]
 [ 22 128]]
```



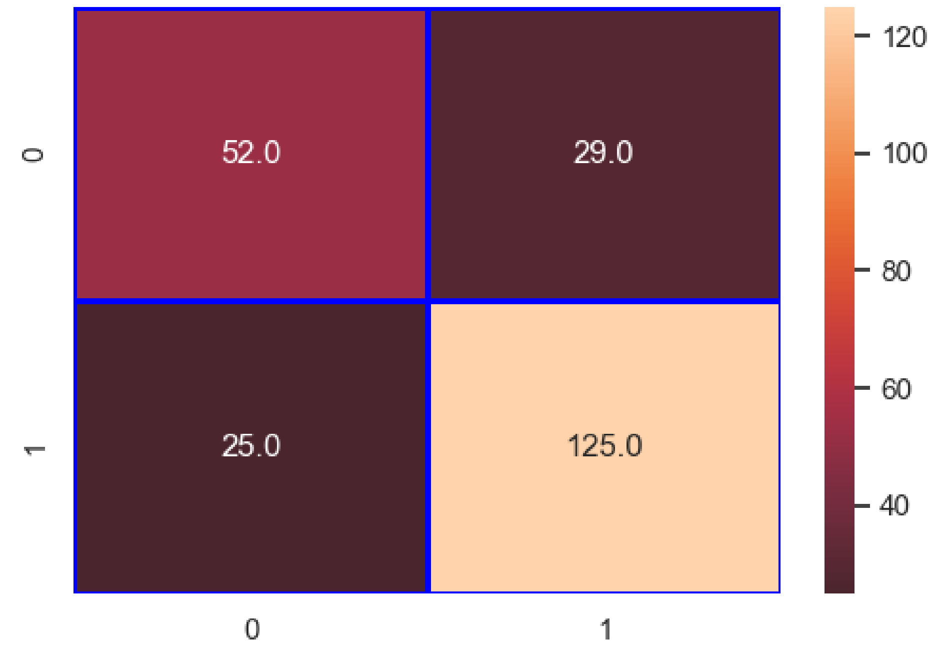
```
=========================================================================================



Modele name : GaussianNB
Scaler name : MaxAbsScaler
Accuracy_score: 75.76 %
Loss: 24.24 %
Cohen_kappa_score: 44.89 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.58      0.63        81
           1       0.79      0.85      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.72      0.72       231
weighted avg       0.75      0.76      0.75       231

confusion_matrix:
 [[ 47  34]
 [ 22 128]]
```



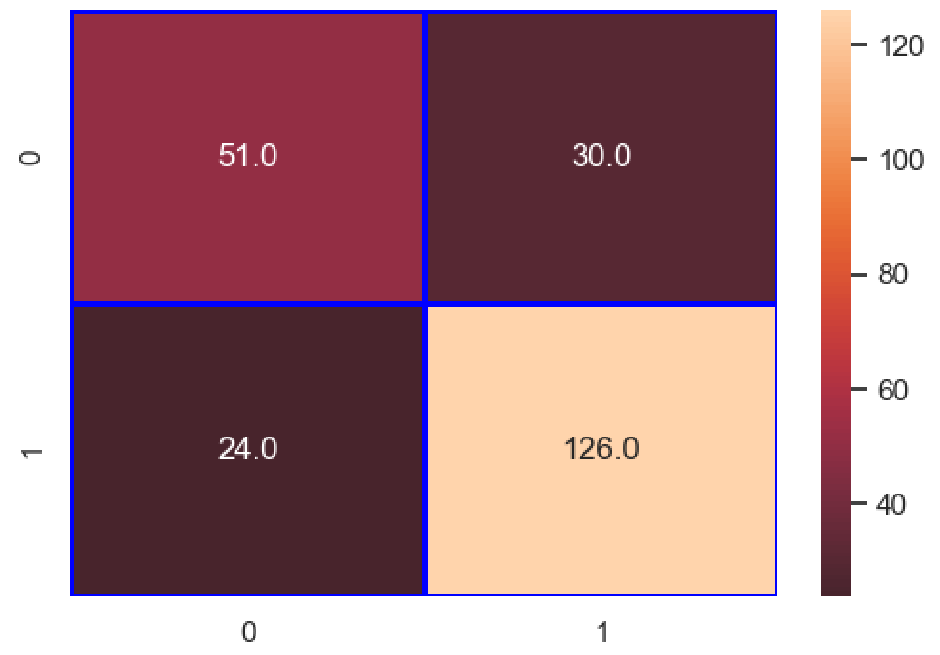
```
==========================================================================================



Modele name : GaussianNB
Scaler name : RobustScaler
Accuracy_score: 75.76 %
Loss: 24.24 %
Cohen_kappa_score: 44.89 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.58      0.63        81
           1       0.79      0.85      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.72      0.72       231
weighted avg       0.75      0.76      0.75       231

confusion_matrix:
 [[ 47  34]
 [ 22 128]]
```



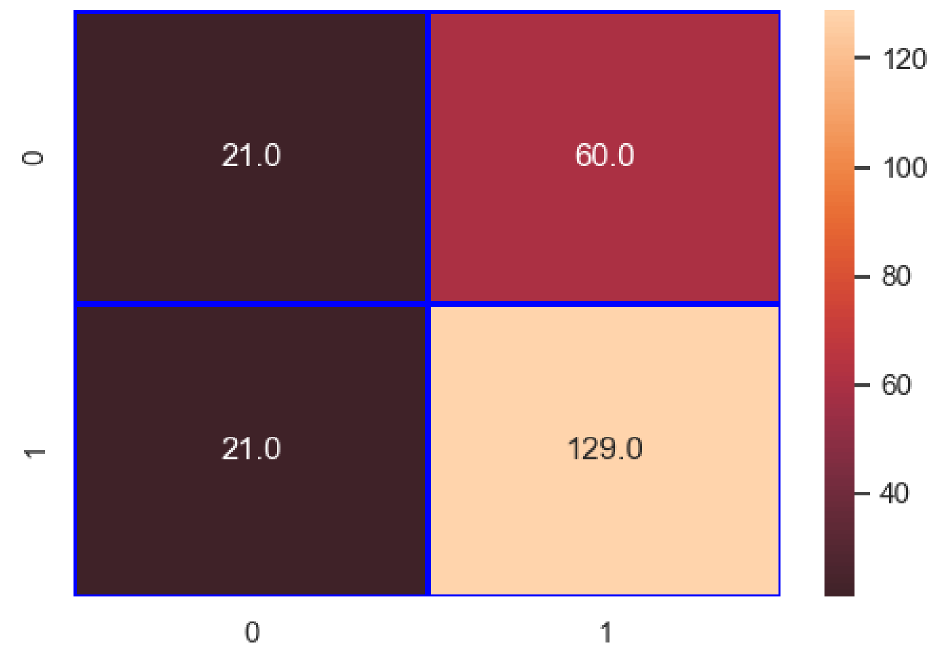
```
==========================================================================================



