Ejercicio Random Forest

TOULOUSE LAUTREC

APRENDIZAJE AUTOMATICO CON PYTHON

RANDOM FOREST

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Curso 2290, Clases Lunes y Miercoles 20:00-22:30pm

Tercera Clase

Ejercicio Random Forest

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.decomposition import PCA
from sklearn.tree import DecisionTreeClassifier

from pylab import rcParams

from imblearn.under_sampling import NearMiss
from imblearn.over_sampling import RandomOverSampler
from imblearn.combine import SMOTETomek
from imblearn.ensemble import BalancedBaggingClassifier

from collections import Counter

#set up graphic style in this case I am using the color scheme from xkcd.com
```

```
rcParams['figure.figsize'] = 14, 8.7 # Golden Mean
LABELS = ["Normal","Fraud"]
#col_list = ["cerulean","scarlet"]# https://xkcd.com/color/rgb/
#sns.set(style='white', font_scale=1.75, palette=sns.xkcd_palette(col_list))

%matplotlib inline
```

In [2]:

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

Cargamos Datos

In [ ]:

```
# Descargar desde https://www.kaggle.com/mlg-ulb/creditcardfraud/data

df = pd.read_csv("/content/drive/MyDrive/DATASET_TOULOUSE_C3/creditcard.csv")
df.head(n=5)
```

Out[ ]:

	Time	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	
0	0.0	-1.359807	-0.072781	2.536347	1.378155	-0.338321	0.462388	0.239599	0.098698	0.363787	...	-0.01
1	0.0	1.191857	0.266151	0.166480	0.448154	0.060018	-0.082361	-0.078803	0.085102	-0.255425	...	-0.22
2	1.0	-1.358354	-1.340163	1.773209	0.379780	-0.503198	1.800499	0.791461	0.247676	-1.514654	...	0.24
3	1.0	-0.966272	-0.185226	1.792993	-0.863291	-0.010309	1.247203	0.237609	0.377436	-1.387024	...	-0.10
4	2.0	-1.158233	0.877737	1.548718	0.403034	-0.407193	0.095921	0.592941	-0.270533	0.817739	...	-0.00

5 rows × 31 columns

In [ ]:

```
df.shape
```

Out[ ]:

```
(284807, 31)
```

Vemos Desbalanceo

In [ ]:

```
pd.value_counts(df['Class'], sort = True) #class comparison 0=Normal 1=Fraud
```

Out[ ]:

```
0    284315
1       492
Name: Class, dtype: int64
```

In [ ]:

```
normal_df = df[df.Class == 0] #registros normales
fraud_df = df[df.Class == 1] #casos de fraude
```

Creamos Dataset

In [ ]:

```
y = df['Class']
X = df.drop('Class', axis=1)
X_train, X_test, y_train, y_test = train_test_split(X, y, train_size=0.7)
```

In [ ]:

```
def mostrar_resultados(y_test, pred_y):
    conf_matrix = confusion_matrix(y_test, pred_y)
    plt.figure(figsize=(8, 8))
    sns.heatmap(conf_matrix, xticklabels=LABELS, yticklabels=LABELS, annot=True, fmt="d"
    plt.title("Confusion matrix")
    plt.ylabel('True class')
    plt.xlabel('Predicted class')
    plt.show()
    print (classification_report(y_test, pred_y))
```

Ejecutamos Modelo con LogisticRegresion para poder Comparar

In [ ]:

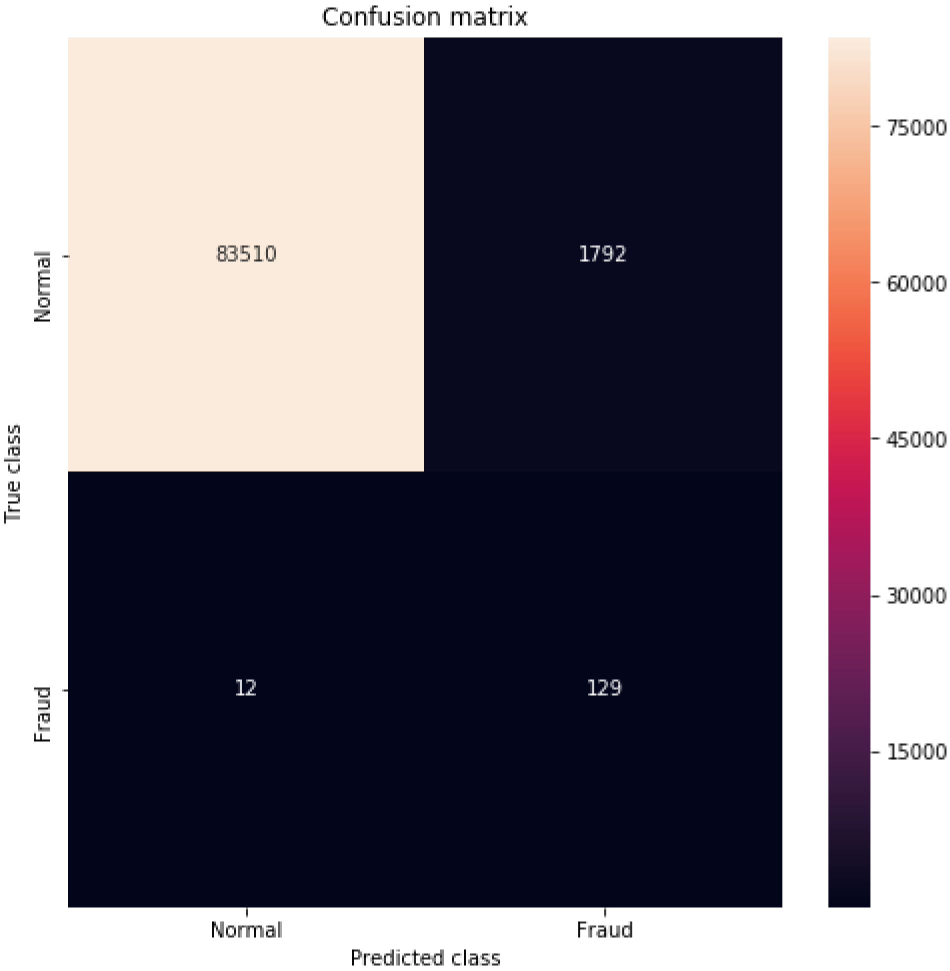
```
def run_model_balanced(X_train, X_test, y_train, y_test):
    clf = LogisticRegression(C=1.0,penalty='l2',random_state=1,solver="newton-cg",class_
    clf.fit(X_train, y_train)
    return clf

model = run_model_balanced(X_train, X_test, y_train, y_test)
```

```
/Users/jbagnato/anaconda3/envs/python36/lib/python3.6/site-packages/sklearn/utils/optimi
ze.py:203: ConvergenceWarning: newton-cg failed to converge. Increase the number of iter
ations.
  "number of iterations.", ConvergenceWarning)
```

Veamos como responde en el test set

In [ ]:

```
pred_y = model.predict(X_test)
mostrar_resultados(y_test, pred_y)
```



```
              precision    recall  f1-score   support

           0       1.00      0.98      0.99     85302
           1       0.07      0.91      0.13       141

    accuracy                           0.98     85443
```

```
   macro avg       0.53      0.95      0.56     85443
weighted avg       1.00      0.98      0.99     85443
```

Probamos con Random Forest

ATENCION: Este modelo toma algo más de tiempo en entrenar

In [ ]:

```
from sklearn.ensemble import RandomForestClassifier

# Crear el modelo con 100 arboles
model = RandomForestClassifier(n_estimators=100,
                               bootstrap = True,verbose=2,
                               max_features = 'sqrt')
# entrenar!
model.fit(X_train, y_train)
```

```
[Parallel(n_jobs=4)]: Using backend ThreadingBackend with 4 concurrent workers.
building tree 1 of 100building tree 2 of 100building tree 3 of 100

building tree 4 of 100

building tree 5 of 100
building tree 6 of 100
building tree 7 of 100
building tree 8 of 100
building tree 9 of 100
building tree 10 of 100
building tree 11 of 100
building tree 12 of 100
building tree 13 of 100
building tree 14 of 100
building tree 15 of 100
building tree 16 of 100
building tree 17 of 100
building tree 18 of 100
building tree 19 of 100
building tree 20 of 100
building tree 21 of 100
building tree 22 of 100
building tree 23 of 100
building tree 24 of 100
building tree 25 of 100
building tree 26 of 100
building tree 27 of 100
building tree 28 of 100
building tree 29 of 100
building tree 30 of 100
building tree 31 of 100
building tree 32 of 100
building tree 33 of 100
building tree 34 of 100
building tree 35 of 100
building tree 36 of 100
[Parallel(n_jobs=4)]: Done  33 tasks      | elapsed:   25.4s
building tree 37 of 100
building tree 38 of 100
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building tree 44 of 100
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building tree 98 of 100
building tree 99 of 100
building tree 100 of 100
```

