```
from google.colab import files
uploaded = files.upload()
```

```
Choose files data2.csv
data2.csv(text/csv) - 429766 bytes, last modified: 30/10/2025 - 100% done
Saving data2.csv to data2.csv
```

```
import pandas as pd

# Load the uploaded CSV file
df = pd.read_csv("data2.csv")

# Show the first 5 rows
df.head(10)
```

```
   Profession  Income    Credit_card_number  Expiry  Security_code  Fraud
0      DOCTOR   42509      3515418493460774   07/25            251      1
1      DOCTOR   80334       213134223583196   05/32            858      1
2      LAWYER   91552      4869615013764888   03/30            755      1
3      LAWYER   43623       341063356109385   01/29            160      1
4      DOCTOR   22962   4707418777543978402   11/30            102      0
5    ENGINEER   72106         4483533221713   05/27            834      0
6      DOCTOR   54992       348781654665997   06/30            207      0
7      LAWYER   19996        38608157332988   12/26            433      0
8      DOCTOR   54682      4495934016931879   01/32            872      0
9      DOCTOR   74679        30107450695256   09/34            295      0
```

Next steps: Generate code with df New interactive sheet

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 6 columns):
 #   Column              Non-Null Count  Dtype 
---  ------              --------------  ----- 
 0   Profession          10000 non-null  object
 1   Income              10000 non-null  int64 
 2   Credit_card_number  10000 non-null  int64 
 3   Expiry              10000 non-null  object
 4   Security_code       10000 non-null  int64 
 5   Fraud               10000 non-null  int64 
dtypes: int64(4), object(2)
memory usage: 468.9+ KB
```

```
df.describe()
```

```
             Income  Credit_card_number  Security_code         Fraud
count   10000.00000        1.000000e+04   10000.000000  10000.000000
mean    49761.20600        3.851363e+17     863.587800      0.501600
std     28837.72928        1.257950e+18    1484.424959      0.500022
min         1.00000        6.040296e+10       0.000000      0.000000
25%     24863.75000        1.800137e+14     275.000000      0.000000
50%     49483.00000        3.512440e+15     539.500000      1.000000
75%     74483.00000        4.594779e+15     813.250000      1.000000
max     99986.00000        4.999697e+18    9990.000000      1.000000
```

```
df.dtypes
```

```
                          0
Profession           object
Income                int64
Credit_card_number    int64
Expiry               object
Security_code         int64
Fraud                 int64