Modele name : GaussianNB
Scaler name : QuantileTransformer
Accuracy_score: 76.62 %
Loss: 23.38 %
Cohen_kappa_score: 48.08 %
Classification_report:
              precision    recall  f1-score   support

           0       0.68      0.64      0.66        81
           1       0.81      0.83      0.82       150

    accuracy                           0.77       231
   macro avg       0.74      0.74      0.74       231
weighted avg       0.76      0.77      0.76       231

confusion_matrix:
 [[ 52  29]
 [ 25 125]]
```



```
==========================================================================================



Modele name : GaussianNB
Scaler name : PowerTransformer
Accuracy_score: 76.62 %
Loss: 23.38 %
Cohen_kappa_score: 47.78 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.63      0.65        81
           1       0.81      0.84      0.82       150

    accuracy                           0.77       231
   macro avg       0.74      0.73      0.74       231
weighted avg       0.76      0.77      0.76       231

confusion_matrix:
 [[ 51  30]
 [ 24 126]]
```

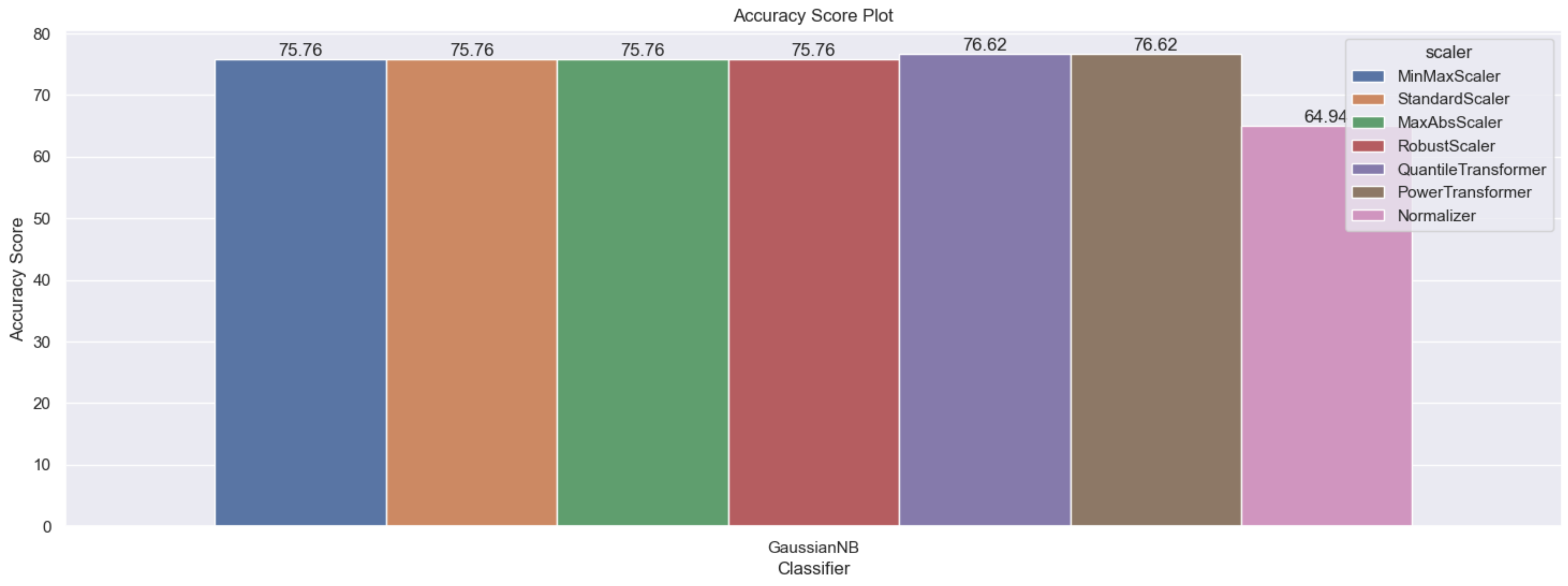


```
================================================================================



Modele name : GaussianNB
Scaler name : Normalizer
Accuracy_score: 64.94 %
Loss: 35.06 %
Cohen_kappa_score: 13.41 %
Classification_report:
               precision    recall  f1-score   support

           0       0.50      0.26      0.34        81
           1       0.68      0.86      0.76       150

    accuracy                           0.65       231
   macro avg       0.59      0.56      0.55       231
weighted avg       0.62      0.65      0.61       231

