DESARROLLO LABORATORIO 20

In [45]:
```
#Just in Case
import warnings
warnings.filterwarnings('ignore')

#Importando las librerías necesarias
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import os
import model_evaluation_utils as meu

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import KBinsDiscretizer
from sklearn.preprocessing import LabelEncoder
from collections import defaultdict
from sklearn.model_selection import GridSearchCV
from imblearn.combine import SMOTETomek
from sklearn.metrics import confusion_matrix, auc, roc_curve
from sklearn.preprocessing import label_binarize
from mlxtend.plotting import plot_decision_regions
from sklearn.naive_bayes import GaussianNB       #Para hacer un modelo Naive-Bayes
from sklearn.svm import SVC                      #Para hacer un modelo de Máquina de Soporte Vecto

from math import log
```

In [2]:
```
# Estableciendo mi directorio de trabajo
os.chdir('D:\Social Data Consulting\Python for Data Science\data')
```

In [3]:
```
miArchivo="HTRU_2.csv"
df_HTRU2=pd.read_csv(miArchivo,sep=',')
df_HTRU2.head()
```

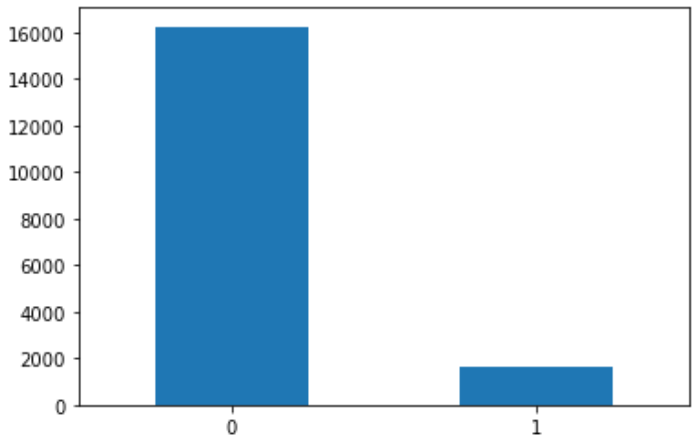
Out[3]:

Med_perfil_int	Desviacion_est_prf_int	Exceso_cur_prf_int	Torcedura_prf_int	Med_curv_DM-SNR	Desviacion_est_cur	Exc_curt_
140.562500	55.683782	-0.234571	-0.699648	3.199833	19.110426	7.975
102.507812	58.882430	0.465318	-0.515088	1.677258	14.860146	10.576
103.015625	39.341649	0.323328	1.051164	3.121237	21.744669	7.735
136.750000	57.178449	-0.068415	-0.636238	3.642977	20.959280	6.896
88.726562	40.672225	0.600866	1.123492	1.178930	11.468720	14.269

1.Frecuencia de Observaciones del TARGET.

