**Model Optimization and Tuning Phase Template**

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| Date | July 5, 2024 |
| Team ID | 739838 |
| Project Title | Customer segmentation using Machine Learning |
| 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** |
| Decision tree | A screenshot of a computer  Description automatically generated |  |
| Random forest | A screenshot of a computer  Description automatically generated | A screenshot of a computer  Description automatically generated |
| Gradient Boosting | A screenshot of a computer  Description automatically generated | A screenshot of a computer  Description automatically generated |

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

|  |  |
| --- | --- |
| **Model** | **Optimized Metric** |
| Decision tree | A screenshot of a computer  Description automatically generated |
| Random forest |  |
| Gradient boosting | A screenshot of a computer  Description automatically generated |

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

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| --- | --- |
| **Final Model** | **Reasoning** |
| Gradient boosting | The gradient Boosting model was selected for its superior performance, exhibiting high accuracy during hyperparameter tuning. Its ability to handle complex relationships, minimize overfitting, and optimize predictive accuracy aligns with project objectives, justifying its selection as the final model |