

## Model Optimization and Tuning Phase Template

Date	20 July 2024
Team ID	SWTID1720163161
Project Title	Hydration Essentials: Classifying Water Bottle Images
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
Model 1	<ul style="list-style-type: none"> <li><b>Hyperparameters:</b> <ol style="list-style-type: none"> <li><b>Batch Size:</b> 32</li> <li><b>Image Size:</b> 256 (each image is resized to 256x256 pixels)</li> <li><b>Channels:</b> 3 (color channels for RGB images)</li> <li><b>Epochs:</b> 50</li> <li><b>Optimizer:</b> Adam</li> <li><b>Loss Function:</b> Sparse Categorical Crossentropy</li> <li><b>Metrics:</b> Accuracy</li> </ol> </li> <li><b>Description:</b> <ol style="list-style-type: none"> <li><b>Batch Size:</b> Number of samples processed before the model is updated.</li> <li><b>Image Size:</b> Dimensions to which each input image is resized.</li> <li><b>Channels:</b> Number of color channels in the input images.</li> <li><b>Epochs:</b> Number of complete passes through the entire training dataset.</li> <li><b>Optimizer:</b> Algorithm used to update model weights.</li> </ol> </li> </ul>

	<p>6. <b>Loss Function:</b> Metric used to evaluate the performance of the model during training.</p> <p>7. <b>Metrics:</b> Criteria used to judge the model's performance.</p> <pre>[2]: BATCH_SIZE = 32       IMAGE_SIZE = 256       CHANNELS=3       EPOCHS=50</pre> <pre>[41]: model.compile(       optimizer='adam',       loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=False),       metrics=['accuracy']     )</pre>
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### Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Model 1	<ul style="list-style-type: none"> <li>• <b>Performance Metrics:</b> This model achieved higher accuracy and lower loss on both the training and validation datasets, demonstrating superior performance.</li> <li>• <b>Training Stability:</b> This model exhibited stable training and validation curves, indicating good generalization and minimal overfitting.</li> <li>• <b>Efficiency:</b> This model was efficient in terms of training time and resource usage, thanks to the appropriate batch size and number of epochs.</li> <li>• <b>Simplicity and Effectiveness:</b> The architecture of This model balances complexity and effectiveness, making it suitable for the given image classification task without unnecessary complexity.</li> <li>• <b>Generalization:</b> The model's performance on the validation set indicates good generalization to unseen data, which is crucial for real-world applications.</li> </ul>