confusion_matrix:
 [[ 21  60]
 [ 21 129]]
```

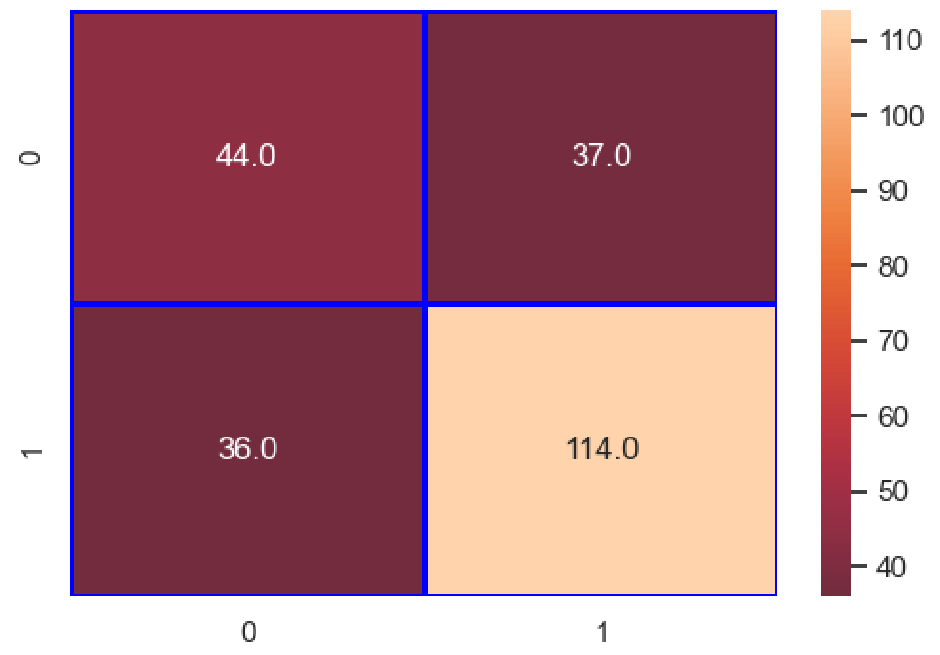


21.0
60.0
21.0
129.0
0
1
0
1
120
100
80
60
40

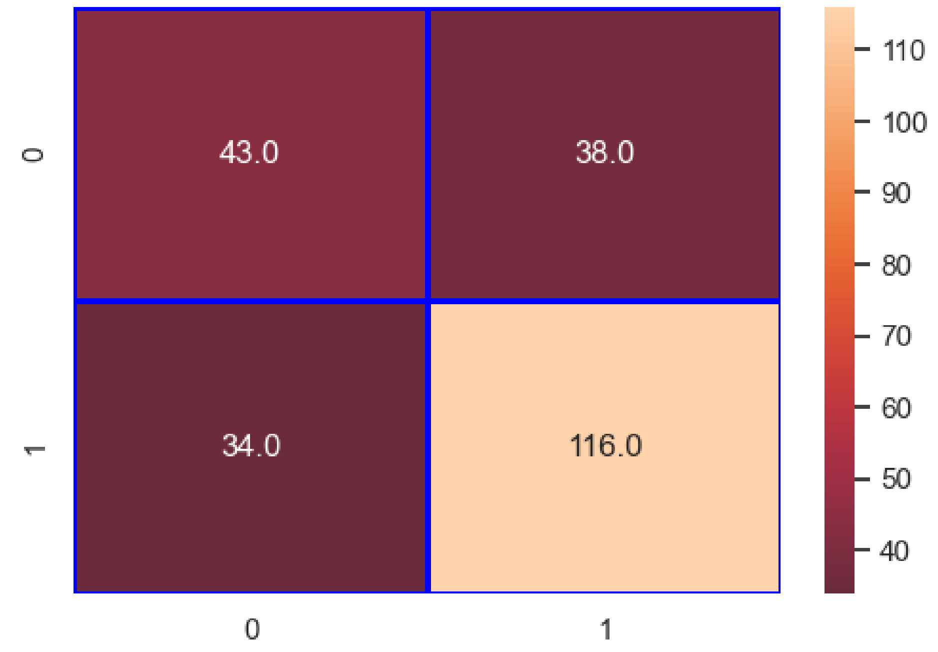
```
================================================================================
```



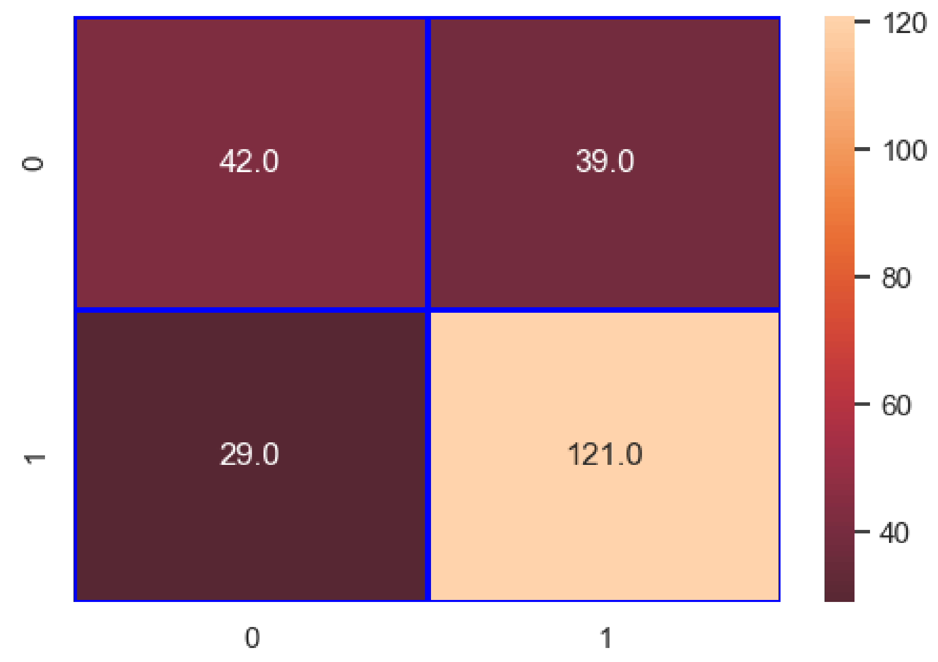
```
Modele name : DecisionTreeClassifier
Scaler name : MinMaxScaler
Accuracy_score: 68.4 %
Loss: 31.6 %
Cohen_kappa_score: 30.41 %
Classification_report:
               precision    recall  f1-score   support

           0       0.55      0.54      0.55        81
           1       0.75      0.76      0.76       150

    accuracy                           0.68       231
   macro avg       0.65      0.65      0.65       231
weighted avg       0.68      0.68      0.68       231

confusion_matrix:
 [[ 44  37]
 [ 36 114]]
```



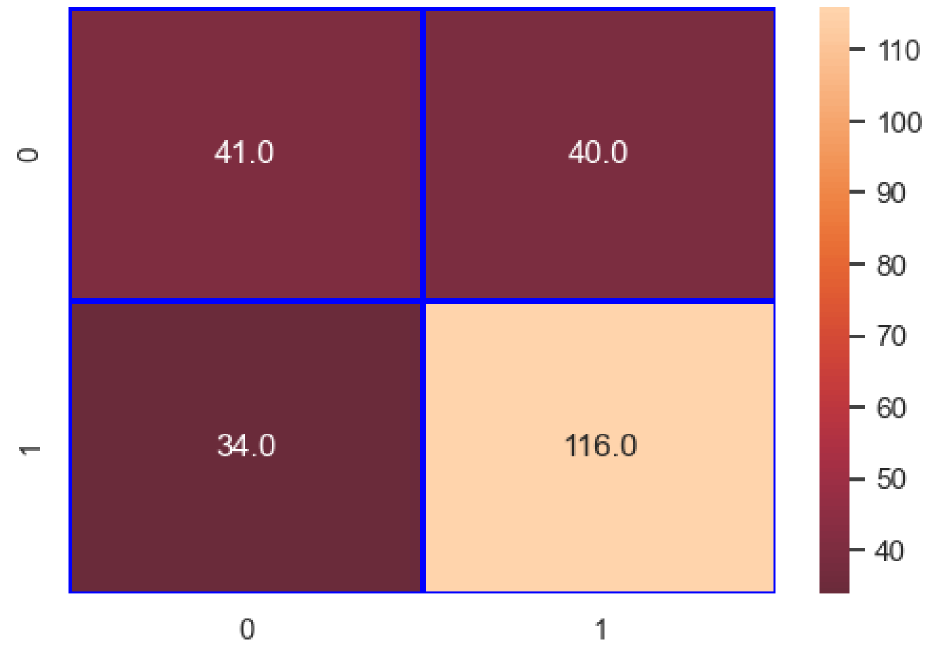
```
==========================================================================================



