XGBoost

```
!pip install xgboost
```

```
Collecting xgboost
  Downloading xgboost-2.1.1-py3-none-manylinux_2_28_x86_64.whl.metadata (2.1 kB)
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (from xgboost) (1.26.4)
Collecting nvidia-nccl-cu12 (from xgboost)
  Downloading nvidia_nccl_cu12-2.22.3-py3-none-manylinux2014_x86_64.whl.metadata (1.8 kB)
Requirement already satisfied: scipy in /usr/local/lib/python3.10/dist-packages (from xgboost) (1.13.1)
Downloading xgboost-2.1.1-py3-none-manylinux_2_28_x86_64.whl (153.9 MB)
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Downloading nvidia_nccl_cu12-2.22.3-py3-none-manylinux2014_x86_64.whl (190.9 MB)
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Installing collected packages: nvidia-nccl-cu12, xgboost
Successfully installed nvidia-nccl-cu12-2.22.3 xgboost-2.1.1
```

Importing Libraries

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, accuracy_score
from sklearn.model_selection import cross_val_score
from xgboost import XGBClassifier
```

Data Preprocessing

```
# Load the data and inspect the target variable
df = pd.read_csv('Data.csv')
print(df['Class'].unique())

from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
y_train = le.fit_transform(y_train)
```

```
[2 4]
```

Importing Dataset

```
df = pd.read_csv('Data.csv')
X = df.iloc[:, :-1].values
y = df.iloc[:, -1].values
```

Splitting the dataset into the training and test set

```
x_train, x_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

Training XGBoost on the training

```
# Check the unique values in the training target variable
print(np.unique(y_train))
```

```
[2 4]
```

```
import numpy as np
y_train = np.where(y_train == 2, 0, 1)
```

```
classifier = XGBClassifier()
xg = classifier.fit(x_train, y_train)
```

Making cofusion matrix

```
y_pred = xg.predict(x_test)
y_pred = np.where(y_pred == 0, 2, 4)
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)
```

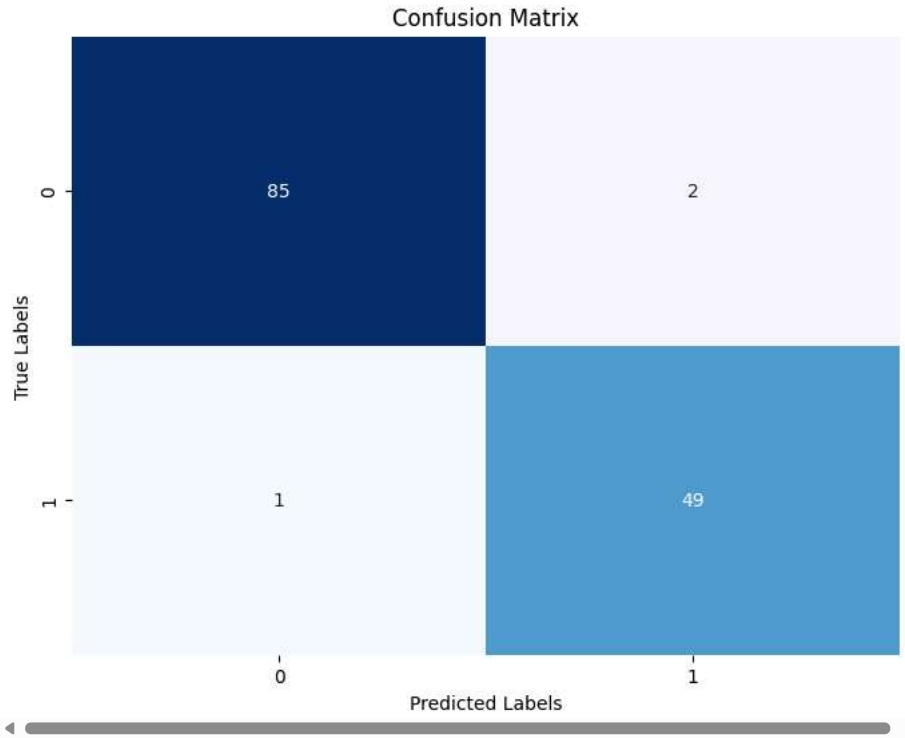
```
[[85  2]
 [ 1 49]]
0.9781021897810219
```

Visualizing Confusion matrix

```
!pip install seaborn
import seaborn as sns
```

```
Requirement already satisfied: seaborn in /usr/local/lib/python3.10/dist-packages (0.13.1)
Requirement already satisfied: numpy!=1.24.0,>=1.20 in /usr/local/lib/python3.10/dist-packages (from seaborn) (1.26.4)
Requirement already satisfied: pandas>=1.2 in /usr/local/lib/python3.10/dist-packages (from seaborn) (2.1.4)
Requirement already satisfied: matplotlib!=3.6.1,>=3.4 in /usr/local/lib/python3.10/dist-packages (from seaborn) (3.7.1)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (1.2.
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (4.5
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (1.4
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (24.1)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (10.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (3.1.
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.2->seaborn) (2024.1)
Requirement already satisfied: tzdata>=2022.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.2->seaborn) (2024.1)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib!=3.6.1,>=3.4->
```

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



Applying K-fold cross validation

```
accuracy_score  = cross_val_score(estimator=xg, X=x_train, y=y_train, cv=10)
print('Accuracy: {:.2f} %'.format(accuracy_score.mean()*100))
print('Standard Deviation: {:.2f} %'.format(accuracy_score.std()*100))
```

```
Accuracy: 96.71 %
Standard Deviation: 2.28 %
```