

Model Optimization and Tuning Phase Template

Date	14 December 2024
Team ID	739884
Project Title	Plant seedling classification using Deep learning
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
CNN Base Model (VGG16)	<p>Categorical Crossentropy, Metrics, Optimizer.</p> <pre> # Freeze all layers in the base model for layer in xception.layers: layer.trainable = False # Add custom layers x = Flatten()(xception.output) prediction = Dense(12, activation='softmax')(x) # Create the final model model = Model(inputs=xception.input, outputs=prediction) # Compile the model model.compile(loss='categorical_crossentropy', # Loss function optimizer='adam', # Optimizer metrics=['accuracy'] # Evaluation metrics) # Model summary (optional) model.summary()</pre> <div>↓</div>

Fine Tuning

Unfreezing Layers, Learning Rate, Number of Epochs.

```
# Unfreeze some layers in the base model for fine-tuning
for layer in xception.layers[-4:]: # Unfreeze the last 4 layers (adjust as needed)
    layer.trainable = True

# Recompile the model with a lower learning rate for fine-tuning
from tensorflow.keras.optimizers import Adam

model.compile(
    loss='categorical_crossentropy',
    optimizer=Adam(learning_rate=1e-5), # Smaller learning rate for fine-tuning
    metrics=['accuracy']
)

# Fine-tuning the model
r_fine_tune = model.fit(
    training_set,
    validation_data=test_dataset,
    epochs=5, # Fine-tune for fewer epochs
    steps_per_epoch=steps_per_epoch,
    validation_steps=validation_steps
)
```

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Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Fine Tuning	We have selected the Fine Tuning model for its accuracy which is greater than other models.