**Model Optimization and Tuning Phase Template**

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| Date | 15 July 2024 |
| Team ID | xxxxxx |
| Project Title | Early Prediction of Chronic Kidney Disease |
| Maximum Marks | 10 Marks |

**Model Optimization and Tuning Phase**

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| **Model** | **Optimized Metric** |
| Decision Tree Classifier |  |
| Gradient Boosting Classifier |  |
| XG Boost Classifier |  |
| KNN |  |
| Random Forest Classifier |  |
| Logistic  Regression |  |

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):**

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| **Model** | **Tuned Hyperparameters** | **Optimal Values** |
| KNN | # Creating a KNeighborsClassifier with initial hyperparameters |  |
| Logistic  Regression | # Creating a LogisticRegression model with initial hyperparameters |  |
| XGBoost  Classifier | # Creating an XGBClassifier with initial hyperparameters |  |
| GradientBoostingClassifier | # Creating a GradientBoosting classifier with initial hyperparameters |  |
| Decision  Tree  Classifier | # Creating a DecisionTree classifier with initial hyperparameters |  |
| Random  Forest  Classifier | # Creating a RandomForest classifier with initial hyperparameters |  |
| **Ada**  **Boost**  **Classifier** | Creating an AdaBoost classifier with a stronger base estimator |  |

**Performance Metrics Comparison Report (2 Marks):**

**Final Model Selection Justification (2 Marks):**

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| --- | --- |
| **Final Model** | **Reasoning** |
| **Ada**  **Boost**  **Classifier** | The model Ada Booster was selected for its performance high accuracy during hyperparameter tuning .Its ability to handle complex relationships, minimize overfitting, high accuracy justifying the selection as the final model. |