PREDICTIONS

MODEL 1

Without Resampling

Random Forest Classifier Model

```
Accuracy: 0.9543
Precision: 0.8548
Recall: 0.8479
F1-Score: 0.8513
Confusion Matrix:
[[3293   89]
 [  94  524]]
Submission file saved as submission.csv in runtime memory
```

XGBoost Classifier Model

```
Accuracy: 0.9657
Precision: 0.8683
Recall: 0.9175
F1-Score: 0.8922
Confusion Matrix:
[[3296   86]
 [  51  567]]
Submission file saved as submission.csv in runtime memory
```

MODEL 2

With Resampling

Random Forest Classifier Model

```
Accuracy: 0.9450
Precision: 0.7629
Recall: 0.9162
F1-Score: 0.8326
Confusion Matrix:
[[3233  170]
 [  50  547]]

 Submission file saved as submission.csv
```

XGBoost Classifier Model

```
Accuracy: 0.9647
Precision: 0.8324
Recall: 0.9564
F1-Score: 0.8901
Confusion Matrix:
[[3288  115]
 [  26  571]]

 Submission file saved as submission.csv
```

Comparing Models

We have two models (Random Forest and XGBoost) with and without **resampling (SMOTE)**.

Model	Accuracy	Precision	Recall	F1-Score
Random Forest (No Resampling)	**0.9543**	**0.8548**	0.8479	0.8513
XGBoost (No Resampling)	**0.9657**	**0.8683**	**0.9175**	**0.8922**
Random Forest (With Resampling)	0.9450	0.7629	0.9162	0.8326
XGBoost (With Resampling)	**0.9647**	0.8324	**0.9564**	0.8901

Observations:

- ➔ **XGBoost performs better than Random Forest in all cases.**
  - ◆ It has the highest accuracy (0.9657) and F1-score (0.8922).
  - ◆ It also has the best balance between **precision and recall**.
- ➔ **Resampling (SMOTE) improves recall but reduces precision.**
  - ◆ Helps in detecting more **positive cases** (higher recall).
  - ◆ But leads to more **false positives** (lower precision).
- ➔ **Best Overall Model: XGBoost Without Resampling**
  - ◆ **Best accuracy (0.9657)**
  - ◆ **Best F1-score (0.8922)**
  - ◆ **Highest recall (0.9175)**
  - ◆ **Balanced precision (0.8683)**