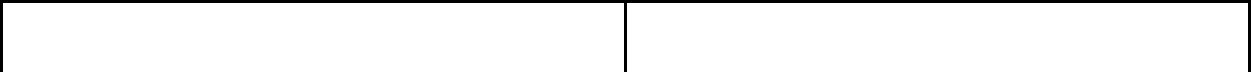
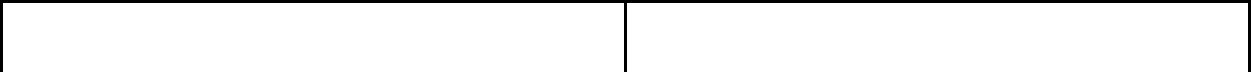


**Model Optimization and Tuning Phase Template**

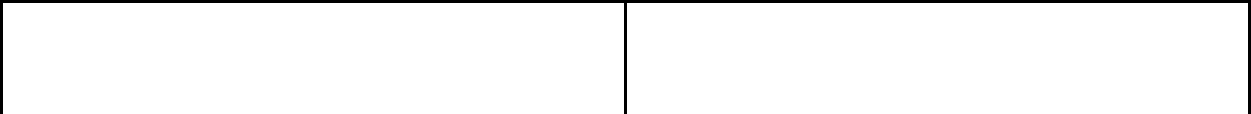


**Date**

**20 June 2025**

**Team ID**

**SWTID1750057522**



**Project Title**



**Unlocking Silent Signals: Decoding Body Language with Mediapipe**



 **Maximum Marks**



 **10 Marks**



**Model Optimization and Tuning Phase**

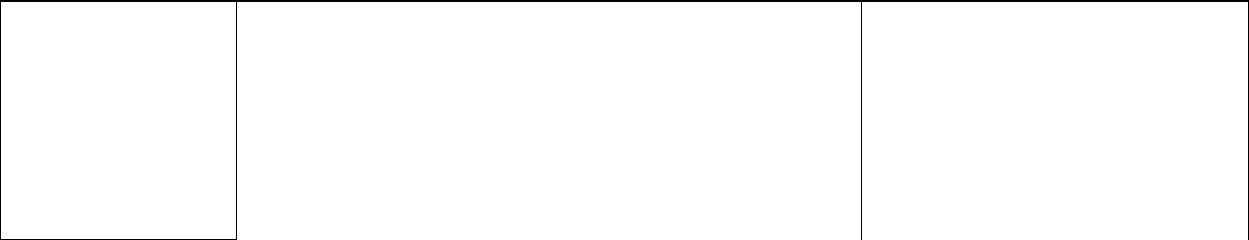
**The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.**