In [4]:
```
pd.value_counts(df_HTRU2.Clase_HTRU).plot(kind='bar',rot=0)
```

Out[4]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x155fa4f0be0>
```



2. Graficos de correlacion de Pearson de los predictores.

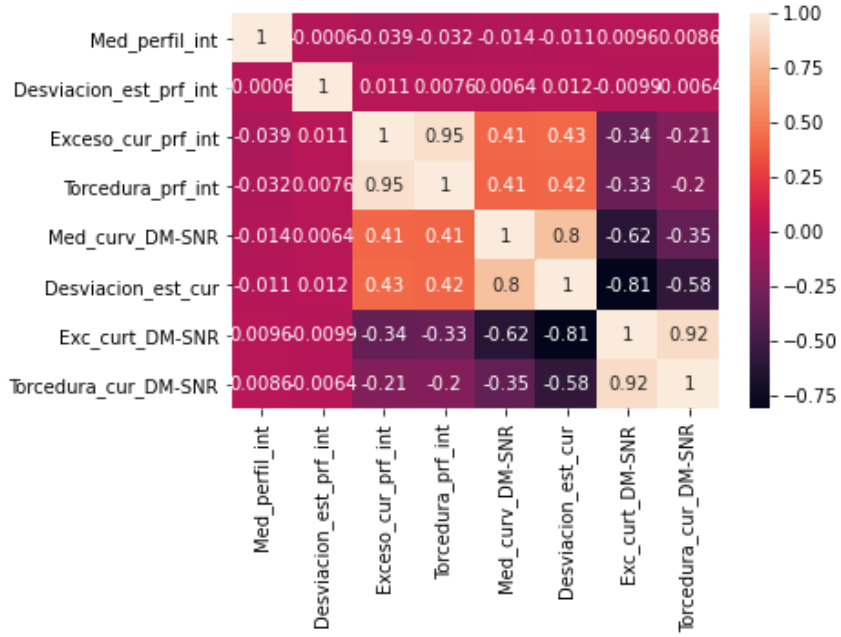
In [18]:
```
columnas=['Med_perfil_int', 'Desviacion_est_prf_int', 'Exceso_cur_prf_int',
       'Torcedura_prf_int', 'Med_curv_DM-SNR', 'Desviacion_est_cur',
       'Exc_curt_DM-SNR', 'Torcedura_cur_DM-SNR']
target=['Clase_HTRU']
```

In [58]:
```
df_HTRU2[columnas].corr(method='pearson')
```

Out[58]:

	Med_perfil_int	Desviacion_est_prf_int	Exceso_cur_prf_int	Torcedura_prf_int	Med_curv_DM-SNR	Desv
Med_perfil_int	1.000000	-0.000597	-0.039351	-0.031990	-0.013739	
Desviacion_est_prf_int	-0.000597	1.000000	0.011141	0.007630	0.006360	
Exceso_cur_prf_int	-0.039351	0.011141	1.000000	0.945729	0.414368	
Torcedura_prf_int	-0.031990	0.007630	0.945729	1.000000	0.412056	
Med_curv_DM-SNR	-0.013739	0.006360	0.414368	0.412056	1.000000	
Desviacion_est_cur	-0.010734	0.011624	0.432880	0.415140	0.796555	
Exc_curt_DM-SNR	0.009607	-0.009918	-0.341209	-0.328843	-0.615971	
Torcedura_cur_DM-SNR	0.008601	-0.006380	-0.214491	-0.204782	-0.354269	

In [59]:
```
sns.heatmap(df_HTRU2[columnas].corr(method='pearson'),annot=True)
plt.show()
```



3.Probabilidades de prediccion.

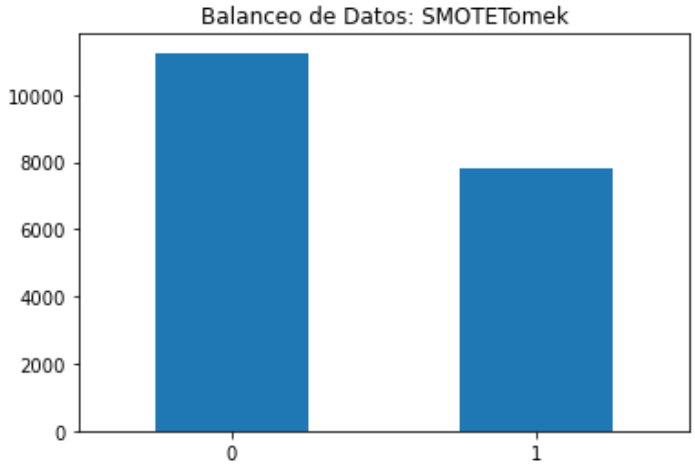
In [13]:
```
X=df_HTRU2.iloc[:,0:df_HTRU2.shape[1]-1].values
y=df_HTRU2.iloc[:,df_HTRU2.shape[1]-1].values
```

In [14]:
```
xtrain,xtest,ytrain,ytest=train_test_split(X,y,test_size=0.3,stratify=y,random_state=2020)
```

Balanceo de la target

In [15]:
```
smt=SMOTETomek(sampling_strategy=0.7, random_state=2020)
xtrain_smt,ytrain_smt=smt.fit_resample(xtrain,ytrain)
```

In [16]:
```
pd.value_counts(ytrain_smt).plot(kind='bar',rot=0)
plt.title('Balanceo de Datos: SMOTETomek')
plt.show()
```



In [19]:
```
data_xtrain=pd.DataFrame(xtrain_smt,columns=columnas)
data_ytrain=pd.DataFrame(ytrain_smt,columns=target)
data_train=pd.concat([data_xtrain,data_ytrain],axis=1)
data_train.head()
```

Out[19]:

Med_perfil_int	Desviacion_est_prf_int	Exceso_cur_prf_int	Torcedura_prf_int	Med_curv_DM-SNR	Desviacion_est_cur	Exc_curt_
117.765625	46.683356	0.319175	-0.143651	1.853679	14.755006	10.773
132.640625	50.282131	-0.135232	-0.266753	1.311873	10.694006	14.443
96.554688	53.000561	0.809315	0.539038	4.046823	24.366237	7.722
141.312500	52.446662	-0.193099	-0.208575	2.249164	17.624895	9.335
140.234375	45.116946	-0.061888	0.225694	1.879599	16.687183	10.615

In [21]:
```
data_xtest=pd.DataFrame(xtest,columns=columnas)
data_ytest=pd.DataFrame(ytest,columns=target)
data_test=pd.concat([data_xtest,data_ytest],axis=1)
data_test.head()
```

Out[21]:

	Med_perfil_int	Desviacion_est_prf_int	Exceso_cur_prf_int	Torcedura_prf_int	Med_curv_DM-SNR	Desviacion_est_cur	Exc_
0	8.156250	27.129446	7.856370	62.868531	128.375418	67.902648	
1	115.320312	45.561588	0.299415	0.642796	1.788462	16.343089	1
2	121.562500	45.859628	0.066315	0.137466	2.341137	16.162139	
3	110.242188	44.725508	0.431287	0.734862	3.200669	20.669437	
4	91.187500	44.702096	0.305570	0.654166	1.614548	10.753443	1

In [22]:
```
#Instanciamos un objeto de clase GaussianNB
clf=GaussianNB()
```

In [24]:
```
#Hacemos que nuestro modelo aprenda de los datos balanceados
clf.fit(xtrain_smt,ytrain_smt)
```

Out[24]:
```
GaussianNB()
```

In [37]:
```
#Calculandremos los Ypredichos
ypredichos_train=clf.predict(xtrain_smt)
ypredichos_test=clf.predict(xtest)
```

Data de entrenamiento

In [30]:
```
proba_train= clf.predict_proba(xtrain_smt)
prob_df_train=pd.DataFrame(proba_train[:,1],columns=['prob y=1'])
```

In [51]:
```
punto_corte=0.5
prob_df_train['prediccion']=np.where(prob_df_train['prob y=1']>punto_corte,1,0)
prob_df_train.head()
```

Out[51]:

	prob y=1	prediccion
0	2.373274e-09	0
1	2.106289e-18	0
2	1.160739e-05	0
3	1.712392e-07	0
4	6.754550e-09	0

In [43]:
```
proba_test= clf.predict_proba(xtest)
prob_df_test=pd.DataFrame(proba_test[:,1],columns=['prob y=1'])
```

In [44]:
```
punto_corte=0.5
prob_df_test['prediccion']=np.where(prob_df_test['prob y=1']>punto_corte,1,0)
prob_df_test.head()
```

Out[44]:

	prob y=1	prediccion
0	1.000000e+00	1
1	1.058449e-08	0
2	3.594379e-08	0
3	2.333821e-06	0
4	4.217411e-17	0

4. Matriz de Confusión.

In [39]:
```
label_name=[0,1]
```

Data de entrenamiento

In [56]:
```
meu.display_confusion_matrix(ytrain_smt,ypredichos_train,classes=label_name)
```

