Model Optimization and Tuning Phase Template

Date	15 March 2024
Team ID	xxxxxx
Project Title	Forecasting Economic Prosperity: Leveraging Machine Learning For GDP Per Capita 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
Linear Regression	N/A	N/A
Random Forest	n_estimators	n_estimators=100
Support Vector Regression	kernel	kernel='rbf'

Performance Metrics Comparison Report (2 Marks):

Model	Baseline Metric	Optimized Metric
Linear Regression	MSE: 21883733.766837504, R^2: -0.9441781713294894	MSE: 21883733.766837504, R^2: -0.9441781713294894
Random Forest	MSE: 7133952.090909091, R^2: 0.36621080852875953	MSE: 7133952.090909091, R^2: 0.36621080852875953
Support Vector Regression	MSE: 15330417.613966553, R^2: -0.3619733999691279	MSE: 15330417.613966553, R^2: -0.3619733999691279

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Random Forest	The Random Forest model was chosen as the final optimized model because it provided the lowest Mean Squared Error (MSE) and highest R^2 score. This indicates that the model performs better at predicting the target variable compared to Linear Regression and Support Vector Regression. Additionally, Random Forests are robust to overfitting and handle both numerical and categorical data well, making them suitable for the "Countries of the World" dataset.