

## Model Development Phase Template

Date	20 May 2025
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Project Title	Uncovering the Hidden Treasure of Mushroom kingdom: A Classification Analysis
Maximum Marks	10 Marks

### Initial Model Training Code, Model Validation and Evaluation Report

#### Initial Model Training Code

```
base_model = InceptionV3(weights="imagenet", include_top=False, input_shape=(img_size[0], img_size[1], 3))

# Build transfer learning model
model5 = Sequential()
model5.add(base_model)
model5.add(GlobalAveragePooling2D())
model5.add(Dense(100, activation="relu"))
model5.add(BatchNormalization())
model5.add(Dropout(0.5))
model5.add(Dense(100, activation="relu"))
model5.add(BatchNormalization())
model5.add(Dropout(0.5))
model5.add(Dense(3, activation="softmax"))

# Freeze the pre-trained layers
for layer in base_model.layers:
    layer.trainable = False

# Compile the model
optimizer = Adam(learning_rate=0.001)
model5.compile(
    optimizer=optimizer,
    loss="categorical_crossentropy",
    metrics=["accuracy"]
)

# Early stopping
early_stop = EarlyStopping(
    monitor="val_loss",
    patience=5
)

# Training
history100 = model5.fit(train_data, epochs=50, validation_data=test_data, callbacks=[early_stop])
```

## Model Validation and Evaluation Report

Model	Summary	Training and Validation Performance Metrics
<b>Model 1</b> (InceptionV3 + Custom Layers)	<p><b>Layer Summary:</b></p> <ul style="list-style-type: none"> <li>• InceptionV3 base model</li> <li>• GlobalAveragePooling2D</li> <li>• Dense(100, relu)</li> <li>• BatchNormalization</li> <li>• Dropout(0.5)</li> <li>• Dense(3, softmax)</li> </ul> <p><b>Total Parameters:</b> 2,311,305</p> <p><b>Trainable Parameters:</b> 2,304,505</p> <p><b>Non-trainable Parameters:</b> 6,800</p>	<p><b>Training Accuracy:</b> 83.42%</p> <p><b>Validation Accuracy:</b> 88.36%</p> <p>Training converged well with slight overfitting mitigated by dropout and batch normalization.</p>