

## Model Development Phase Template

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

#### Initial Model Training Code

```
# Load pre-trained MobileNetV2
base_model = MobileNetV2(weights='imagenet', include_top=False, input_shape=(224, 224, 3))
base_model.trainable = False

# Add custom layers
x = base_model.output
x = GlobalAveragePooling2D()(x)
x = Dense(128, activation='relu')(x)
predictions = Dense(15, activation='softmax')(x) # 15 vegetable classes
model = Model(inputs=base_model.input, outputs=predictions)

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

# Train model
history = model.fit(train_data, validation_data=val_data, epochs=10)

# Save model
model.save('vegetable_classifier_model.h5')
```

## Model Validation and Evaluation Report

Model	Summary	Training and Validation Performance Metrics
<b>Model 1</b> (MobileNetV2 + Custom Layers)	<b>Layer Summary:</b> <ul style="list-style-type: none"> <li>• MobileNetV2 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> 2,311,305 <b>Trainable Parameters:</b> 2,304,505 <b>Non-trainable Parameters:</b> 5,500	<b>Training Accuracy:</b> 87.71% <b>Validation Accuracy:</b> 89.24%  Training converged well with slight overfitting mitigated by dropout and batch normalization.