Model Optimization and Tuning Phase Template

Date	15 March 2024
Team ID	SWTID1720627211
Project Title	Cognitive Care: Early Intervention for Alzheimer's Disease
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
Xception	• **Learning Rate:** Adam optimizer with a default learning rate of 0.001. • **Batch Size:** 6500 training samples per iteration. • **Epochs:** 30 complete passes through the training dataset. • **Dropout Rate:** 0.5 to prevent overfitting. • **Zoom Range:** Random zoom between 0.99 and 1.01. • **Brightness Range**: Random brightness adjustment between 0.8 and 1.2. • **Rescale:** Data normalized by scaling pixel values to 1./255. • **GlobalAveragePooling2D:** A pooling layer to reduce the spatial dimensions of the feature maps.

Vgg19	• **Learning Rate:** Adam optimizer with a default learning rate of 0.001. • **Batch Size:** 6500 training samples per iteration. • **Epochs:** 30 complete passes through the training dataset. • **Dropout Rate:** 0.5 to prevent overfitting. • **Zoom Range:** Random zoom between 0.99 and 1.01. • **Brightness Range:** Random brightness adjustment between 0.8 and 1.2. • **Rescale:** Data normalized by scaling pixel values to 1./255. • **Conv Block:** Multiple convolutional layers with small 3x3 filters.
Inception V3	• **Learning Rate:** Adam optimizer with a default learning rate of 0.001. • **Batch Size:** 6500 training samples per iteration. • **Epochs:** 30 complete passes through the training dataset. • **Dropout Rate:** 0.5 to prevent overfitting. • **Zoom Range:** Random zoom between 0.99 and 1.01. • **Brightness Range**: Random brightness adjustment between 0.8 and 1.2. • **Rescale:** Data normalized by scaling pixel values to 1./255. • **Factorized Convolutions:** Use of smaller convolutions like 1x7 and 7x1 to reduce comp

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Xception	The Xception model was chosen as the final optimized model for its consistent improvement in accuracy and validation metrics over 30

	epochs, achieving a final validation accuracy of 85.36%. The model effectively learned to distinguish between different classes of Alzheimer's Disease progression, demonstrating robust performance and convergence during training