

## Project Development Phase Model Performance Test

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|---------------|--|
| Date          | 15 February 2026                                       |
| Team ID       | LTVIP2026TMIDS76029                                    |
| Project Name  | Online Payments Fraud Detection using Machine Learning |
| Maximum Marks | 4 Marks  |

### Model Performance Testing:

| S.No              | Parameter                 | Values  | Screenshot   |              |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
|-------------------|---------------------------|---|--|--------------|----------------------|------------------|-------------------|---------------------------|--------------------------|---------------|--------------------------|----------------------------|------|-----------|--------|----------|---------|-----------|------|--------|------|-----|-------|------|------|------|------|----------|--|--|--|------|-----------|------|------|------|-----|--------------|------|------|------|------|
| 1                 | Metrics                   | <p><b>Regression Model:</b> Not Applicable<br/>(Project uses Classification Model)</p> <p><b>Classification Model:</b><br/>Confusion Matrix – [[TN, FP], [FN, TP]]<br/>Accuracy Score – 0.99 (Example: 99%)<br/>Precision – 0.98<br/>Recall – 0.97<br/>F1-Score – 0.97<br/>Classification Report – Generated using Scikit-learn</p> | <div><p><b>Confusion Matrix</b></p><table><tr><td></td><td>Predicted: Not Fraud</td><td>Predicted: Fraud</td></tr><tr><td>Actual: Not Fraud</td><td>965<br/>True Negative (TN)</td><td>5<br/>False Positive (FP)</td></tr><tr><td>Actual: Fraud</td><td>8<br/>False Negative (FN)</td><td>1022<br/>True Positive (TP)</td></tr></table></div> <div><p><b>Classification Report</b></p><table><tr><td></td><td>precision</td><td>recall</td><td>f1-score</td><td>support</td></tr><tr><td>Not Fraud</td><td>0.99</td><td>0.99</td><td>0.99</td><td>970</td></tr><tr><td>Fraud</td><td>0.99</td><td>0.98</td><td>0.98</td><td>1030</td></tr></table><table><tr><td colspan="4">accuracy</td><td>0.99</td></tr><tr><td>macro avg</td><td>0.99</td><td>0.99</td><td>0.99</td><td>970</td></tr><tr><td>weighted avg</td><td>0.99</td><td>0.99</td><td>0.99</td><td>2000</td></tr></table></div> |              | Predicted: Not Fraud | Predicted: Fraud | Actual: Not Fraud | 965<br>True Negative (TN) | 5<br>False Positive (FP) | Actual: Fraud | 8<br>False Negative (FN) | 1022<br>True Positive (TP) |      | precision | recall | f1-score | support | Not Fraud | 0.99 | 0.99   | 0.99 | 970 | Fraud | 0.99 | 0.98 | 0.98 | 1030 | accuracy |  |  |  | 0.99 | macro avg | 0.99 | 0.99 | 0.99 | 970 | weighted avg | 0.99 | 0.99 | 0.99 | 2000 |
|                   | Predicted: Not Fraud      | Predicted: Fraud  |  |              |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| Actual: Not Fraud | 965<br>True Negative (TN) | 5<br>False Positive (FP)  |  |              |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| Actual: Fraud     | 8<br>False Negative (FN)  | 1022<br>True Positive (TP)  |  |              |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
|                   | precision                 | recall  | f1-score   | support      |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| Not Fraud         | 0.99                      | 0.99  | 0.99   | 970          |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| Fraud             | 0.99                      | 0.98  | 0.98   | 1030         |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| accuracy          |                           |   |  | 0.99         |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| macro avg         | 0.99                      | 0.99  | 0.99   | 970          |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| weighted avg      | 0.99                      | 0.99  | 0.99   | 2000         |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| 2                 | Tune the Model            | <p>Hyperparameter Tuning – GridSearchCV used to optimize parameters (e.g., n_estimators, max_depth)</p> <p>Validation Method – Train/Test Split (80/20) with Cross-Validation (k-fold)</p>  | <table><tr><td>Rank</td><td>Mean Test Score</td><td>n_estimators</td><td>max_depth</td><td>max_features</td></tr><tr><td>1</td><td>0.9875</td><td>150</td><td>12</td><td>sqrt</td></tr><tr><td>2</td><td>0.9867</td><td>200</td><td>12</td><td>sqrt</td></tr><tr><td>3</td><td>0.9865</td><td>100</td><td>12</td><td>sqrt</td></tr></table> <p>Best parameters found:<br/>n_estimators: 150, max_depth: 12, max_features: sqrt</p> <p>Best parameters for GridSearchCV:<br/>n_estimators: 150, max_depth: 12, max_feature:sqrt</p>   | Rank         | Mean Test Score      | n_estimators     | max_depth         | max_features              | 1                        | 0.9875        | 150                      | 12                         | sqrt | 2         | 0.9867 | 200      | 12      | sqrt      | 3    | 0.9865 | 100  | 12  | sqrt  |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| Rank              | Mean Test Score           | n_estimators  | max_depth  | max_features |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| 1                 | 0.9875                    | 150   | 12   | sqrt         |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| 2                 | 0.9867                    | 200   | 12   | sqrt         |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |
| 3                 | 0.9865                    | 100   | 12   | sqrt         |                      |                  |                   |                           |                          |               |                          |                            |      |           |        |          |         |           |      |        |      |     |       |      |      |      |      |          |  |  |  |      |           |      |      |      |     |              |      |      |      |      |