**Model Optimization and Tuning Phase Template**

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| Date | Nov 30, 2024 |
| Team ID | 739838 |
| Project Title | Unlocking the Minds: Analyzing Mental Health with NLP |
| 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):

|  |  |  |
| --- | --- | --- |
| **Model** | **Tuned Hyperparameters** | **Optimal Values** |
| SVC |  |  |
| Decision tree classifier | A screenshot of a computer  Description automatically generated | A screenshot of a computer  Description automatically generated |
| Random forest classifier | A screenshot of a computer  Description automatically generated | A screenshot of a computer  Description automatically generated |
| Ada boost classifier |  | A screenshot of a computer  Description automatically generated |
| Gradient boosting classifier | A screenshot of a computer  Description automatically generated | A screenshot of a computer  Description automatically generated |
| Logistic Regression | 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** |
| SVC | A screenshot of a computer  Description automatically generated |
| Decision tree classifier | A screenshot of a computer  Description automatically generated |
| Random forest classifier | A screenshot of a computer  Description automatically generated |
| Ada boost classifier | A screenshot of a computer  Description automatically generated |
| Gradient boosting classifier | A screenshot of a computer  Description automatically generated |
| Logistic Regression | A screenshot of a computer  Description automatically generated |

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

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| --- | --- |
| **Final Model** | **Reasoning** |
| SVC (support vector classifier) | SVC performs well with limited data since it focuses on support vectors rather than the entire dataset. SVC's combination of flexibility (kernels), accuracy, robustness, and theoretical rigor makes it the "best" choice for projects where these qualities are critical and evaluating alternatives based on dataset's size, structure, and requirements is essential. |