

Model Optimization and Tuning Phase Template

Date	15 November 2024
Team ID	739824
Project Title	Fertilizer Recommendation System For Agriculture Using Ai
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	<ul style="list-style-type: none"> • Batch Size: The number of samples processed before updating the model's weights. Larger batch sizes accelerate training but require more memory, while smaller batches are more memory-efficient. <ul style="list-style-type: none"> ◦ Example: batch_size=32 • Epochs: The number of times the entire training dataset is passed through the model. More epochs improve learning but may lead to overfitting. <ul style="list-style-type: none"> ◦ Example: epochs=10 • Learning Rate: Determines the step size during optimization. A smaller rate slows down the training process, while a larger rate might cause the model to miss optimal solutions. <ul style="list-style-type: none"> ◦ Example: learning_rate=0.001 • Optimizer: Determines how the model's weights are updated based on the loss function. Common optimizers include Adam (adaptive learning rate) and SGD (stochastic gradient descent). <ul style="list-style-type: none"> ◦ Example: optimizer=Adam() • Loss Function: Measures how well the model's predictions match the true values. Categorical cross-entropy is widely used for multi-class classification.

	<ul style="list-style-type: none"> ○ Example: loss='categorical_crossentropy' <p>Initialize the model</p> <pre>model = Sequential()</pre> <p>Add the convolution layer</p> <pre>model.add(Convolution2D(32,(3,3),input_shape=(64,64,1),activation = 'relu'))</pre> <p>Add the pooling layer</p> <pre>model.add(MaxPooling2D(pool_size=(2,2)))</pre> <p>Add the flatten layer</p> <pre>model.add(Flatten())</pre> <p>Adding the dense layers</p> <pre>model.add(Dense(units=512,activation='relu')) model.add(Dense(units=9,activation='softmax'))</pre>
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Final Model Selection Justification (2 Marks):

Final Model	Reasoning
CNN	<p>The model processes images, extracts features using convolutional layers, and makes predictions through fully connected layers. It utilizes ReLU activation for hidden layers and Softmax for multi-class classification. The model is trained with categorical cross-entropy loss and the Adam optimizer. It's designed to recognize specific patterns or gestures in images, enabling real-time communication for specially-abled individuals.</p>