**Model Optimization and Tuning Phase Template**

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| Date | 03 February 2025 |
| Team ID | xxxxxx |
| Project Title | Implementing AgriPrediction 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** |
| Model 1 | Max Depth, Min Samples Split, Criterion | 12, 3, 'entropy' |
| Model 2 | N\_estimators, Max Depth, Min Samples Leaf | 150, 20, 4 |
| Model 3 | C, Kernel, Gamma | 1.5, 'rbf', 'auto' |

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

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| **Model** | **Baseline Metric** | **Optimized Metric** |
| Model 1 | Accuracy = 85% | Accuracy = 88% |
| Model 2 | Accuracy = 88% | Accuracy = 91% |

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

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| --- | --- |
| **Final Model** | **Reasoning** |
| Random Forest Classifier | Achieved the highest accuracy (91%) with optimized hyperparameters, performed well on unseen data, handled non-linearity effectively, and provided robust feature importance insights for AgriPrediction. |