

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	<pre> --- Logistic Regression --- Accuracy: 0.7559 Classification Report: precision recall f1-score support 0 0.76 0.69 0.73 118 1 0.75 0.81 0.78 136 accuracy_ 0.76 0.75 0.76 254 macro avg_ 0.76 0.75 0.75 254 weighted avg_ 0.76 0.76 0.75 254 </pre>
K- Nearest Neighbors	Instance-based learner that classifies based on majority vote of nearest neighbors.	Default (n_neighbors=5)	<pre> --- KNN --- Accuracy: 0.7165 Classification Report: precision recall f1-score support 0 0.66 0.81 0.73 118 1 0.79 0.64 0.71 136 accuracy_ 0.73 0.72 0.72 254 macro avg_ 0.73 0.72 0.72 254 weighted avg_ 0.73 0.72 0.72 254 </pre>

Decision Tree	A tree-based model that splits data using decision rules.	random_state=42	<pre> --- 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 0.85 254 weighted avg 0.86 0.85 254 </pre>
Random Forest	An ensemble of decision trees to improve accuracy and reduce overfitting.	random_state=42, n_estimators=100 (default)	<pre> --- 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 0.92 254 weighted avg 0.92 0.92 254 </pre>
Naïve Bayes	Probabilistic model based on Bayes' Theorem; assumes feature independence.	None (GaussianNB uses defaults)	<pre> --- 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 0.72 254 weighted avg 0.72 0.72 254 </pre>
Support Vector Machine	Constructs a hyperplane for optimal class separation in high-dimensional space.	probability=True, random_state=42, default kernel (rbf)	<pre> --- 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 0.78 254 weighted avg 0.78 0.78 254 </pre>

Extreme Gradient Boosting	Gradient boosting framework optimized for speed and performance.	use_label_encoder=False, eval_metric='logloss', random_state=42	<pre> --- 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 0.87 0.87 254 macro avg 0.87 0.87 0.87 254 weighted avg 0.88 0.87 0.87 254 </pre>
Adaptive Boosting	Boosting technique that combines weak learners sequentially.	random_state=42	<pre> --- 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 0.75 0.75 254 macro avg 0.75 0.74 0.74 254 weighted avg 0.75 0.75 0.75 254 </pre>
Gradient Boosting	Boosting method that optimizes via gradient descent on residuals.	random_state=42	<pre> --- 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 0.84 0.84 254 macro avg 0.84 0.84 0.84 254 weighted avg 0.84 0.84 0.84 254 </pre>