dtype: object
```

```
# To know is there any missing value in the dataset.
df.isnull().sum()
```

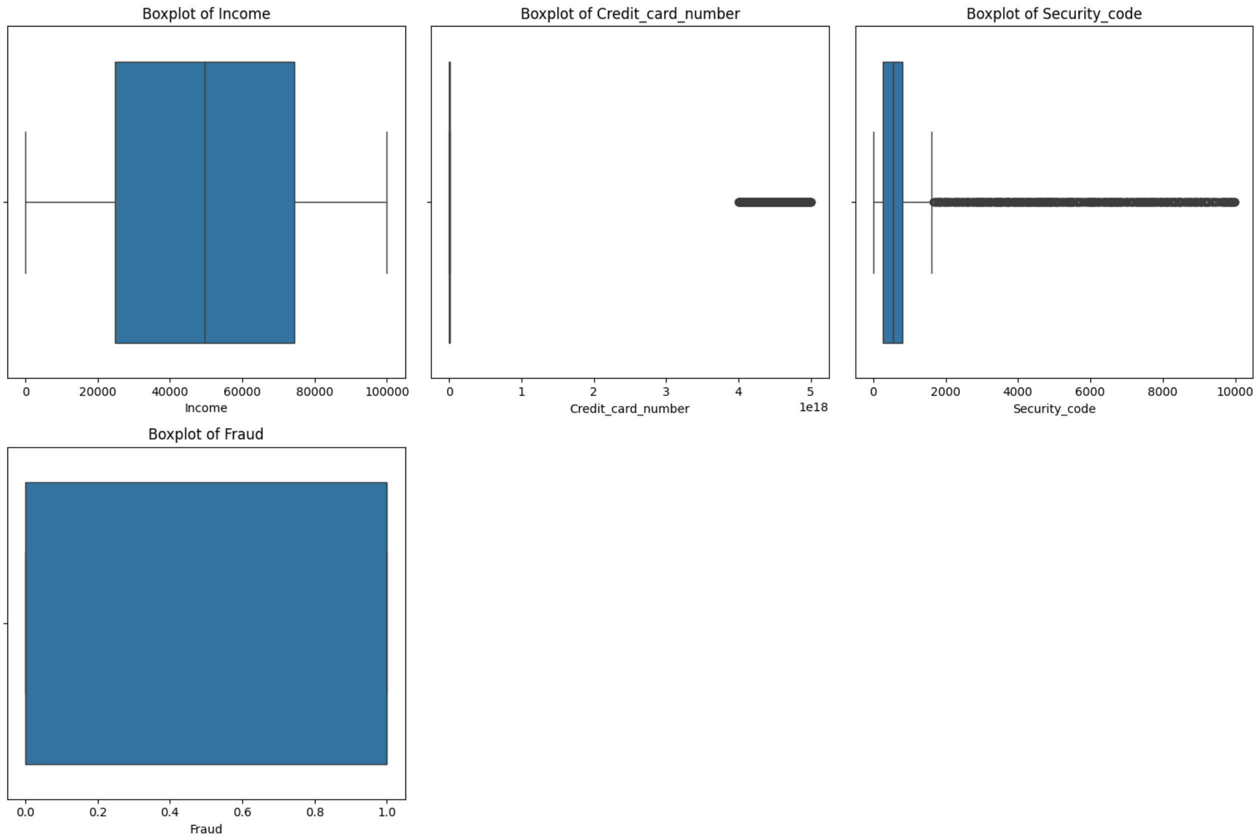
```
                    0
Profession          0
Income              0
Credit_card_number  0
Expiry              0
Security_code       0
Fraud               0

dtype: int64
```

```
# To find out is there any outliers
import matplotlib.pyplot as plt
import seaborn as sns

# Select numeric columns only
numeric_cols = df.select_dtypes(include=['int64', 'float64']).columns

# Plot boxplots for each numeric column
plt.figure(figsize=(15, 10))
for i, col in enumerate(numeric_cols, 1):
    plt.subplot(len(numeric_cols)//3 + 1, 3, i)
    sns.boxplot(x=df[col])
    plt.title(f'Boxplot of {col}')
plt.tight_layout()
plt.show()
```


Boxplot of Income

Boxplot of Credit_card_number

Boxplot of Security_code

Boxplot of Fraud

```
# Normalization of numerical Columns
from sklearn.preprocessing import MinMaxScaler

scaler = MinMaxScaler()
numeric_cols = df.select_dtypes(include=['int64', 'float64']).columns

df[numeric_cols] = scaler.fit_transform(df[numeric_cols])
df.head(10)
```

	Profession	Income	Credit_card_number	Expiry	Security_code	Fraud
0	DOCTOR	0.425144	7.031142e-04	07/25	0.025125	1.0
1	DOCTOR	0.803451	4.261734e-05	05/32	0.085886	1.0
2	LAWYER	0.915647	9.739699e-04	03/30	0.075576	1.0
3	LAWYER	0.436285	6.820472e-05	01/29	0.016016	1.0
4	DOCTOR	0.229644	9.415407e-01	11/30	0.010210	0.0
5	ENGINEER	0.721158	8.846796e-07	05/27	0.083483	0.0
6	DOCTOR	0.549992	6.974847e-05	06/30	0.020721	0.0
7	LAWYER	0.199980	7.710018e-06	12/26	0.043343	0.0
8	DOCTOR	0.546892	8.992292e-04	01/32	0.087287	0.0
9	DOCTOR	0.746892	6.009773e-06	09/34	0.029530	0.0

Next steps: Generate code with df New interactive sheet