Modele name : DecisionTreeClassifier
Scaler name : StandardScaler
Accuracy_score: 68.83 %
Loss: 31.17 %
Cohen_kappa_score: 30.77 %
Classification_report:
              precision    recall  f1-score   support

           0       0.56      0.53      0.54        81
           1       0.75      0.77      0.76       150

    accuracy                           0.69       231
   macro avg       0.66      0.65      0.65       231
weighted avg       0.68      0.69      0.69       231

confusion_matrix:
 [[ 43  38]
 [ 34 116]]
```



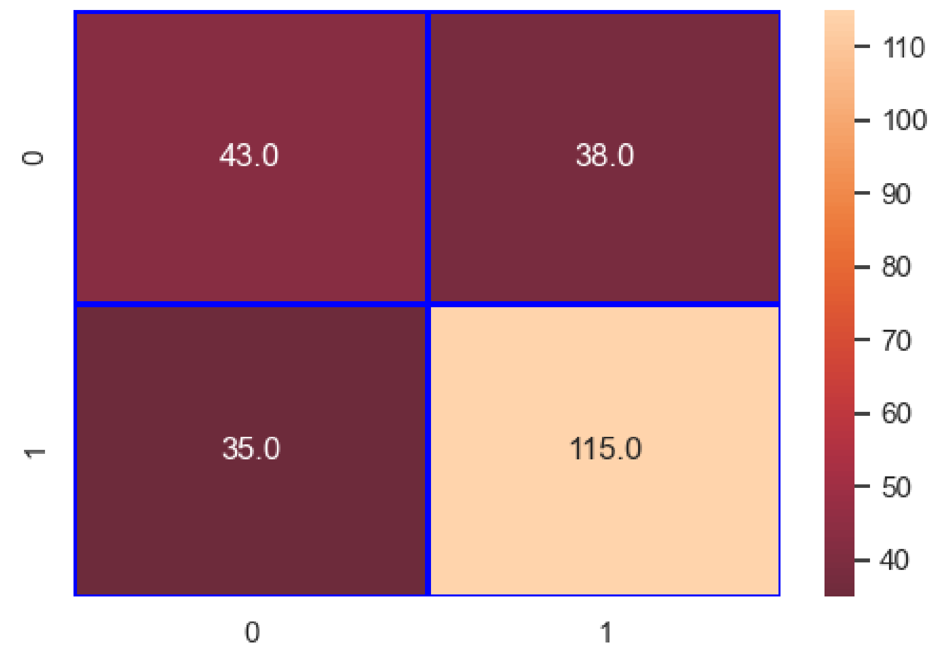
```
==========================================================================================



Modele name : DecisionTreeClassifier
Scaler name : MaxAbsScaler
Accuracy_score: 70.56 %
Loss: 29.44 %
Cohen_kappa_score: 33.47 %
Classification_report:
               precision    recall  f1-score   support

           0       0.59      0.52      0.55        81
           1       0.76      0.81      0.78       150

    accuracy                           0.71       231
   macro avg       0.67      0.66      0.67       231
weighted avg       0.70      0.71      0.70       231

confusion_matrix:
 [[ 42  39]
 [ 29 121]]
```



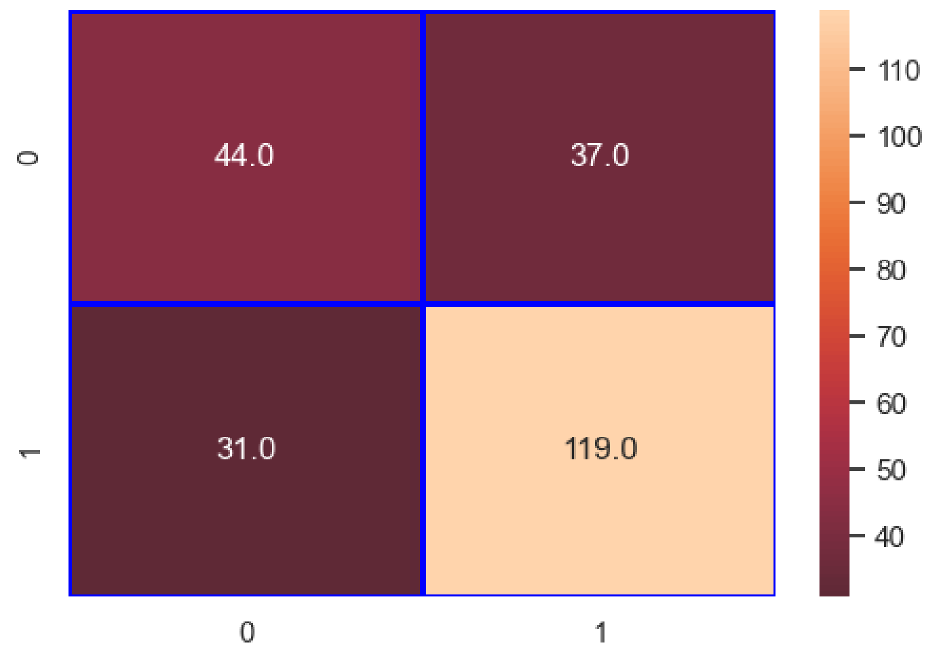
```
========================================================================================



Modele name : DecisionTreeClassifier
Scaler name : RobustScaler
Accuracy_score: 67.97 %
Loss: 32.03 %
Cohen_kappa_score: 28.44 %
Classification_report:
               precision    recall  f1-score   support

           0       0.55      0.51      0.53        81
           1       0.74      0.77      0.76       150

    accuracy                           0.68       231
   macro avg       0.65      0.64      0.64       231
weighted avg       0.67      0.68      0.68       231

confusion_matrix:
 [[ 41  40]
 [ 34 116]]
```



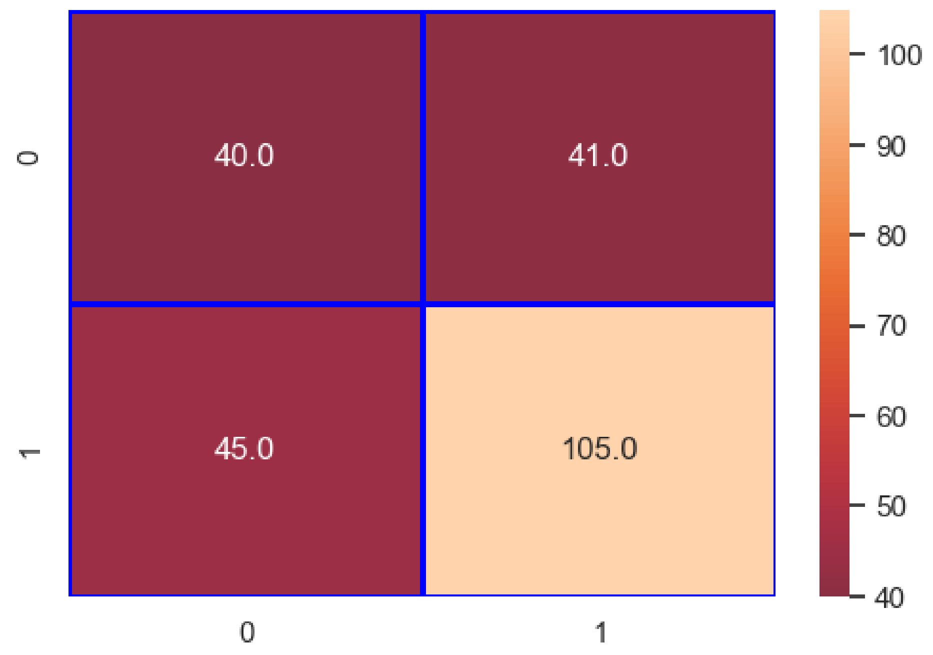
```
==========================================================================================



