**Model Optimization and Tuning Phase Template**

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| Date | 09 July 2024 |
| Team ID | SWTID1720023141 |
| Project Title | Prediction and Analysis of Liver Patient  Data Using Machine Learning |
| 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 hyper parameters, 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 | WhatsApp Image 2024-07-11 at 16.49.40_94ac9e5c | WhatsApp Image 2024-07-11 at 16.49.51_0fe8d1dd |
| K neighbors  Classifier | WhatsApp Image 2024-07-11 at 16.50.13_08e225a2 | WhatsApp Image 2024-07-11 at 16.50.21_c53bbd56 |
| RandomForest  Classifier | WhatsApp Image 2024-07-11 at 16.50.57_1373c6c7 | WhatsApp Image 2024-07-11 at 16.51.06_07cdf814 |
| SVC | WhatsApp Image 2024-07-11 at 16.51.33_52e908e1 | WhatsApp Image 2024-07-11 at 16.52.31_8c85f3c3 |

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

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| **Model** | **Baseline Metric** | **Optimized Metric** |
| Logistic  Regression | WhatsApp Image 2024-07-11 at 16.54.11_09ad2831 | WhatsApp Image 2024-07-11 at 16.54.32_9a1d3c94 |
| K neighbors  Classifier | WhatsApp Image 2024-07-11 at 16.55.14_1322f80d | WhatsApp Image 2024-07-11 at 16.55.26_5b919b20 |
| RandomForest  Classifier | WhatsApp Image 2024-07-11 at 16.55.46_36a13588 | WhatsApp Image 2024-07-11 at 16.55.59_d8ca23db |
| SVC | WhatsApp Image 2024-07-11 at 16.56.11_68418500 | WhatsApp Image 2024-07-11 at 16.56.21_ffc23c16 |

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

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| **Final Model** | **Reasoning** |
| SVC | Support Vector Classifier (SVC) is selected for its effectiveness in high-dimensional spaces and robustness to overfitting. It handles both linear and non-linear classification problems by employing kernel functions, making it a versatile and powerful tool suitable for a wide range of applications. |