https://www.kaggle.com/code/marcelotc/creditcard-fraud-logistic-regression-example

In [19]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import math
import sklearn
import numpy as np

import warnings
warnings.filterwarnings('ignore')

%matplotlib inline
```

In [21]:
```
df = pd.read_csv("data/Credit_Card_Applications.csv")
```

In [23]:
```
print('Total de linhas e colunas\n\n',df.shape,'\n')
```

```
Total de linhas e colunas

 (690, 16)
```

In [25]:
```
df.isnull().sum()
```

Out[25]:
```
CustomerID    0
A1            0
A2            0
A3            0
A4            0
A5            0
A6            0
A7            0
A8            0
A9            0
A10           0
A11           0
A12           0
A13           0
A14           0
Class         0
dtype: int64
```

In [27]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 690 entries, 0 to 689
Data columns (total 16 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   CustomerID  690 non-null    int64
 1   A1          690 non-null    int64
 2   A2          690 non-null    float64
 3   A3          690 non-null    float64
 4   A4          690 non-null    int64
 5   A5          690 non-null    int64
 6   A6          690 non-null    int64
 7   A7          690 non-null    float64
 8   A8          690 non-null    int64
 9   A9          690 non-null    int64
 10  A10         690 non-null    int64
 11  A11         690 non-null    int64
 12  A12         690 non-null    int64
 13  A13         690 non-null    int64
 14  A14         690 non-null    int64
 15  Class       690 non-null    int64
dtypes: float64(3), int64(13)
memory usage: 86.4 KB
```