Modele name : DecisionTreeClassifier
Scaler name : QuantileTransformer
Accuracy_score: 68.4 %
Loss: 31.6 %
Cohen_kappa_score: 30.01 %
Classification_report:
               precision    recall  f1-score   support

           0       0.55      0.53      0.54        81
           1       0.75      0.77      0.76       150

    accuracy                           0.68       231
   macro avg       0.65      0.65      0.65       231
weighted avg       0.68      0.68      0.68       231

confusion_matrix:
 [[ 43  38]
 [ 35 115]]
```



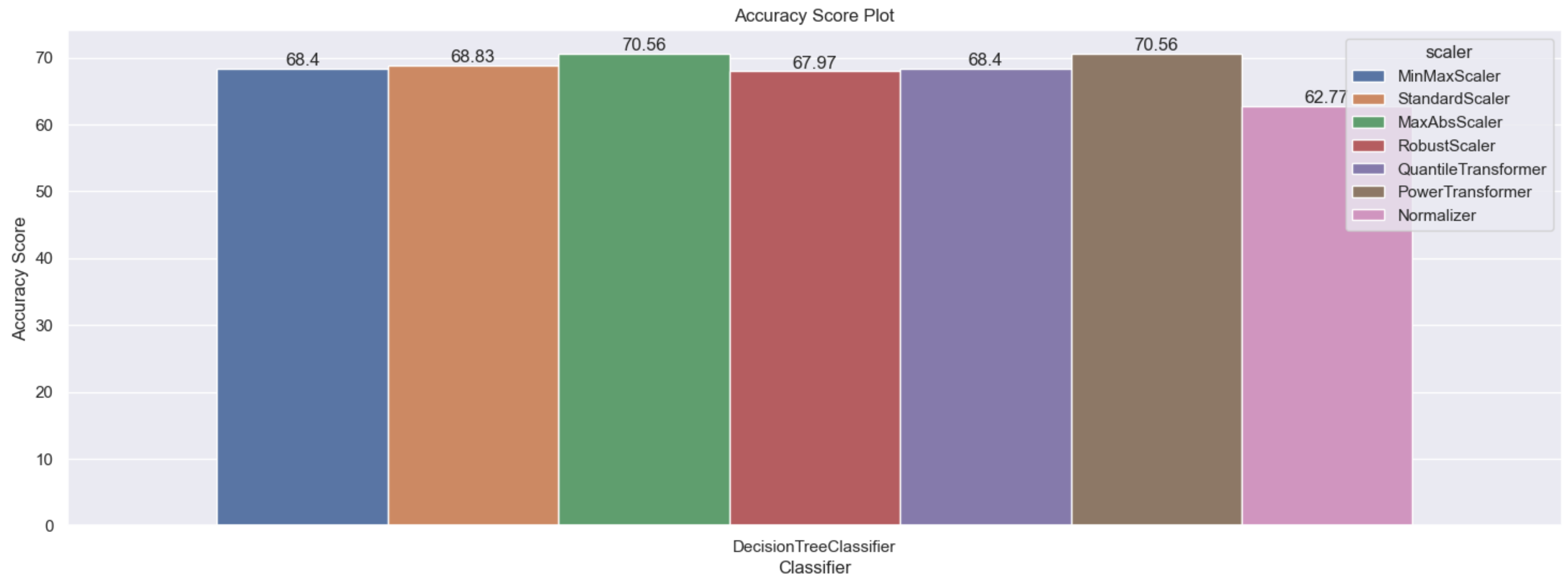
```
==========================================================================================



Modele name : DecisionTreeClassifier
Scaler name : PowerTransformer
Accuracy_score: 70.56 %
Loss: 29.44 %
Cohen_kappa_score: 34.24 %
Classification_report:
               precision    recall  f1-score   support

           0       0.59      0.54      0.56        81
           1       0.76      0.79      0.78       150

    accuracy                           0.71       231
   macro avg       0.67      0.67      0.67       231
weighted avg       0.70      0.71      0.70       231

confusion_matrix:
 [[ 44  37]
 [ 31 119]]
```



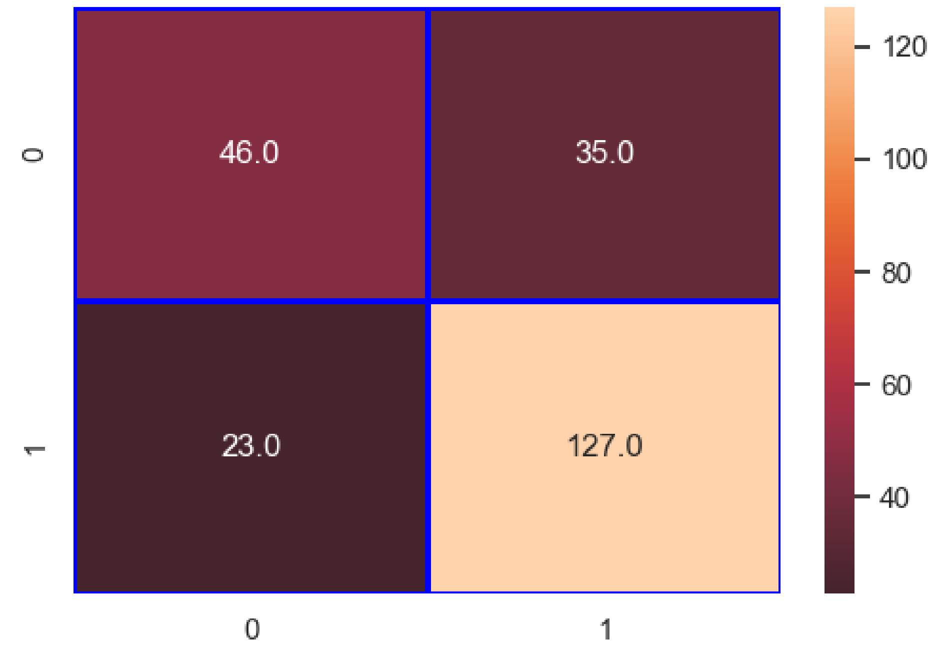
```
==========================================================================================



