Model Optimization and Tuning Phase Report

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| Date | 08 August 2025 |
| Skill Wallet ID | **SWUID20250188325** |
| Project Title | Predictive Pulse: Harnessing Machine Learning for Blood Pressure Analysis |
| 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):**

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| **Model** | **Tuned Hyperparameters** | **Optimal Values** |
| **Logistic Regression** |  |  |
| **Random Forest** |  |  |
| **Decision Tree** |  |  |
| **Gaussian Navie Bayes** |  |  |
| **Multinomial Navie Bayes** |  |  |

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

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| **Model** | **Optimized Metric** |
| **Logistic Regression** |  |
| **Random Forest** |  |
| **Decision Tree** |  |
| **Gaussian Navie Bayes** |  |
| **Multinomial Navie Bayes** |  |

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

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| **Final Model** | **Reasoning** |
| Random Forest (RF) | Random Forest Model is used because it consistently delivers high predictive accuracy and demonstrates strong generalization on both training and test data. Random Forest is robust to overfitting due to its ensemble approach, which averages the results of multiple decision trees. It can effectively handle complex, non-linear relationships and is less sensitive to outliers and noise in the dataset. Additionally, Random Forest provides valuable insights into feature importance, helping to interpret which variables most influence predictions. Its overall performance and reliability make it an excellent choice for this classification problem. |