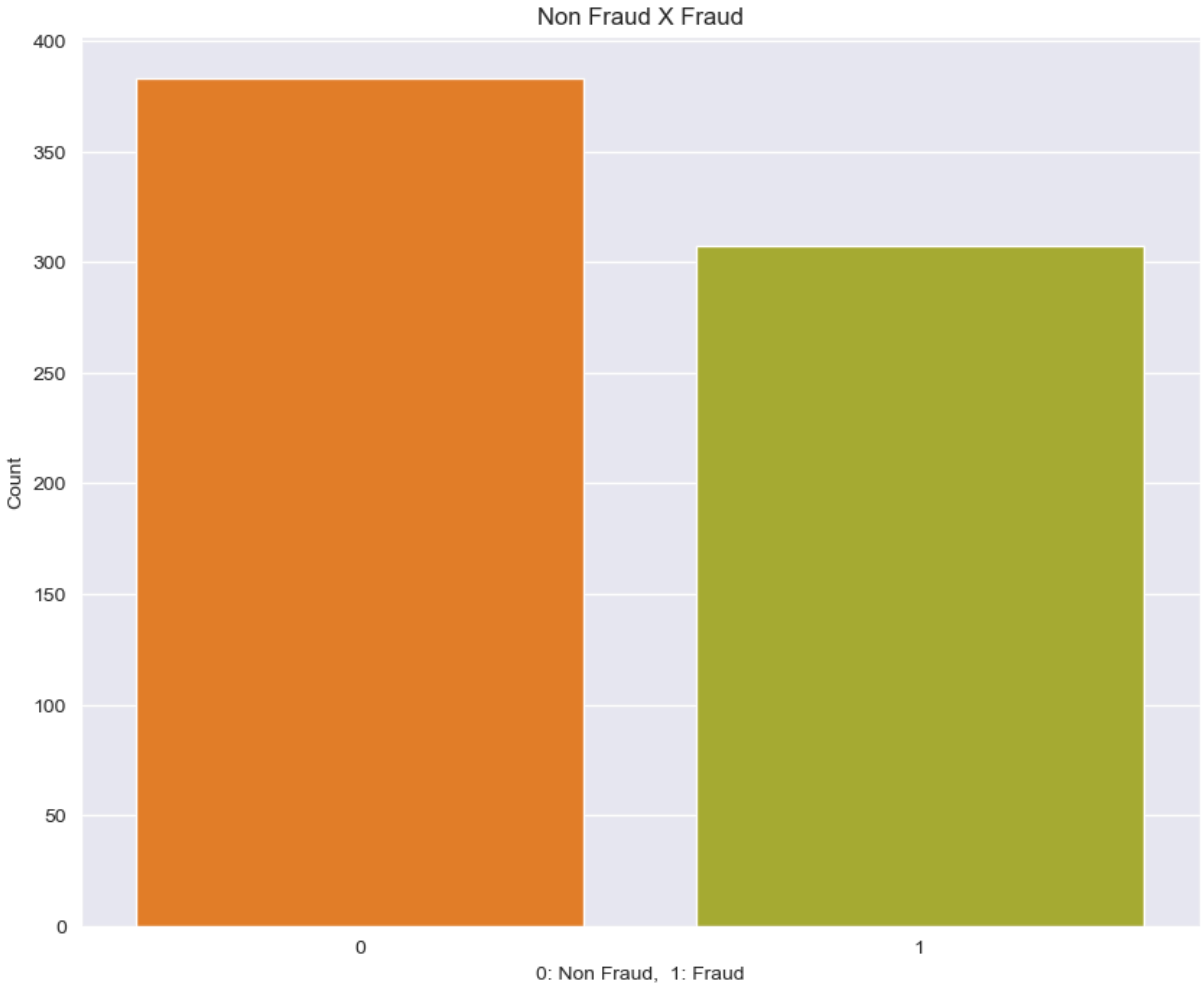
In [29]:
```
df.describe().round()
```

Out[29]:

	CustomerID	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A1
count	690.0	690.0	690.0	690.0	690.0	690.0	690.0	690.0	690.0	690.0	690.0	690
mean	15690471.0	1.0	32.0	5.0	2.0	7.0	5.0	2.0	1.0	0.0	2.0	0
std	71506.0	0.0	12.0	5.0	0.0	4.0	2.0	3.0	0.0	0.0	5.0	0
min	15565714.0	0.0	14.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0
25%	15631687.0	0.0	23.0	1.0	2.0	4.0	4.0	0.0	0.0	0.0	0.0	0
50%	15690161.0	1.0	29.0	3.0	2.0	8.0	4.0	1.0	1.0	0.0	0.0	0
75%	15751896.0	1.0	38.0	7.0	2.0	10.0	5.0	3.0	1.0	1.0	3.0	1
max	15815443.0	1.0	80.0	28.0	3.0	14.0	9.0	28.0	1.0	1.0	67.0	1

In [31]:
```
plt.figure(figsize=(10,8))
sns.set_style('darkgrid')
sns.barplot(x=df['Class'].value_counts().index,y=df['Class'].value_counts(), palett
plt.title('Non Fraud X Fraud')
plt.ylabel('Count')
plt.xlabel('0: Non Fraud,  1: Fraud')
print ('Non Fraud % ',round(df['Class'].value_counts()[0]/len(df)*100,2))
print ('Fraud %    ',round(df['Class'].value_counts()[1]/len(df)*100,2));
```

```
Non Fraud %  55.51
Fraud %     44.49
```



In [53]:
```
feature_names = df.iloc[:, 1:30].columns
target = df.iloc[:1, 30:].columns

data_features = df[feature_names]
data_target = df['Class']
```

In [55]:
```
feature_names
```

Out[55]:
```
Index(['A1', 'A2', 'A3', 'A4', 'A5', 'A6', 'A7', 'A8', 'A9', 'A10', 'A11',
       'A12', 'A13', 'A14', 'Class'],
      dtype='object')
```

In [57]:
```
target
```

Out[57]:
```
Index([], dtype='object')
```

In [59]:
```
from sklearn.model_selection import train_test_split
np.random.seed(123)
X_train, X_test, y_train, y_test = train_test_split(data_features, data_target,
                                                    train_size=0.70, test_size=0.30
                                                    random_state=1)
```

In [61]:
```
from sklearn.linear_model import LogisticRegression
lr = LogisticRegression()
```

You can complete this part for practice

Follow the steps from this link: https://www.kaggle.com/code/marcelotc/creditcard-fraud-logistic-regression-example

