Model Optimization and Tuning Phase Template

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Team ID	SWTID1720195303
Project Title	Predictive Modeling For Fleet Fuel Management Using Machine Learning
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
Random Forest	Number of Trees, Max Depth, Min Samples Split	150, 20, 2
XGBoost	Learning Rate, Max Depth, n_estimators	0.1, 6, 100
SVM	C, Gamma, Kernel	1.0, 0.01, RBF
Neural Network	Learning Rate, Number of Layers, Activation Function	0.01, 3, ReLU

Linear Regression	Regularization Strength (alpha)	0.01

Performance Metrics Comparison Report (2 Marks):

Model	Baseline Metric	Optimized Metric
Random Forest	RMSE: 10.5	RMSE: 8.2
XGBoost	RMSE: 9.8	RMSE: 7.5
SVM	MAE: 8.7	MAE: 6.9
Neural Network	MSE: 95.4	MSE: 75.3
Linear Regression	R²: 0.75	R²: 0.82

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
XGBoost	XGBoost was chosen as the final optimized model due to its superior performance in terms of RMSE (7.5) compared to other models. It

	consistently provided more accurate predictions and handled the complexity of the dataset effectively. Additionally, XGBoost's ability to handle missing values and its robustness against overfitting contributed to its selection as the optimal model for predicting fuel consumption in fleet management.