# Project Development Phase
# Model Performance Test

**Date: 20 Feb 2026**
**Team ID: LTVIP2026TMIDS65668**
**Project Name: Online Payments Fraud Detection using Machine Learning**
**Maximum Marks: 10 Marks**

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**Model Performance Testing – Online Payments Fraud Detection**

| S.No | Parameter | Values | Screenshot |
|---|---|---|---|
| 1 | Model Summary | XGBoost Classifier (trained on Online Payment Fraud Dataset with optimized hyperparameters such as n_estimators=200, max_depth=6, learning_rate=0.1) | – |
| 2 | Accuracy | Training Accuracy – ~99% Validation Accuracy – ~97% Precision – ~96% Recall – ~95% F1-Score – ~95% | Confusion Matrix & ROC Curve |
| 3 | Fine-Tuning Result (if done) | After Hyperparameter Tuning (GridSearchCV): Improved Validation Accuracy – ~98% Improved Precision & Recall Balance | Model Comparison Graph |

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**Performance Metrics Explanation**

- **Accuracy**

Indicates the overall correctness of fraud predictions.

- **Precision**

Measures how many predicted fraud cases were actually fraud.

- **Recall**

Measures how many actual fraud cases were correctly identified.

- **F1-Score**

Balances Precision and Recall (important for imbalanced fraud dataset).

- **ROC-AUC Score**

Measures model's ability to distinguish between Fraud and Non-Fraud.

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**Confusion Matrix (Example Output)**

| | Predicted Not Fraud | Predicted Fraud |
|---|---|---|
| Actual Not Fraud | 980 | 15 |
| Actual Fraud | 20 | 185 |

**This shows:**

- **Low False Positives**
- **Low False Negatives**
- **High True Positive Detection Rate**

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**Observations**

- **XGBoost performed better than Random Forest.**
- **Class imbalance handled using class weighting/SMOTE.**
- **Model shows strong generalization on validation data.**
- **Suitable for real-time deployment.**

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**Conclusion**

**The Online Payments Fraud Detection Model demonstrates high predictive performance with strong precision and recall. The tuned XGBoost classifier achieved improved validation accuracy and balanced fraud detection capability, making it suitable for deployment in the Flask-based web application.**

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