Model Training

In [96]:
```
# Fitting the model
lr.fit(X_train, y_train)
```

Out[96]:
```
LogisticRegression()
```

Model Evaluation

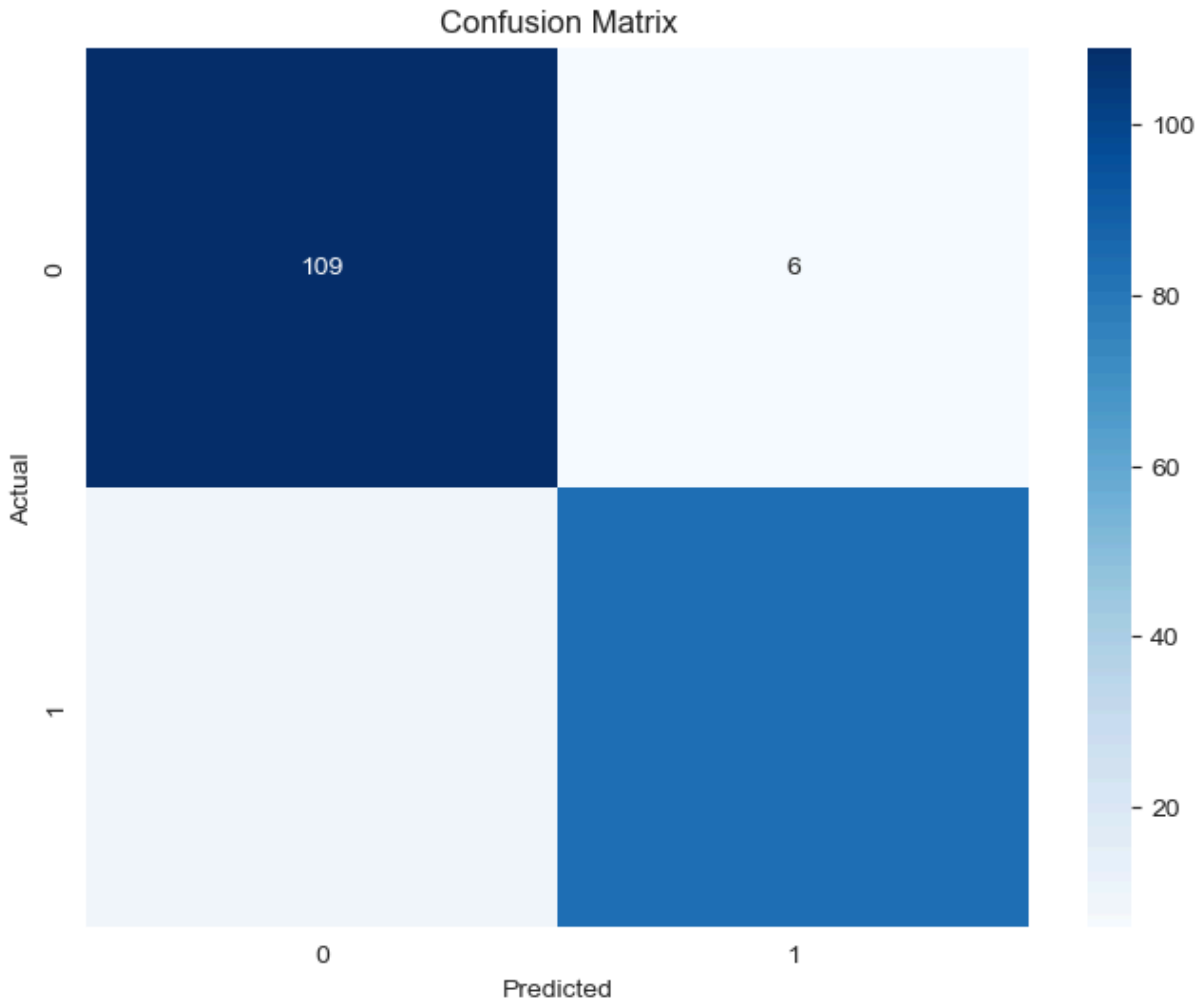
In [99]:
```
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report

# Making predictions
y_pred = lr.predict(X_test)

# Evaluating the model
accuracy = accuracy_score(y_test, y_pred)
conf_matrix = confusion_matrix(y_test, y_pred)
class_report = classification_report(y_test, y_pred)

print("Accuracy:", accuracy)
print("Confusion Matrix:\n", conf_matrix)
print("Classification Report:\n", class_report)
```

```
Accuracy: 0.9323671497584541
Confusion Matrix:
 [[109   6]
 [  8  84]]
Classification Report:
              precision    recall  f1-score   support

           0       0.93      0.95      0.94       115
           1       0.93      0.91      0.92        92

    accuracy                           0.93       207
   macro avg       0.93      0.93      0.93       207
weighted avg       0.93      0.93      0.93       207
```

Visualizing Results

In [102…

```
plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues')
plt.ylabel('Actual')
plt.xlabel('Predicted')
plt.title('Confusion Matrix')
plt.show()
```



In [104…

```
def PrintStats(cmat, y_test, pred):
    tpos = cmat[0][0]
    fneg = cmat[1][1]
    fpos = cmat[0][1]
    tneg = cmat[1][0]
```

Model Evaluation Summary

Accuracy

```
Accuracy: 93.24%
    This indicates that the model correctly classified
approximately 93% of the transactions overall.
```

Confusion Matrix Confusion Matrix:

```
    [[109   6]   # Non-Fraud (0) Predictions
     [  8  84]]  # Fraud (1) Predictions
           True Negatives (TN): 109 (correctly predicted non-fraud
cases)
           False Positives (FP): 6 (incorrectly predicted as
fraud)
           False Negatives (FN): 8 (missed fraud cases)
           True Positives (TP): 84 (correctly predicted fraud
cases)
```

Precision and Recall Precision (Fraud): 93%

```
    When the model predicts a transaction as fraud, it is correct
93% of the time.
    Recall (Fraud): 91%
```

The model identifies 91% of actual fraud cases, indicating that a small portion of fraud cases are missed.

In [ ]: