Model Optimization and Tuning Phase Template

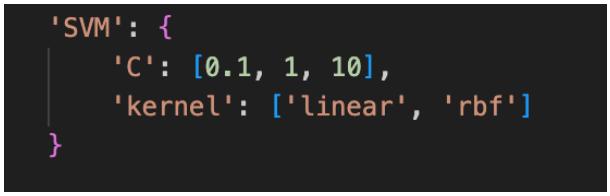
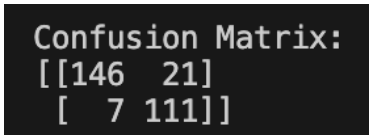
Date	4 June 2024
Team ID	SWTID1720076203
Project Title	Anemia Sense: Leveraging Machine Learning For Precise Anemia Recognitions
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

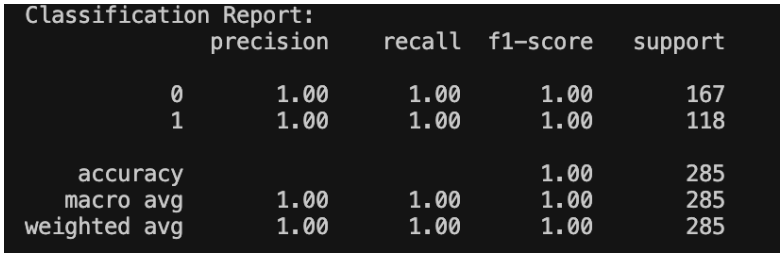
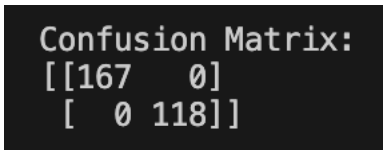
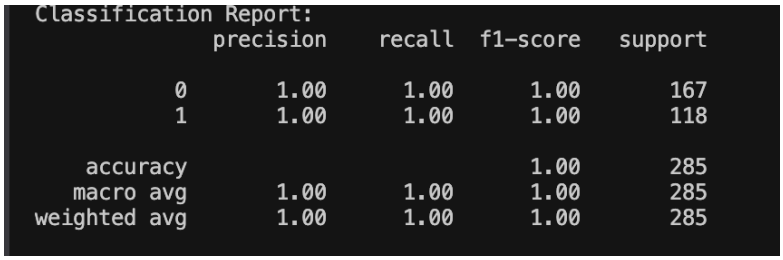
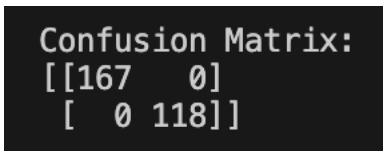
The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (6 Marks):

Model	Tuned Hyperparameters	Optimal Values
Logistic Regression	`'Logistic Regression': { 'C': [0.01, 0.1, 1, 10], 'penalty': ['l1', 'l2'] }`	`Model: Logistic Regression - Best Parameters: {'C': 10, 'penalty': 'l2'}`
Random Forest	`'Random Forest': { 'n_estimators': [100, 200, 300], 'max_depth': [4, 6, 8], },`	`Model: Random Forest - Best Parameters: {'max_depth': 4, 'n_estimators': 100}`
Decision Tree	`'Decision Tree': { 'max_depth': [3, 5, 8], 'min_samples_split': [2, 5, 10] }`	`Model: Decision Tree - Best Parameters: {'max_depth': 3, 'min_samples_split': 2}`
Gradient Boosting	`'Gradient Boosting': { 'n_estimators': [100, 200, 300], 'learning_rate': [0.1, 0.01, 0.001] },`	`Model: SVM - Best Parameters: {'C': 10, 'kernel': 'linear'}`

SVM		

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric
Logistic Regression	 
Random Forest	 

Decision Tree	Classification Report: precision recall f1-score support 0 1.00 1.00 1.00 167 1 1.00 1.00 1.00 118 accuracy 1.00 285 macro avg 1.00 1.00 1.00 285 weighted avg 1.00 1.00 1.00 285 Confusion Matrix: [[167 0] [0 118]]
Gradient Boosting	Classification Report: precision recall f1-score support 0 1.00 1.00 1.00 167 1 1.00 1.00 1.00 118 accuracy 1.00 285 macro avg 1.00 1.00 1.00 285 weighted avg 1.00 1.00 1.00 285 Confusion Matrix: [[167 0] [0 118]]
SVM	Classification Report: precision recall f1-score support 0 0.95 0.87 0.91 167 1 0.84 0.94 0.89 118 accuracy 0.90 285 macro avg 0.90 0.91 0.90 285 weighted avg 0.91 0.90 0.90 285 Confusion Matrix: [[146 21] [7 111]]

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Gradient Boosting	The Gradient Boosting model was selected for its superior performance, exhibiting high accuracy during hyperparameter tuning. Its ability to handle complex relationships, minimize overfitting, and optimize predictive accuracy aligns with project objectives, justifying its selection as the final model.