

## Model Development Phase Template

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|---------------|--|
| Date          | 6 February 2026  |
| Student Name  | Muskan Nisar Shaikh  |
| Project Title | Uncovering The Hidden Treasures Of The 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><br>(InceptionV3 + Custom Layers) | <b>Layer Summary:</b> <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> <b>Total Parameters:</b><br>2,311,305<br><b>Trainable Parameters:</b><br>2,304,505<br><b>Non-trainable Parameters:</b> 6,800 | <b>Training Accuracy:</b> 83.42%<br><b>Validation Accuracy:</b> 88.36%<br><br>Training converged well with slight overfitting mitigated by dropout and batch normalization. |