Model Development Phase Template

Date	18 June 2025
Team ID	SWTID1749709635
Project Title	Mental Health Prediction
Maximum Marks	6 Marks

Model Selection Report

In the forthcoming Model Selection Report, various models will be outlined, detailing their descriptions, hyperparameters, and performance metrics, including Accuracy or F1 Score. This comprehensive report will provide insights into the chosen models and their effectiveness.

Model Selection Report:

Model	Description	Hyperparameters	Performance Metric (e.g., Accuracy, F1 Score)
Logistic Regression	A linear model suitable for binary classification tasks.	max_iter=1000, random_state=42	
K- Nearest Neighbors	Instance-based learner that classifies based on majority vote of nearest neighbors.	Default (n_neighbors=5)	

Decision Tree	A tree-based model that splits data using decision rules.	random_state=42	```--- Decision Tree ---
Accuracy: 0.8504
Classification Report:
              precision   recall f1-score   support

           0   0.79   0.92   0.85   118
           1   0.92   0.79   0.85   136

    accuracy   0.85   254
   macro avg   0.86   0.86   0.85   254
weighted avg   0.86   0.85   0.85   254``` |
| Random Forest | An ensemble of decision trees to improve accuracy and reduce overfitting. | random_state=42, n_estimators=100 (default) | ```--- Random Forest ---
Accuracy: 0.9213
Classification Report:
              precision   recall f1-score   support

           0   0.91   0.92   0.92   118
           1   0.93   0.92   0.93   136

    accuracy   0.92   254
   macro avg   0.92   0.92   0.92   254
weighted avg   0.92   0.92   0.92   254``` |
| Naïve Bayes | Probabilistic model based on Bayes' Theorem; assumes feature independence. | None (GaussianNB uses defaults) | ```--- Naive Bayes ---
Accuracy: 0.7205
Classification Report:
              precision   recall f1-score   support

           0   0.71   0.68   0.69   118
           1   0.73   0.76   0.74   136

    accuracy   0.72   254
   macro avg   0.72   0.72   0.72   254
weighted avg   0.72   0.72   0.72   254``` |
| Support Vector Machine | Constructs a hyperplane for optimal class separation in high-dimensional space. | probability=True, random_state=42, default kernel (rbf) | ```--- SVM ---
Accuracy: 0.7795
Classification Report:
              precision   recall f1-score   support

           0   0.78   0.73   0.75   118
           1   0.78   0.82   0.80   136

    accuracy   0.78   254
   macro avg   0.78   0.78   0.78   254
weighted avg   0.78   0.78   0.78   254``` |

Extreme Gradient Boosting	Gradient boosting framework optimized for speed and performance.	use_label_encoder=False, eval_metric='logloss', random_state=42	```
			--- XGBoost ---
			Accuracy: 0.8701
			Classification Report:
			              precision recall f1-score support
			
			           0 0.81 0.93 0.87 118
			           1 0.93 0.82 0.87 136
			
			    accuracy 0.87 254
			   macro avg 0.87 0.87 0.87 254
			weighted avg 0.88 0.87 0.87 254
			``

Adaptive Boosting	Boosting technique that combines weak learners sequentially.	random_state=42	```
			--- AdaBoost ---
			Accuracy: 0.7480
			Classification Report:
			              precision recall f1-score support
			
			           0 0.76 0.67 0.71 118
			           1 0.74 0.82 0.78 136
			
			    accuracy 0.75 254
			   macro avg 0.75 0.74 0.74 254
			weighted avg 0.75 0.75 0.75 254
			``

Gradient Boosting	Boosting method that optimizes via gradient descent on residuals.	random_state=42	```
			--- Gradient Boosting ---
			Accuracy: 0.8386
			Classification Report:
			              precision recall f1-score support
			
			           0 0.83 0.82 0.83 118
			           1 0.85 0.85 0.85 136
			
			    accuracy 0.84 254
			   macro avg 0.84 0.84 0.84 254
			weighted avg 0.84 0.84 0.84 254
			``