# Model Optimization and Tuning Phase Template

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| Date | 05 Oct 2025 |
| Team ID | LTVIP2025TMIDS63456 |
| Project Title | Analysis of Medium App Reviews from Google Play Store |
| Maximum Marks | 10 Marks |

## Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining neural network 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 (8 Marks):

| Model | Tuned Hyperparameters |
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| **K-Nearest Neighbors (KNN)** | - `n_neighbors`: Number of neighbors to use (affects bias-variance tradeoff).<br>- `weights`: Uniform or distance-based influence of neighbors.<br>- `metric`: Distance metric used (e.g., 'euclidean', 'manhattan'). |
| **Naive Bayes** | - `var_smoothing`: Portion added to variance to avoid zero division errors (for GaussianNB).<br>Typically tuned using log-scale values (e.g., 1e-9, 1e-8). |
| **Random Forest** | - `n_estimators`: Number of trees in the forest.<br>- `max_depth`: Maximum depth of each tree.<br>- `min_samples_split`: Minimum samples required to split an internal node.<br>- `max_features`: Number of features to consider for best split. |

## Final Model Selection Justification (2 Marks):

| Final Model | Reasoning |
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| **Random Forest**<br>(Example) | Random Forest was chosen as the final model due to its superior performance in terms of accuracy and robustness on the validation set. It handles non-linear relationships and feature interactions effectively and showed the highest F1-score among all models. |