Model Optimization and Tuning Phase Template

Date	6 SEPTEMBER 2024
Team ID	166
Project Title	Deep learning techniques on breast cancer prediction
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining neural network 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 (8 Marks):

Model	Tuned Hyperparameters
Hyper parameters types	In the context of breast cancer, hyperparameters could influence: **1.Model Selection**: Choosing models (like decision trees, SVMs, or neural networks) that can predict outcomes based on various features from patient data. **2.Feature Selection**: Deciding which features (like tumor size, grade, or biomarker levels) are important can significantly affect model performance. **3.Regularization**: Hyperparameters that control overfitting, such as L1 or L2 regularization, are critical in ensuring the model generalizes well to unseen data. **4.Training Parameters**: Learning rate, batch size, and the number of epochs can impact how well a model learns from data, which is crucial in accurately predicting outcomes.

Paramete types	When analyzing breast cancer data, various types of parameters are used, often categorized into features and model hyperparameters. Here's a breakdown: **1. Clinical Parameters** These are derived from patient data and are crucial for diagnosis and prognosis: • **Demographics**: Age, race, and family history of breast cancer. • **Tumor Characteristics**: Size, grade, and stage of the tumor. • **Biomarkers**: Hormone receptor status (e.g., ER, PR), HER2 status, and other genetic markers. • **Histopathological Features**: Type of breast cancer (e.g., invasive ductal carcinoma, lobular carcinoma). **2. Treatment Parameters** These can influence outcomes and are essential for survival analysis: • **Surgical Interventions**: Type of surgery (lumpectomy vs. mastectomy). • **Radiation Therapy**: Dosing and duration. • **Chemotherapy**: Regimen, duration, and response. **3. Outcome Parameters** These assess the effectiveness of treatments and patient survival: • **Survival Rates**: Overall survival, disease-free survival. • **Recurrence Rates**: Time to recurrence after treatment. • **Quality of Life**: Patient-reported outcomes and side effects. **4. Hyperparameters in Machine Learning Models** When building predictive models, hyperparameters play a critical role: • **Learning Rate**: Controls how much to adjust the model in response to the error each time the model weights are updated. • **Regularization Strength**: Helps prevent overfitting by penalizing larger coefficients. • **Number of Trees/Estimators**: In ensemble methods, like random forests,

	this determines how many trees to build. • **Max Depth**: For tree-based models, this limits how deep each tree can grow. **5. Feature Selection Parameters** In feature engineering, certain parameters help determine which features to include: • **Correlation Threshold**: Determines the cutoff for including correlated features. • **Feature Importance**: Metrics to assess the significance of each feature based on model training.
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Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Model 1 (or other)	Explanation of why this model was chosen as the final optimized model