Modele name : DecisionTreeClassifier
Scaler name : Normalizer
Accuracy_score: 62.77 %
Loss: 37.23 %
Cohen_kappa_score: 19.17 %
Classification_report:
              precision    recall  f1-score   support

           0       0.47      0.49      0.48        81
           1       0.72      0.70      0.71       150

    accuracy                           0.63       231
   macro avg       0.59      0.60      0.60       231
weighted avg       0.63      0.63      0.63       231

confusion_matrix:
 [[ 40  41]
 [ 45 105]]
```


40.0
41.0
45.0
105.0
0
1
0
1
100
90
80
70
60
50
40

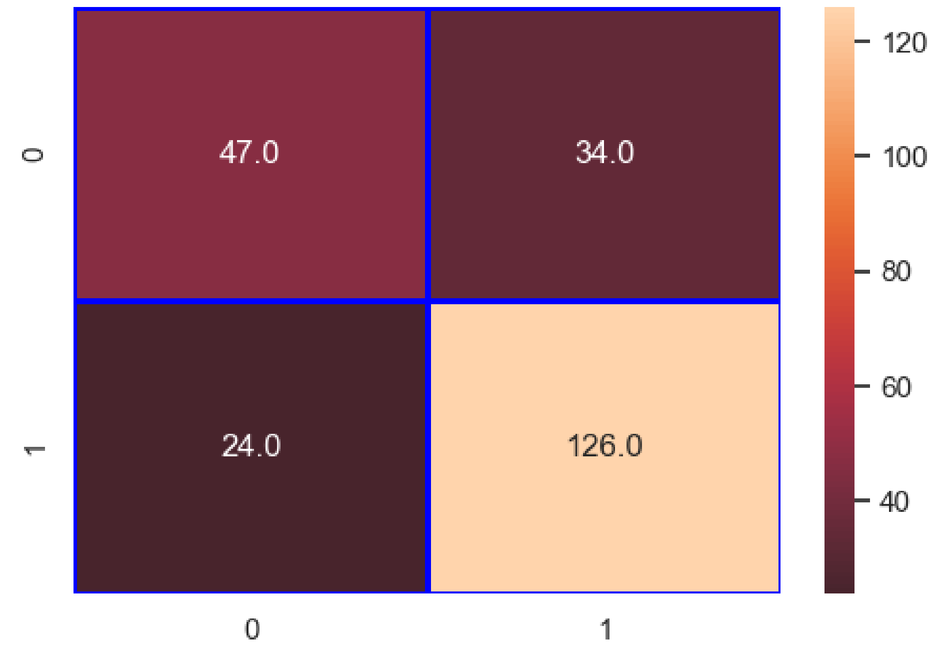
```
=================================================================================
```



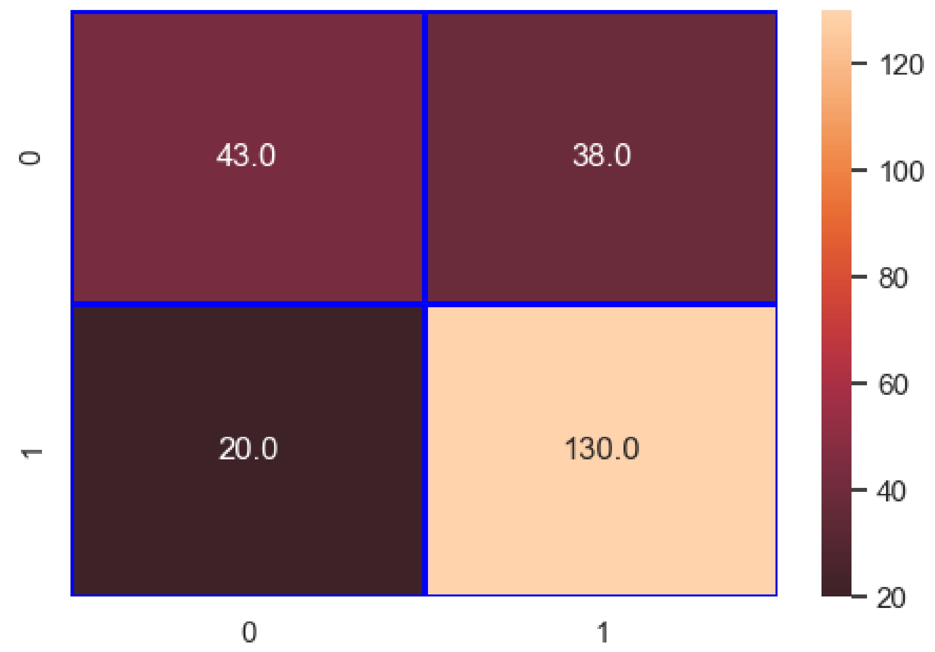
```
Modele name : RandomForestClassifier
Scaler name : MinMaxScaler
Accuracy_score: 74.89 %
Loss: 25.11 %
Cohen_kappa_score: 42.92 %
Classification_report:
               precision    recall  f1-score   support

           0       0.67      0.57      0.61        81
           1       0.78      0.85      0.81       150

    accuracy                           0.75       231
   macro avg       0.73      0.71      0.71       231
weighted avg       0.74      0.75      0.74       231

confusion_matrix:
 [[ 46  35]
 [ 23 127]]
```



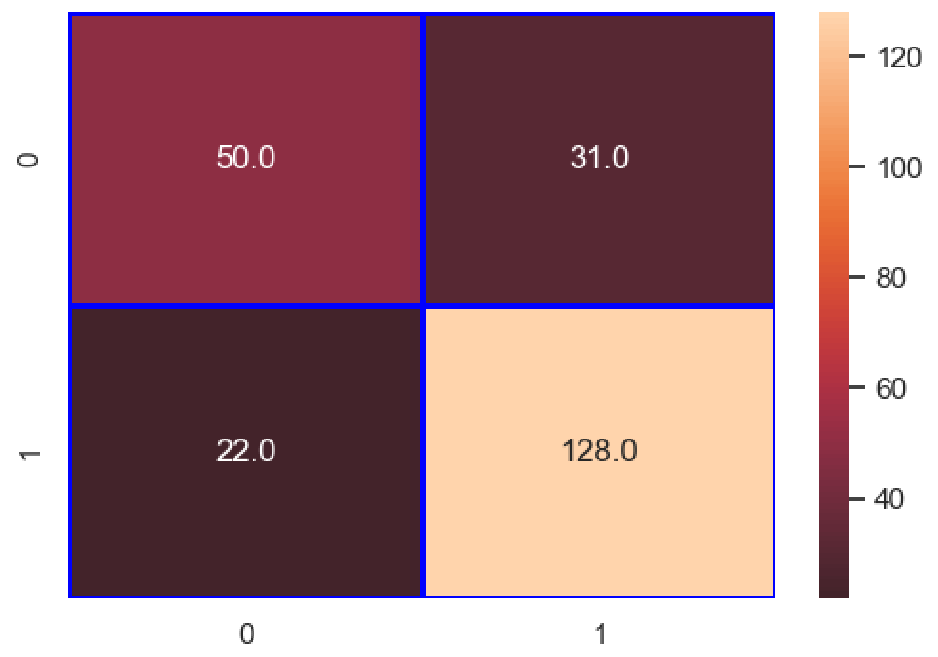
```
=========================================================================================



