Date	18-JUNE-2024
Team ID	740028
Project Title	**Frappe Activity: Mobile Phone Activity Classification Using Machine Learning**
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

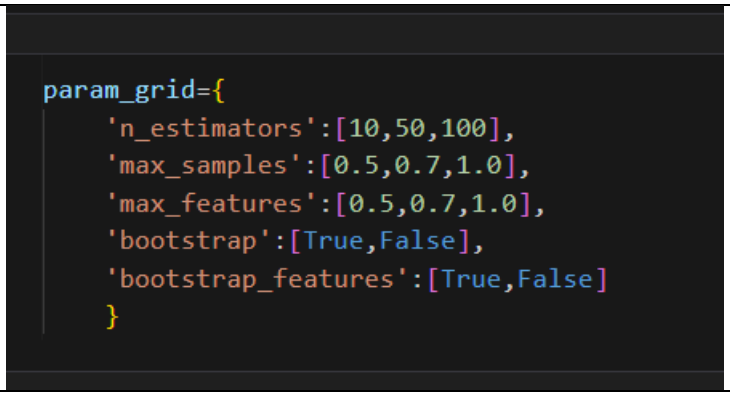
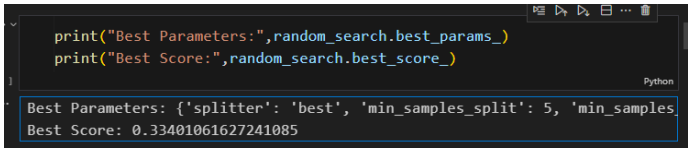
The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation :

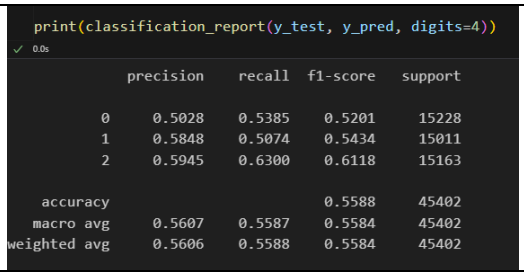
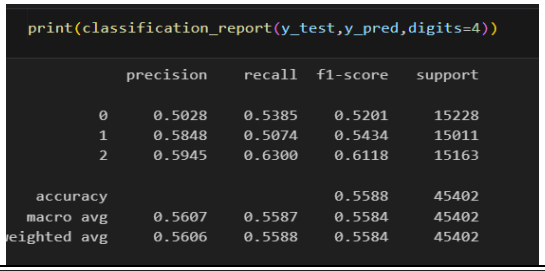
Model	Tuned Hyperparameters	Optimal Values

Decision Tree	`dt_classifier = DecisionTreeClassifier()`
	`# Define the parameter grid`
	`param_grid = {`
	`'criterion': ['gini', 'entropy'],`
	`'splitter': ['best', 'random'],`
	`'max_depth': [None, 2, 4, 6, 8, 10],`
	`'min_samples_split': [2, 5, 10],`
	`'min_samples_leaf': [1, 2, 4],`
	`'max_features': [None, 'sqrt', 'log2'],`
	`'min_impurity_decrease': [0.0, 0.1, 0.2],`
	`'ccp_alpha': [0.0, 0.1, 0.2]`
	`}`
		`print("Best Parameters:",random_search.best_params_)`
		`print("Best Score:",random_search.best_score_)`
		`Best Parameters: {'splitter': 'best', 'min_samples_split': 5, 'min_samples_leaf': 4, 'min_impurity_decrease': 0.2, 'max_features': None, 'max_depth`
		`Best Score: 0.3340106162724085`

Random Forest	`from sklearn.ensemble import RandomForestClassifier`
	`rf_final = RandomForestClassifier()`
	Python
		`print("Best Score:",rf_final.score(x_test,y_test))`
		`Best Score: 0.8208669221620193`

Bagging		

Performance metrics Comparison Report:

Model	Optimized Metric
Decision Tree	
Random Forest	
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Final Model Selection Justification:

Final Model	Reasoning
Decision Tree	The Decision Tree 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