```
       0     1
0  10706   550
1   1534  6307
```

In [53]:
```
meu.display_model_performance_metrics(ytrain_smt,ypredichos_train,classes=label_name)
```

```
Model Performance metrics:
------------------------------
Accuracy: 0.8909
Precision: 0.8932
Recall: 0.8909
F1 Score: 0.8895

Model Classification report:
------------------------------
              precision    recall  f1-score   support

           0       0.87      0.95      0.91     11256
           1       0.92      0.80      0.86      7841

    accuracy                           0.89     19097
   macro avg       0.90      0.88      0.88     19097
weighted avg       0.89      0.89      0.89     19097


Prediction Confusion Matrix:
------------------------------
       0     1
0  10706   550
1   1534  6307
```

Data de testeo

In [55]:
```
meu.display_confusion_matrix(ytest,ypredichos_test,classes=label_name)
```

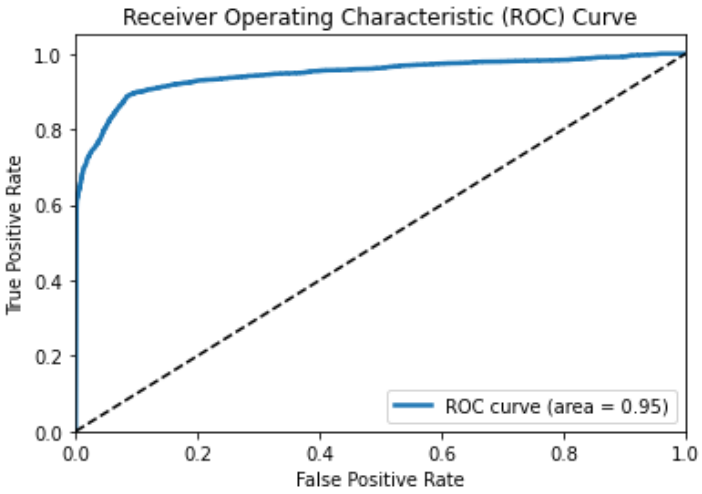
```
      0    1
0  4643  235
1    77  415
```

In [54]:
```
meu.display_model_performance_metrics(ytest,ypredichos_test,classes=label_name)
```

```
Model Performance metrics:
------------------------------
Accuracy: 0.9419
Precision: 0.9521
Recall: 0.9419
F1 Score: 0.9454

Model Classification report:
------------------------------
              precision    recall  f1-score   support

           0       0.98      0.95      0.97      4878
           1       0.64      0.84      0.73       492

    accuracy                           0.94      5370
   macro avg       0.81      0.90      0.85      5370
weighted avg       0.95      0.94      0.95      5370


Prediction Confusion Matrix:
------------------------------
      0    1
0  4643  235
1    77  415
```

5. Generar el grafico de la curva ROC para datos de entrenamiento y testeo.

In [40]:
```
meu.plot_model_roc_curve(clf,xtrain_smt,ytrain_smt,class_names=label_name)
```



In [52]:
```
meu.plot_model_roc_curve(clf,xtest,ytest,class_names=label_name)
```