Modele name : RandomForestClassifier
Scaler name : StandardScaler
Accuracy_score: 74.89 %
Loss: 25.11 %
Cohen_kappa_score: 43.25 %
Classification_report:
               precision    recall  f1-score   support

           0       0.66      0.58      0.62        81
           1       0.79      0.84      0.81       150

    accuracy                           0.75       231
   macro avg       0.72      0.71      0.72       231
weighted avg       0.74      0.75      0.74       231

confusion_matrix:
 [[ 47  34]
 [ 24 126]]
```



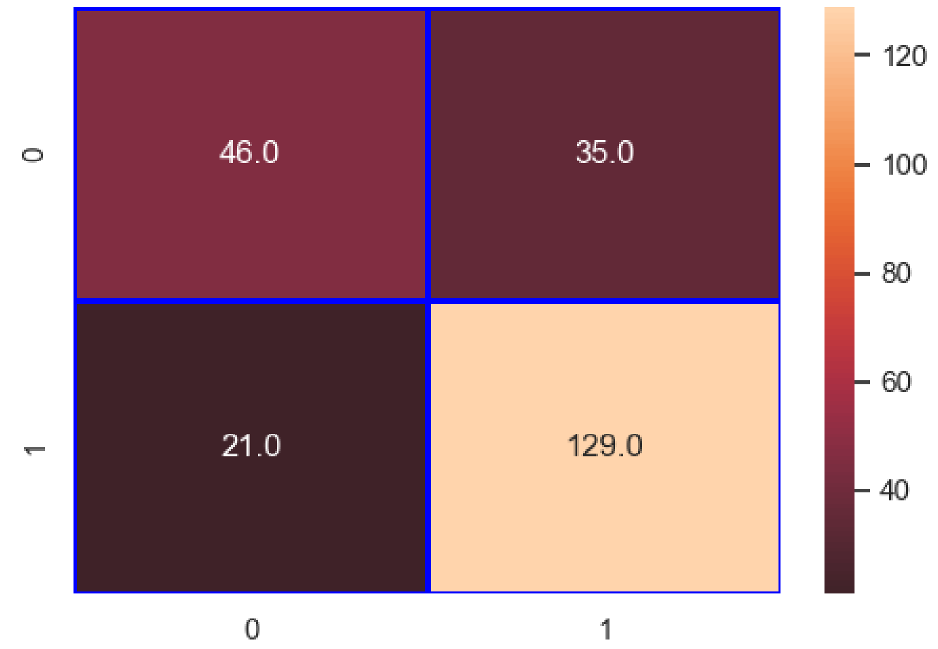
```
==========================================================================================



Modele name : RandomForestClassifier
Scaler name : MaxAbsScaler
Accuracy_score: 74.89 %
Loss: 25.11 %
Cohen_kappa_score: 41.89 %
Classification_report:
               precision    recall  f1-score   support

           0       0.68      0.53      0.60        81
           1       0.77      0.87      0.82       150

    accuracy                           0.75       231
   macro avg       0.73      0.70      0.71       231
weighted avg       0.74      0.75      0.74       231

confusion_matrix:
 [[ 43  38]
 [ 20 130]]
```



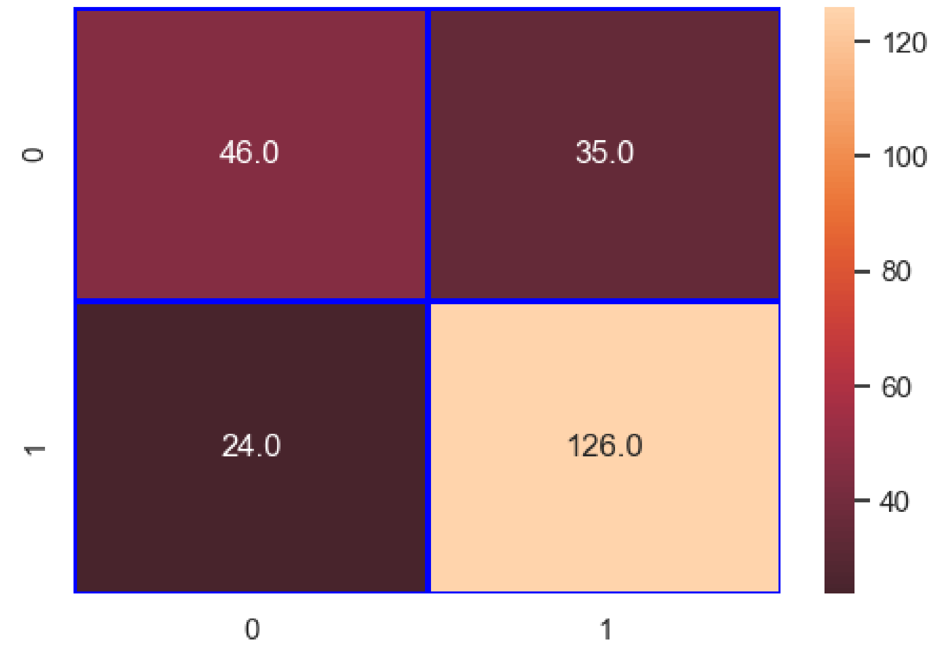
```
==========================================================================================



Modele name : RandomForestClassifier
Scaler name : RobustScaler
Accuracy_score: 77.06 %
Loss: 22.94 %
Cohen_kappa_score: 48.3 %
Classification_report:
               precision    recall  f1-score   support

