Model Development Phase Template

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| Date | 08 August 2025 |
| Skill Wallet ID | **SWUID20250188325** |
| Project Title | Predictive Pulse: Harnessing Machine Learning for Blood Pressure Analysis |
| 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.

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| Model | Description | Hyperparameters | Performance Metrics |
| Logistic Regression | A linear model for classification, suitable for linearly separable data, interpretable and efficient. | C, solver, max\_iter | Train Accuracy: 0.9788 | Test Accuracy: 0.9644 | Cross-Validation Accuracy (mean of 5 folds): 0.8855 |
| Random Forest | Ensemble of decision trees; robust, handles complex relationships, reduces overfitting, and provides feature importance for BP stage prediction. | n\_estimators=100, max\_depth=10, min\_samples\_split=5, random\_state=42 | Train Accuracy: 0.9986 | Test Accuracy: 1.0000 | Cross-Validation Accuracy (mean of 5 folds): 0.9595 |
| Decision Tree | Simple tree structure; interpretable, captures non-linear relationships, suitable for initial insights into BP stage classification. | max\_depth=5, min\_samples\_split=4, random\_state=42 | Train Accuracy: 0.9986 | Test Accuracy: 1.0000 | Cross-Validation Accuracy (mean of 5 folds): 0.9468 |
| Gaussian NB | Probabilistic classifier based on Bayes theorem, assumes feature independence, effective for small datasets. | var\_smoothing | Train Accuracy: 0.8952 | Test Accuracy: 0.8904 | Cross-Validation Accuracy (mean of 5 folds): 0.8937 |
| Multinomial NB | Naive Bayes variant for multinomially distributed data; useful for count-based features but less suited to continuous BP readings. | alpha | Train Accuracy: 0.8055 | Test Accuracy: 0.8027 | Cross-Validation Accuracy (mean of 5 folds): 0.7633 |