```
[Parallel(n_jobs=4)]: Done 100 out of 100 | elapsed:  1.3min finished
```

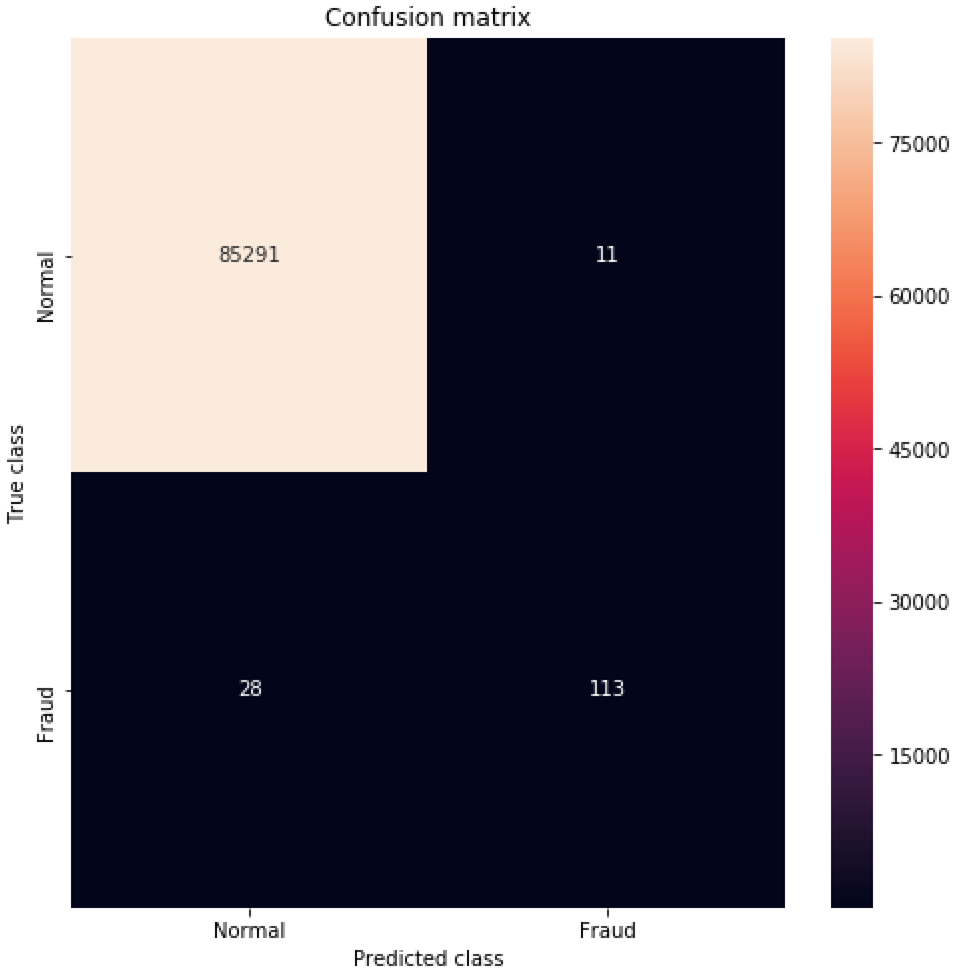
Out[ ]:

```
RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                       max_depth=None, max_features='sqrt', max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, n_estimators=100, n_jobs=4,
                       oob_score=False, random_state=None, verbose=2,
                       warm_start=False)
```

Revisemos los resultados

In [ ]:

```
pred_y = model.predict(X_test)
mostrar_resultados(y_test, pred_y)
```



```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00     85302
           1       0.91      0.80      0.85       141

    accuracy                           1.00     85443
   macro avg       0.96      0.90      0.93     85443
weighted avg       1.00      1.00      1.00     85443
```

Otro Bosque: Random Forest -más veloz-

In [ ]:

```
# otro modelo, variando hiperparámetros
model = RandomForestClassifier(n_estimators=100, class_weight="balanced",
                               max_features = 'sqrt', verbose=2, max_depth=6,
                               oob_score=True, random_state=50)
# a entrenar
model.fit(X_train, y_train)
```

```
[Parallel(n_jobs=4)]: Using backend ThreadingBackend with 4 concurrent workers.
building tree 1 of 100building tree 2 of 100building tree 3 of 100
building tree 4 of 100
building tree 5 of 100
building tree 6 of 100
building tree 7 of 100
building tree 8 of 100
building tree 9 of 100
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```

```
[Parallel(n_jobs=4)]: Done  33 tasks      | elapsed:    9.6s
```

```
building tree 37 of 100
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building tree 100 of 100
```

```
[Parallel(n_jobs=4)]: Done 100 out of 100 | elapsed:   28.3s finished
```

Out[ ]:

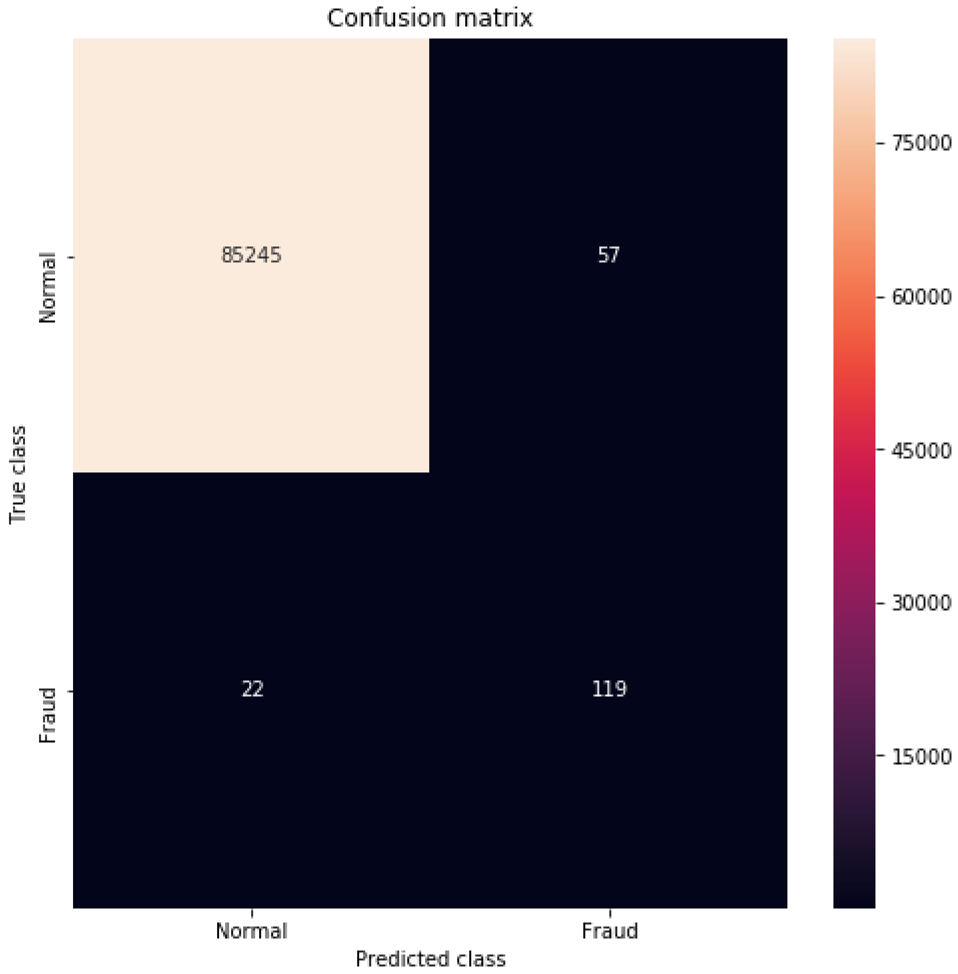
```
RandomForestClassifier(bootstrap=True, class_weight='balanced',
                       criterion='gini', max_depth=6, max_features='sqrt',
                       max_leaf_nodes=None, min_impurity_decrease=0.0,
                       min_impurity_split=None, min_samples_leaf=1,
                       min_samples_split=2, min_weight_fraction_leaf=0.0,
                       n_estimators=100, n_jobs=4, oob_score=True,
                       random_state=50, verbose=2, warm_start=False)
```

Veamos la Confusion Matrix con el conjunto de Test

In [ ]:

```
pred_y = model.predict(X_test)
mostrar_resultados(y_test, pred_y)
```

```
[Parallel(n_jobs=4)]: Using backend ThreadingBackend with 4 concurrent workers.
[Parallel(n_jobs=4)]: Done  33 tasks      | elapsed:    0.1s
[Parallel(n_jobs=4)]: Done 100 out of 100 | elapsed:    0.3s finished
```



```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00     85302
           1       0.68      0.84      0.75       141

    accuracy                           1.00     85443
   macro avg       0.84      0.92      0.88     85443
weighted avg       1.00      1.00      1.00     85443
```

Comprobamos Resultados

In [ ]:

```
from sklearn.metrics import roc_auc_score

# Calculate roc auc
roc_value = roc_auc_score(y_test, pred_y)
```

In [ ]:

```
print(roc_value)
```

```
0.9216517085479026
```

El valor de roc cuanto más cerca de 1, mejor. si fuera 0.5 daría igual que fuesen valores aleatorios y sería un mal modelo