Model Optimization and Tuning Phase Template

Date	22 June 2024
Team ID	740185
Project Title	Loan Sanction Amount Prediction Data With Ml
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
KNN	n_neighbors	5
SVC	C, kernel	C: 1.0, kernel: 'rbf'
Decision Tree	max_depth, min_samples_split	max_depth: 10, min_samples_split: 2
Random Forest	n_estimators, max_features	n_estimators: 100, max_features: 'sqrt'

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric
KNN	**Optimized Metric:** R^2 score = 0.75 **Description:** KNN showed moderate performance, capturing local data patterns well but not as robust as other models.
SVC	**Optimized Metric:** R^2 score = 0.78 **Description:** SVC provided good accuracy with its non-linear decision boundaries, making it suitable for complex datasets.
Random Forest	**Optimized Metric:** R^2 score = 0.85 **Description:** Random Forest excelled in handling complex relationships and reducing overfitting through its ensemble approach, providing the highest accuracy.

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Random Forest	The Random Forest model was chosen based on its demonstrated high accuracy and robustness in handling complex relationships within the dataset. Its ensemble nature reduces overfitting and provides reliable predictions by averaging multiple decision trees. This aligns with the task's need for accurate and consistent performance across different scenarios, ensuring reliable loan sanction amount predictions with high predictive power.