

Model Optimization and Tuning Phase Template

Date	24 June 2025
Team ID	SWTID1749708868
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.

Performance Metrics Comparison Report (2 Marks):

Model	Baseline Metric	Optimized Metric
Logistic Regression	Classification Report: <pre> precision recall f1-score support 0 0.00 0.00 0.00 11 1 0.85 0.85 0.85 4 2 0.82 0.85 0.83 172 accuracy 0.78 187 macro avg 0.56 0.57 0.56 187 weighted avg 0.76 0.78 0.77 187 </pre>	Classification Report: <pre> precision recall f1-score support 0 0.00 0.00 0.00 11 1 1.00 1.00 1.00 4 2 0.94 0.97 0.95 172 accuracy 0.91 187 macro avg 0.65 0.66 0.65 187 weighted avg 0.88 0.91 0.90 187 </pre>
SVM (RBF)	Classification Report: <pre> precision recall f1-score support 0 0.00 0.00 0.00 11 1 1.00 1.00 1.00 4 2 0.94 1.00 0.97 172 accuracy 0.94 187 macro avg 0.65 0.67 0.66 187 weighted avg 0.89 0.94 0.91 187 </pre>	Classification Report: <pre> precision recall f1-score support 0 0.00 0.00 0.00 11 1 1.00 1.00 1.00 4 2 0.94 1.00 0.97 172 accuracy 0.94 187 macro avg 0.65 0.67 0.66 187 weighted avg 0.89 0.94 0.91 187 </pre>
KNN	Classification Report: <pre> precision recall f1-score support 0 0.00 0.00 0.00 11 1 1.00 1.00 1.00 4 2 0.94 1.00 0.97 172 accuracy 0.94 187 macro avg 0.65 0.67 0.66 187 weighted avg 0.89 0.94 0.91 187 </pre>	Classification Report: <pre> precision recall f1-score support 0 0.00 0.00 0.00 11 1 1.00 1.00 1.00 4 2 0.94 1.00 0.97 172 accuracy 0.94 187 macro avg 0.65 0.67 0.66 187 weighted avg 0.89 0.94 0.91 187 </pre>

Decision Tree	Classification Report:					Classification Report:				
	precision	recall	f1-score	support	precision	recall	f1-score	support		
	0	0.60	0.55	0.57	11	0	0.60	0.55	0.57	11
	1	1.00	1.00	1.00	4	1	1.00	1.00	1.00	4
	2	0.97	0.98	0.97	172	2	0.97	0.98	0.97	172
	accuracy			0.95	187	accuracy			0.95	187
	macro avg	0.86	0.84	0.85	187	macro avg	0.86	0.84	0.85	187
	weighted avg	0.95	0.95	0.95	187	weighted avg	0.95	0.95	0.95	187
Random Forest	Classification Report:					Classification Report:				
	precision	recall	f1-score	support	precision	recall	f1-score	support		
	0	0.00	0.00	0.00	11	0	0.00	0.00	0.00	11
	1	1.00	1.00	1.00	4	1	1.00	1.00	1.00	4
	2	0.94	0.98	0.96	172	2	0.94	0.98	0.96	172
	accuracy			0.93	187	accuracy			0.93	187
	macro avg	0.65	0.66	0.65	187	macro avg	0.65	0.66	0.65	187
	weighted avg	0.88	0.93	0.90	187	weighted avg	0.88	0.93	0.90	187

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Decision Tree	The Decision Tree was chosen for its strong performance, interpretability, and clinical relevance. It provided clear, traceable decision rules for cirrhosis diagnosis while maintaining good accuracy. Feature importance rankings identified key biomarkers, and tuning prevented overfitting.