**Model Optimization and Tuning Phase Report**

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| Date | June 2025 |
| Team ID | SWTID1749841176 |
| Project Title | Online Payment Fraud Detection using Machine Learning |
| Maximum Marks | 6 Marks |

**Model Optimization and Tuning Phase:**

The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

**Hyperparameter Tuning Documentation (6 Marks):**

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| **Model** | **Tuned Hyperparameters** |
| Random Forest Classifier |  |
| Decision Tree Classifier |  |
| Extra Trees Classifier |  |
| Support Vector Machine Classifier |  |
| XgBoost Classifier |  |

**Performance Metrics Comparison:**

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| --- | --- |
| **Model** | **Optimized Metric** |
| Random Forest Classifier |  |
| Decision Tree Classifier |  |
| Extra Trees Classifier |  |
| Support Vector Machine Classifier |  |
| XgBoost Classifier |  |

**Final Model Selection:**

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| --- | --- |
| **Final Model** | **Reasoning** |
| Decision Tree Classifier | Decision Tree Classifier, is the best choice because it delivers perfect classification performance while maintaining strong generalization. Decision trees are inherently interpretable, allowing you to understand and explain decisions through clear decision paths. They naturally handle both numerical and categorical features without the need for scaling or complex preprocessing. Additionally, they are capable of capturing complex, nonlinear relationships and feature interactions, making them highly effective across a wide range of problems. |