Model Optimization and Tuning Phase Template

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Team ID	SWTID1720084775
Project Title	ECommerce Shipping Prediction 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 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
SVM	c, kernel, gamma	1.0, rbf, 0.01
Gaussian NB	priors, var_smoothing	None, 1e-9
KNN	n_neighbors, weights, algorithm, p	25, uniform, auto, 2
XGBoost	booster	gbtree

ANN	Units, kernel_initialiser, activation	Input layer: 16, ‘random_uniform’, ‘relu’ First Hidden Layer: 16, ‘random_uniform’, ‘relu’ Second Hidden Layer: 8, ‘random_uniform’, ‘relu’ Output layer: 1, ‘random_uniform’, ‘relu’

Performance Metrics Comparison Report (2 Marks):

Model	Baseline Metric	Optimized Metric
SVM	Accuracy: 0.6676056338028169 F1 Score: 0.6428571428571428 Confusion matrix: [[654 218] [372 531]]	Accuracy: 0.6732394366197183 F1 Score: 0.6424167694204685 Confusion matrix: [[674 198] [382 521]]

Gaussian NB	Accuracy: 0.6698591549295775
	
	F1 Score: 0.6536643026004728
	
	Confusion Matrix:
	`[[636 236]`
	`[350 553]]`
		Accuracy: 0.6698591549295775
		
		F1 Score: 0.6536643026004728
		
		Confusion Matrix:
		`[[636 236]`
		`[350 553]]`

KNN	Accuracy: 0.6473239436619719
	
	F1 Score: 0.6251497005988024
	
	Confusion Matrix:
	`[[627 245]`
	`[381 522]]`
		Accuracy: 0.68
		
		F1 score: 0.6377551020408163
		
		Confusion Matrix:
		`[[707 165]`
		`[403 500]]`

XGBoost	Accuracy: 0.6794366197183098
	F1 Score: 0.6463642013673089
	
	Confusion Matrix:
	`[[686 186]`
	`[383 520]]`
		Accuracy: 0.6794366197183098
		F1 Score: 0.6463642013673089
		
		Confusion Matrix:
		`[[686 186]`
		`[383 520]]`

ANN	Accuracy: 0.7115492957746479
	F1 Score: 0.6418015482054891
	Confusion Matrix:
	`[[804 68]`
	`[444 459]]`
		Accuracy: 0.7132394366197183
		F1 Score: 0.6392629340892985
		Confusion Matrix:
		`[[815 57]`
		`[452 451]]`

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
ANN	The Artificial Neural Network model gave the most accurate results out of all the models that were tested and tuned.