**Model Optimization and Tuning Phase Template**

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| Date | 15 March 2024 |
| Team ID | LTVIP2024TMID24785 |
| Project Title | Customer segmentation using ML |
| Maximum Marks | 10 Marks |

**Model Optimization and Tuning Phase**

The Model Optimization and Tuning Phase involves refining machine learning 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 (6 Marks):

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| **Model** | **Tuned Hyperparameters** | **Optimal Values** |
| Model 1 | Learning Rate, Number of Clusters | 0.01, 5 |
| Model 2 | Max Depth, Min Samples Split | 10, 2 |
| Model 3 | Regularization Parameter, Gamma | 0.1, 0.5 |

### Performance Metrics Comparison Report (2 Marks):

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| **Model** | **Baseline Metric** | **Optimized Metric** |
| Model 1 | Silhouette Score: 0.45 | Silhouette Score: 0.62 |
| Model 2 | Accuracy: 75% | Accuracy: 85% |

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

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| --- | --- |
| **Final Model** | **Reasoning** |
| Model 1 (or other) | Model 1 was chosen due to its higher silhouette score, indicating better-defined customer segments, and its balance between performance and computational efficiency. |