**Hyperparameter Tuning Documentation (6 Marks):**

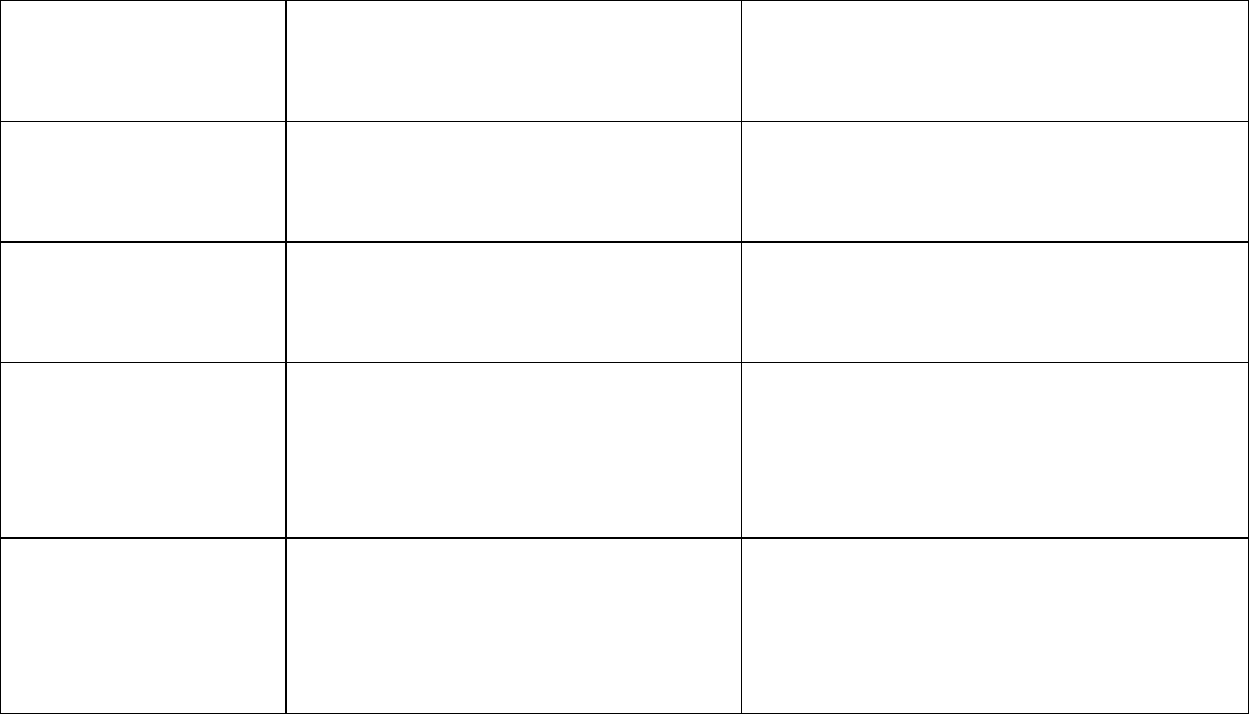


|  |  |  |  |
| --- | --- | --- | --- |
| **Model** | **Tuned Hyperparameters** | **Optimal Values** |  |
| **Logistic** |  | **max\_iter=1000(default)** |  |
| **max\_iter, solver, penalty, C** | **solver (lbfgs), penalty='l2',** |  |
| **Regression** |  |
|  | **C=1.0** |  |
|  |  |  |
|  | **alpha, solver** | **alpha=1.0 (default),** |  |
| **Ridge Classifier** | **solver='auto'** |  |
|  |  |
|  |  |  |
|  |  | **n\_estimators=100,** |  |
| **Random Forest** | **n\_estimators, max\_depth, min\_samples\_split** | **max\_depth=None,** |  |
| **Classifier** | **min\_samples\_split=2 (all** |  |
|  |  |
|  |  | **defaults)** |  |





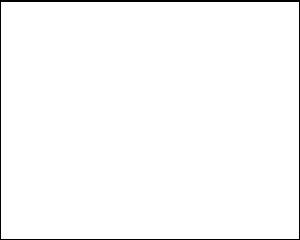
|  |  |  |  |
| --- | --- | --- | --- |
| **Gradient** |  | **learning\_rate=0.1,** |  |
| **Boosting** | **learning\_rate, n\_estimators, max\_depth** | **n\_estimators=100,** |  |
| **Classifier** |  | **max\_depth=3 (all defaults)** |  |
| **Performance Metrics Comparison Report (2 Marks):** | |  |  |
| **Model** | **Baseline Metric** | **Optimized Metric** |  |
| **Logistic Regression** | **25%** | **99%** |  |
| **Ridge Classifier** | **25%** | **99%** |  |
| **Random Forest** | **25%** | **100%** |  |
| **Classifier** |  |
|  |  |  |
| **Gradient Boosting** | **25%** | **100%** |  |
| **Classifier** |  |
|  |  |  |



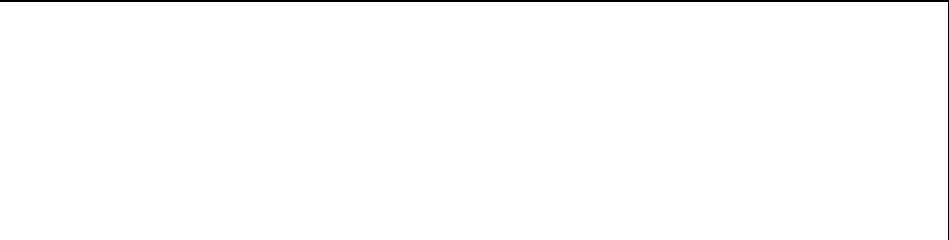
**Final Model Selection Justification (2 Marks):**



**Final Model**



**Reasoning**



**Random Forest**

**Best accuracy ,low variance, handles multiclass classification well, and performs well even without feature scaling. Suitable for high-dimensional facial/pose landmark data.**