           0       0.69      0.62      0.65        81
           1       0.81      0.85      0.83       150

    accuracy                           0.77       231
   macro avg       0.75      0.74      0.74       231
weighted avg       0.77      0.77      0.77       231

confusion_matrix:
 [[ 50  31]
 [ 22 128]]
```



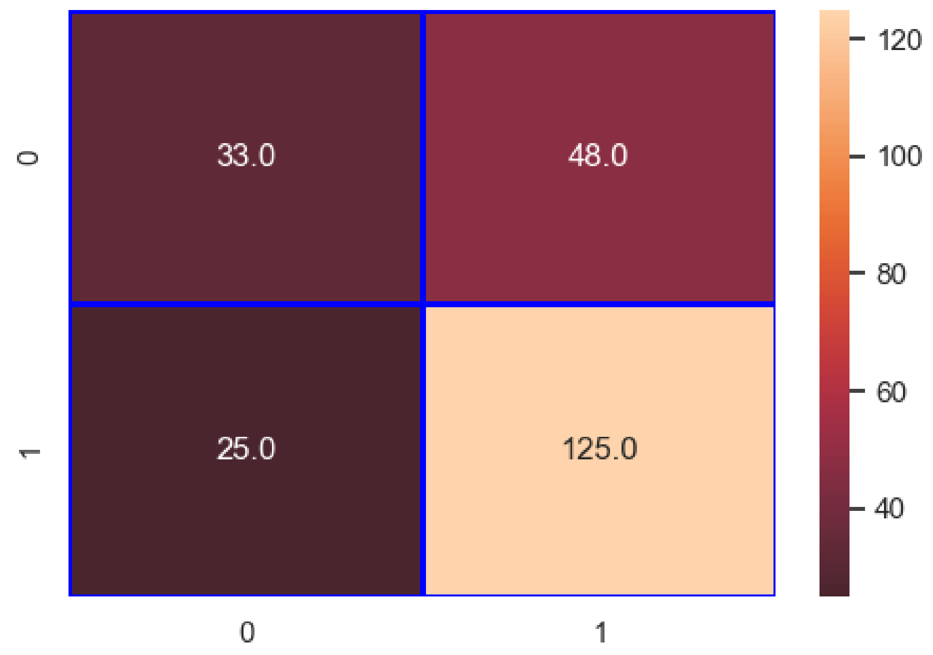
```
==========================================================================================



Modele name : RandomForestClassifier
Scaler name : QuantileTransformer
Accuracy_score: 75.76 %
Loss: 24.24 %
Cohen_kappa_score: 44.56 %
Classification_report:
               precision    recall  f1-score   support

           0       0.69      0.57      0.62        81
           1       0.79      0.86      0.82       150

    accuracy                           0.76       231
   macro avg       0.74      0.71      0.72       231
weighted avg       0.75      0.76      0.75       231

confusion_matrix:
 [[ 46  35]
 [ 21 129]]
```



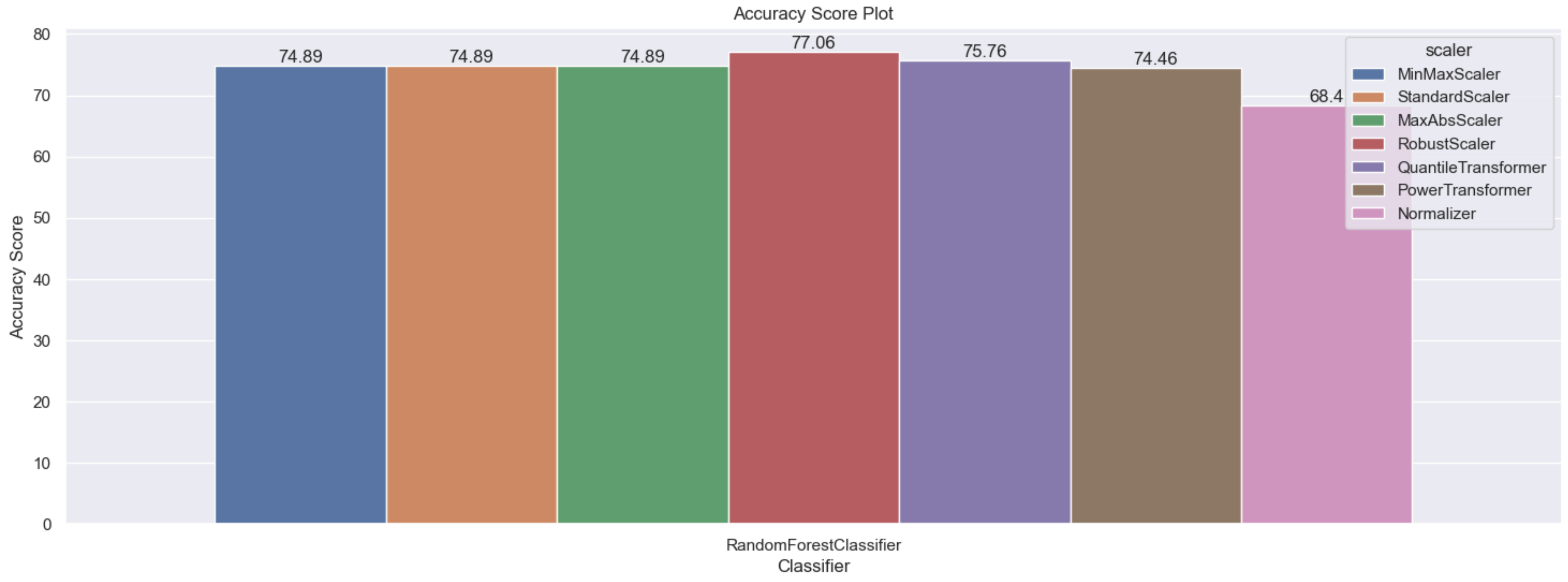
```
===========================================================================================



Modele name : RandomForestClassifier
Scaler name : PowerTransformer
Accuracy_score: 74.46 %
Loss: 25.54 %
Cohen_kappa_score: 42.11 %
Classification_report:
               precision    recall  f1-score   support

           0       0.66      0.57      0.61        81
           1       0.78      0.84      0.81       150

    accuracy                           0.74       231
   macro avg       0.72      0.70      0.71       231
weighted avg       0.74      0.74      0.74       231

confusion_matrix:
 [[ 46  35]
 [ 24 126]]
```



```
==========================================================================================



Modele name : RandomForestClassifier
Scaler name : Normalizer
Accuracy_score: 68.4 %
Loss: 31.6 %
Cohen_kappa_score: 25.76 %
Classification_report:
               precision    recall  f1-score   support

           0       0.57      0.41      0.47        81
           1       0.72      0.83      0.77       150

    accuracy                           0.68       231
   macro avg       0.65      0.62      0.62       231
weighted avg       0.67      0.68      0.67       231

confusion_matrix:
 [[ 33  48]
 [ 25 125]]
```


33.0
48.0
25.0
125.0
0
1
0
1
120
100
80
60
40

```
==========================================================================================
```



Accuracy Score Plot
Accuracy Score
0
10
20
30
40
50
60
70
80
74.89
74.89
74.89
77.06
75.76
74.46
68.4
scaler
MinMaxScaler
StandardScaler
MaxAbsScaler
RobustScaler
QuantileTransformer
PowerTransformer
Normalizer
RandomForestClassifier
Classifier

```
Done...
```

```
In [ ]:
```