```
# Normalization of Catagorical Columns
categorical_columns = df.select_dtypes(include=['object']).columns
```

```
print("Categorical Columns: ", categorical_columns)
```

```
Categorical Columns:  Index(['Profession', 'Expiry'], dtype='object')
```

```
# Convert ExpiryDate to datetime first
df['Expiry'] = pd.to_datetime(df['Expiry'], errors='coerce')

# Then check again for categorical columns
categorical_columns = df.select_dtypes(include=['object']).columns
print(categorical_columns)
```

```
Index(['Profession'], dtype='object')
```

```
data_encoded = pd.get_dummies(df, columns=categorical_columns)
data_encoded.head(10)
```

	Income	Credit_card_number	Expiry	Security_code	Fraud	Profession_DOCTOR	Profession_ENGINEER	Profession_LAWYER
0	0.425144	7.031142e-04	NaT	0.025125	1.0	True	False	False
1	0.803451	4.261734e-05	2032-05-01	0.085886	1.0	True	False	False
2	0.915647	9.739699e-04	NaT	0.075576	1.0	False	False	True
3	0.436285	6.820472e-05	NaT	0.016016	1.0	False	False	True
4	0.229644	9.415407e-01	NaT	0.010210	0.0	True	False	False
5	0.721158	8.846796e-07	NaT	0.083483	0.0	False	True	False
6	0.549992	6.974847e-05	NaT	0.020721	0.0	True	False	False
7	0.199980	7.710018e-06	NaT	0.043343	0.0	False	False	True
8	0.546892	8.992292e-04	2032-01-01	0.087287	0.0	True	False	False

Next steps: Generate code with data_encoded New interactive sheet

