**Model Optimization and Tuning Phase Template**

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| Date | 26 June 2025 |
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| 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):

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| **Model** | **Tuned Hyperparameters** |
| **K-Nearest Neighbors (KNN)** | - n\_neighbors: Number of neighbors to use (affects bias-variance tradeoff).  - weights: Uniform or distance-based influence of neighbors.  - metric: Distance metric used (e.g., 'euclidean', 'manhattan'). |
| **Naive Bayes** | - var\_smoothing: Portion added to variance to avoid zero division errors (for GaussianNB).  Typically tuned using log-scale values (e.g., 1e-9, 1e-8). |
| **Random Forest** | - n\_estimators: Number of trees in the forest.  - max\_depth: Maximum depth of each tree.  - min\_samples\_split: Minimum samples required to split an internal node.  - max\_features: Number of features to consider for best split. |

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### Final Model Selection Justification (2 Marks):

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| **Final Model** | **Reasoning** |
| **Random Forest** (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. |