**Model Optimization and Tuning Phase Template**

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| Date | 13 July 2024 |
| Team ID | SWTID1720092248 |
| Project Title | Revolutionizing Liver Care: Predicting Liver Cirrhosis Using Advanced Machine Learning Techniques |
| 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 | C, solver | 1.0, liblinear |
| Logistic Regression CV | Cs, cv, solver | [1.0], 10, liblinear |
| XGBoost | n\_estimators, learning\_rate, max\_depth | 100, 0.1, 6 |
| Ridge Classifier | alpha | 1.0 |
| KNN | n\_neighbors | 5 |
| Random Forest | n\_estimators, max\_depth | 100, None |
| Support Vector Classifier | C, kernel | 1.0, linear |

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

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| --- | --- | --- |
| **Model** | **Baseline Metric** | **Optimized Metric** |
| Logistic Regression | 0.996606 | 0.996606 |
| Logistic Regression CV | 0.996606 | 0.996606 |
| XGBoost | 0.997738 | 0.997738 |
| Ridge Classifier | 0.977376 | 0.977376 |
| KNN | 0.935520 | 0.935520 |
| Random Forest | 1.000000 | 1.000000 |
| Support Vector Classifier | 0.997738 | 0.997738 |

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

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| --- | --- |
| **Final Model** | **Reasoning** |
| logistic regression | Chosen for its high accuracy, simplicity, and ease of interpretation. Additionally, it performed consistently well across various metrics and is computationally efficient. |