Model Optimization and Tuning Phase

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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 :

Model	Tuned Hyperparameters	Optimal Values
Model-1 Random Forest Regressor	n_estimators, criterion, max_depth, min_samples_split, min_samples_leaf, max_features, max_leaf_nodes, bootstrap, oob_score, random_state, max_samples	(100 to 500), squared error, (none,10,20,30),(2,5,10) ,(1,2,4), auto, none, True, false, 42, none
Model-2 Decision tree	max_depth, min_samples_split, min_samples_leaf, max_features, criterion, max_leaf_nodes	(None.10.20.30),(2,10,20), (1,5,10), (auto,sqrt), (mse,mae), (none.10 to 30)

Model-3 Hist Gradient Boosting regressor	Max_iter, learning rate, max_depth, max_bins, min_samples_leaf	(100,200,300), (0.01, 0.1, 0.2), (3,4,5,6), (10,20,30), (1,2,4)
Model-4 Supprt Vector regressor	C, epsilon, kernel, degree, gamma, random_state	(0.1,1,10,100,1000), (0.1,0.2,0.5,1.0), (linear,poly,rgf), (scale,auto,0.001,0.01,0.1),(none,random)

Performance Metrics Comparison Report:

Model	Baseline Metric	Optimized Metric
Model 1	Baseline value	Optimized value
Model 2	Baseline value	Optimized value

Final Model Selection Justification :

Final Model	Reasoning

Model 1 – Random forest regressor	It achieved the highest r2 score, mean squared error etc among the evaluated models, indicating better predictive accuracy.