Model Optimization and Tuning Phase Template

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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 Regression	max_iter, solver, penalty, C	max_iter=1000(default) solver (lbfgs), penalty='l2', C=1.0
Ridge Classifier	alpha, solver	alpha=1.0 (default), solver='auto'
Random Forest Classifier	n_estimators, max_depth, min_samples_split	n_estimators=100, max_depth=None, min_samples_split=2 (all defaults)

Gradient Boosting Classifier	learning_rate, n_estimators, max_depth	learning_rate=0.1, n_estimators=100, 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 Classifier	25%	100%
Gradient Boosting Classifier	25%	100%

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.