Model Optimization and Tuning Phase Template

Date	9 July 2024
Team ID	team-740110
Project Title	Precise Coffee Quality Prediction
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
Logistic Regression	-	-
Decision Tree Classifier	-	-
Random Forest Classifier	-	-

NOTE: In our project not provided grid search and hyperparameters topic.

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric
Logistic Regression	precision recall f1-score support 0 0.96 0.70 0.81 37 1 0.08 0.50 0.14 2 accuracy 0.69 39 macro avg 0.52 0.60 0.48 39 weighted avg 0.92 0.69 0.78 39
Decision Tree Classifier	precision recall f1-score support 0 0.94 0.92 0.93 37 1 0.00 0.00 0.00 2 accuracy 0.87 39 macro avg 0.47 0.46 0.47 39 weighted avg 0.90 0.87 0.88 39
Random Forest Classifier	precision recall f1-score support 0 0.95 1.00 0.97 37 1 0.00 0.00 0.00 2 accuracy 0.95 39 macro avg 0.47 0.50 0.49 39 weighted avg 0.90 0.95 0.92 39

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Random Forest Classifier	Random Forest was chosen for the coffee quality prediction project due to its superior accuracy and robustness against overfitting, achieving an optimized accuracy score of 94.9%. This ensemble method effectively handles non-linear relationships and is less sensitive to noise and outliers compared to other models. Additionally, Random Forest provides valuable insights into feature importance, requires minimal data preprocessing, and scales well with large datasets, making it the optimal choice for delivering consistent and reliable coffee quality assessments