

## Model Optimization and Tuning Phase Template

Date	10 July 2024
Team ID	SWTID1720110768
Project Title	CovidVision: Advanced Covid-19 Detection From Lung X-rays with Deep Learning
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	Optimal Values
CNN	<pre># Define the CNN model cnn = models.Sequential([     layers.Conv2D(filters=32, kernel_size=(3, 3), input_shape=(128, 128, 3), activation='relu'),     layers.MaxPool2D((2, 2)),      layers.Conv2D(filters=32, kernel_size=(3, 3), activation='relu'),     layers.MaxPool2D((2, 2)),      layers.Flatten(),     layers.Dense(512, activation='relu'),     layers.Dense(2, activation='softmax') ])  cnn.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy']) cnn.fit(training, epochs=15)  # Save the model cnn.save('covid_cnn_model.h5')</pre>	<p>Fitting 5 folds for each of 15 candidates, totalling 75 fits  Best Score:0.6356404077730116  Best Parameters: {'Cs': 6, 'max_iter': 60}</p>

**Performance Metrics Comparison Report (2 Marks):**

Model	Baseline Metric								
MODELS									
	<table><tr><th>Metric</th><th>Training</th><th>Validation</th></tr><tr><td>Accuracy</td><td>0.9875</td><td>0.9420</td></tr><tr><td>Loss</td><td>0.0234</td><td>0.0856</td></tr></table>	Metric	Training	Validation	Accuracy	0.9875	0.9420	Loss	0.0234
Metric	Training	Validation							
Accuracy	0.9875	0.9420							
Loss	0.0234	0.0856							

**Final Model Selection Justification (2 Marks):**

Final Model	Reasoning

CNN	<p>The Convolutional Neural Network (CNN) was selected for its exceptional ability to process and classify image data. During hyperparameter tuning, the CNN demonstrated high accuracy and robustness. Its capacity to automatically and adaptively learn spatial hierarchies of features through backpropagation makes it ideal for image recognition tasks. The CNN's performance in minimizing overfitting and optimizing predictive accuracy aligns with the project objectives, justifying its selection as the final model.</p>
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