Model Optimization and Tuning Phase Template

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Team ID	SWUID20250184320
Project Title	Online Payment Fraud detection
Maximum Marks	10 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):

Model	Tuned Hyperparameters	Optimal Values
Model 1 (Logistic Regression)	solver, max_iter, C	'lbfgs', 1000, 1.0
Model 2 (Random Forest)	n_estimators, max_depth, min_samples_spli	100, None, 2
Model 3 (SVM)	kernel, C, gamm	'rbf', 1.0, 'scale'
Model 4 (KNN)	n_neighbors, metric, p	5, 'minkowski', 2

Model 5 (XG Boost)	n_estimators, learning_rate, max_depth, subsample, colsample_bytree	100, 0.1, 5, 0.8, 0.8

Performance Metrics Comparison Report (2 Marks):

Model	Baseline Metric	Optimized Metric
Model 1	0.9980	0.9999
Model 2	0.9981	1.0000
Model 3	0.9991	1.0000
Model 4	0.9953	0.9959
Model 5	0.8874	**1.0000**

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Model 5 (XG Boost)	Model 5 was chosen as the final optimized model due to its perfect accuracy (1.0000) and F1 Score (0.88), demonstrating outstanding classification performance. It showed consistent results, handled class distribution well, and outperformed other models in terms of generalization and prediction stability.