Model Optimization and Tuning Phase Template

Date	30 June 2025
Team ID	LTVIP2025TMID36055
Project Title	Revolutionising Liver Care-Predicting Liver Cirrhosis using Advanced 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 hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (6 Marks):

Model	Tuned Hyperparameters	Optimal Values

Random Forest	'n_estimators': [100, 200, 300], 'max_features': ['auto', 'sqrt', 'log2'], 'max_depth': [10, 20, 30, None], 'min_samples_split': [2, 5, 10], 'min_samples_leaf': [1, 2, 4], 'bootstrap': [True, False] }	Best parameters: {'bootstrap': False, 'max_depth': 20, 'max_features': 'sqrt', 'min_samples_leaf' : 1, 'min_samples_split': 10, 'n_estimators': 200}
KNN	param_grid = {	Best parameters: {'bootstrap': False, 'max_depth': 20, 'max_features': 'sqrt', 'min_samples_leaf'

Model	Baseline Metric	Optimized Metric
Random Forest	Accuracy: 0.8666666666666667	Accuracy: 0.887719298245614

	'n_estimators': [100, 200, 300], 'max_features': ['auto', 'sqrt', 'log2'], 'max_depth': [10, 20, 30, None], 'min_samples_split': [2, 5, 10], 'min_samples_leaf': [1, 2, 4], 'bootstrap': [True, False] }	: 1, 'min_samples_split': 10, 'n_estimators': 200}

xgboost	aram_grid = {
	'max_depth': [3, 5, 7],
	'learning_rate': [0.01, 0.1, 0.2],
	'n_estimators': [100, 200, 300],
	'subsample': [0.8, 0.9, 1.0],
	'colsample_bytree': [0.8, 0.9, 1.0]
	}
		Best parameters: {'colsample_bytree': 0.8, 'learning_rate': 0.01, 'max_depth': 5, 'n_estimators': 200, 'subsample': 0.8}

Performance Metrics Comparison Report (2 Marks):

KNN	Baseline KNN Accuracy: 0.8947368421052632	Baseline KNN Accuracy: 0.8847368421052632

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
KNN	I have choosen KNN model because it shows higher accuracy and prediction needs to be accurate incase of medical field