```
# Convert all boolean columns (True/False) to integers (1/0)
bool_cols = data_encoded.select_dtypes(include=['bool']).columns
data_encoded[bool_cols] = data_encoded[bool_cols].astype(int)
data_encoded.head(10)
```

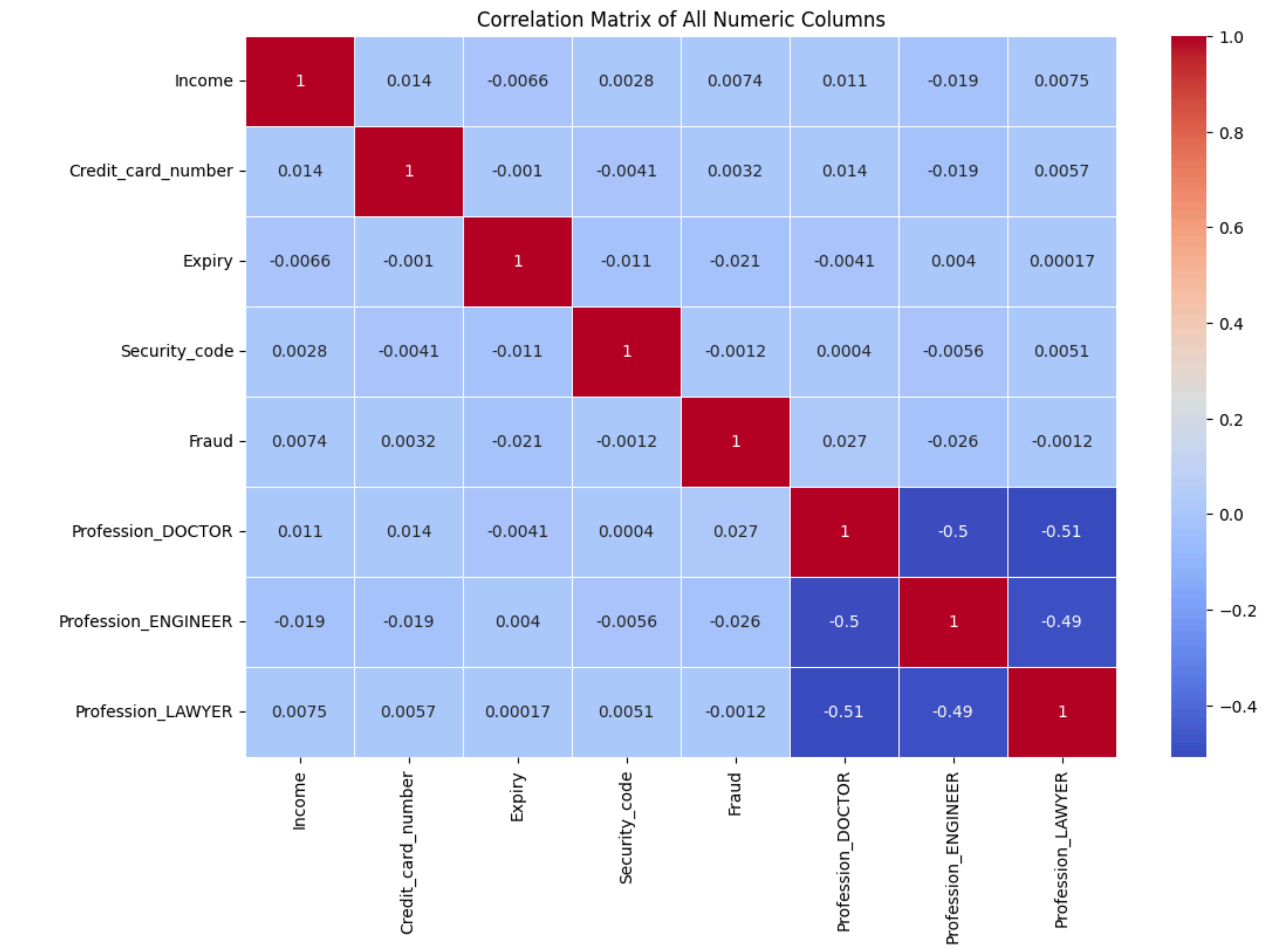
	Income	Credit_card_number	Expiry	Security_code	Fraud	Profession_DOCTOR	Profession_ENGINEER	Profession_LAWYER
0	0.425144	7.031142e-04	NaT	0.025125	1.0	1	0	0
1	0.803451	4.261734e-05	2032-05-01	0.085886	1.0	1	0	0
2	0.915647	9.739699e-04	NaT	0.075576	1.0	0	0	1
3	0.436285	6.820472e-05	NaT	0.016016	1.0	0	0	1
4	0.229644	9.415407e-01	NaT	0.010210	0.0	1	0	0
5	0.721158	8.846796e-07	NaT	0.083483	0.0	0	1	0
6	0.549992	6.974847e-05	NaT	0.020721	0.0	1	0	0
7	0.199980	7.710018e-06	NaT	0.043343	0.0	0	0	1
8	0.546892	8.992292e-04	2032-01-01	0.087287	0.0	1	0	0

Next steps: Generate code with data_encoded New interactive sheet

```
# Calculate correlation for all numeric columns
import seaborn as sns
import matplotlib.pyplot as plt

# Calculate correlation for all numeric columns
corr_matrix = data_encoded.corr()

# Plot the heatmap
plt.figure(figsize=(12, 8))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', linewidths=0.5)
plt.title("Correlation Matrix of All Numeric Columns")
plt.show()
```



Correlation Matrix of All Numeric Columns

	Income	Credit_card_number	Expiry	Security_code	Fraud	Profession_DOCTOR	Profession_ENGINEER	Profession_LAWYER
Income	1	0.014	-0.0066	0.0028	0.0074	0.011	-0.019	0.0075
Credit_card_number	0.014	1	-0.001	-0.0041	0.0032	0.014	-0.019	0.0057
Expiry	-0.0066	-0.001	1	-0.011	-0.021	-0.0041	0.004	0.00017
Security_code	0.0028	-0.0041	-0.011	1	-0.0012	0.0004	-0.0056	0.0051
Fraud	0.0074	0.0032	-0.021	-0.0012	1	0.027	-0.026	-0.0012
Profession_DOCTOR	0.011	0.014	-0.0041	0.0004	0.027	1	-0.5	-0.51
Profession_ENGINEER	-0.019	-0.019	0.004	-0.0056	-0.026	-0.5	1	-0.49
Profession_LAWYER	0.0075	0.0057	0.00017	0.0051	-0.0012	-0.51	-0.49	1

```
# Split the data into 70% training and 30% testing
from sklearn.model_selection import train_test_split

X = data_encoded.drop(columns=['Fraud', 'Expiry'])   # Feature columns
y = data_encoded['Fraud']                # Target column

# Correct order: X_train, X_test, y_train, y_test
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)

print("Training set shape:", X_train.shape)
print("Testing set shape:", X_test.shape)
```

```
Training set shape: (7000, 6)
Testing set shape: (3000, 6)
```

```
# Decision Tree Classifier
# 1️⃣ Import the library
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report

# 2️⃣ Create the model
dt_model = DecisionTreeClassifier(random_state=42)

# 3️⃣ Train the model on training data
dt_model.fit(X_train, y_train)

# 4️⃣ Make predictions on test data
y_pred = dt_model.predict(X_test)

# 5️⃣ Evaluate the model
print("✅ Model Accuracy:", accuracy_score(y_test, y_pred))
print("\n📊 Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("\n📈 Classification Report:\n", classification_report(y_test, y_pred))
```

```
✅ Model Accuracy: 0.49333333333333335

📊 Confusion Matrix:
 [[724 752]
 [768 756]]

📈 Classification Report:
               precision    recall  f1-score   support

         0.0       0.49      0.49      0.49      1476
         1.0       0.50      0.50      0.50      1524

    accuracy                           0.49      3000
   macro avg       0.49      0.49      0.49      3000
weighted avg       0.49      0.49      0.49      3000
```

```
#Logistic Regression
# 1️⃣ Import libraries
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report

# 2️⃣ Create the model
log_model = LogisticRegression(max_iter=1000, random_state=42)

# 3️⃣ Train the model
log_model.fit(X_train, y_train)

# 4️⃣ Predict on test data
y_pred = log_model.predict(X_test)

# 5️⃣ Evaluate performance
print("✅ Model Accuracy:", accuracy_score(y_test, y_pred))
print("\n📊 Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("\n📈 Classification Report:\n", classification_report(y_test, y_pred))
```

```
✅ Model Accuracy: 0.5143333333333333

📊 Confusion Matrix:
 [[999 477]
 [980 544]]

📈 Classification Report:
               precision    recall  f1-score   support

         0.0       0.50      0.68      0.58      1476
         1.0       0.53      0.36      0.43      1524

    accuracy                           0.51      3000
   macro avg       0.52      0.52      0.50      3000
weighted avg       0.52      0.51      0.50      3000
```

```
# Random Forest Classifier
# 1) Import
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report

# 2) Create the model (solid defaults)
rf = RandomForestClassifier(
    n_estimators=300,
    max_depth=None,        # let trees grow; you can try values like 5, 10, 20
    min_samples_split=2,
    min_samples_leaf=1,
    n_jobs=-1,             # use all CPUs
    random_state=42
)

# 3) Train
rf.fit(X_train, y_train)

# 4) Predict
y_pred = rf.predict(X_test)

# 5) Evaluate
print("✅ Random Forest Accuracy:", accuracy_score(y_test, y_pred))
print("\n📊 Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
print("\n📈 Classification Report:\n", classification_report(y_test, y_pred))
```

```
✅ Random Forest Accuracy: 0.495
```