Model Optimization and Tuning Phase

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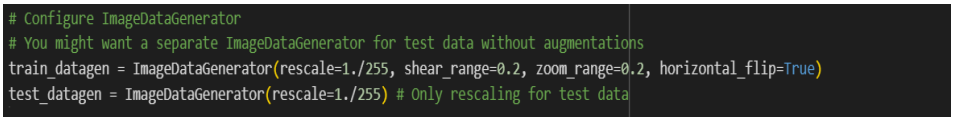
Team ID	739877
Project Title	WCE Curated Colon Disease Classification using Deep Learning
Maximum Marks	10 Marks

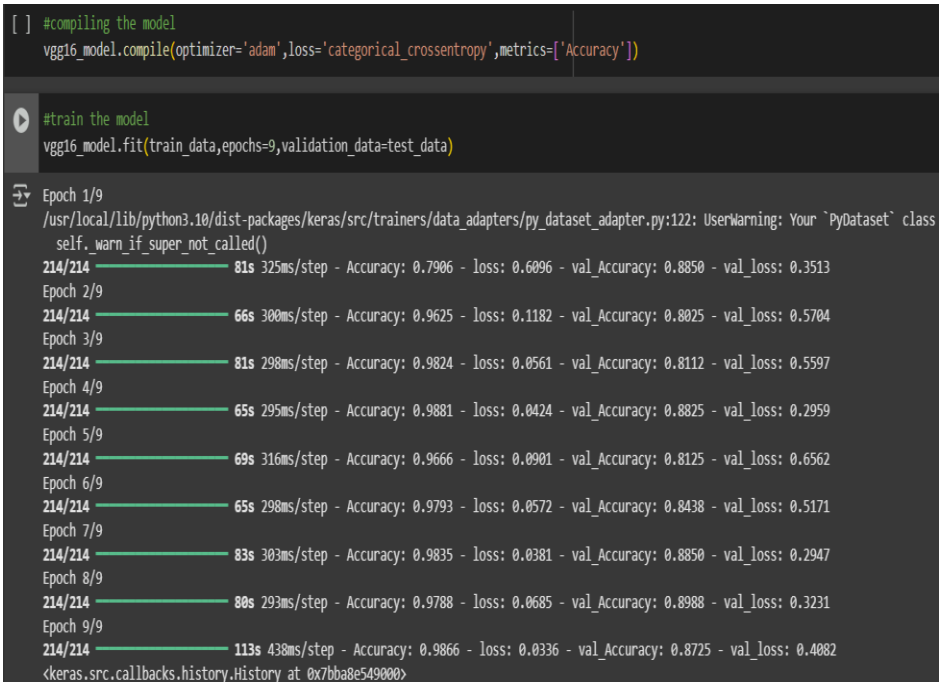
Model Optimization and Tuning Phase

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
Vgg16_model	- **Batch Size**: Set to 15 for efficient training  - **Epochs**: Set to 9 epochs for good balance between underfitting and Overfitting - **Augmentation Parameters**: Shear range, zoom range, and horizontal flipping used to improve generalization

```
# Configure ImageDataGenerator
# You might want a separate ImageDataGenerator for test data without augmentations
train_datagen = ImageDataGenerator(rescale=1./255, shear_range=0.2, zoom_range=0.2, horizontal_flip=True)
test_datagen = ImageDataGenerator(rescale=1./255) # Only rescaling for test data
```



```
[ ] #compiling the model
vgg16_model.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['Accuracy'])

#train the model
vgg16_model.fit(train_data,epochs=9,validation_data=test_data)

Epoch 1/9
/usr/local/lib/python3.10/dist-packages/keras/src/trainers/data_adapters/py_dataset_adapter.py:122: UserWarning: Your `PyDataset` class
  self._warn_if_super_not_called()
214/214 ━━━━━━━━━━━━━━━━━━━━ 81s 325ms/step - Accuracy: 0.7906 - loss: 0.6096 - val_Accuracy: 0.8850 - val_loss: 0.3513
Epoch 2/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 66s 300ms/step - Accuracy: 0.9625 - loss: 0.1182 - val_Accuracy: 0.8825 - val_loss: 0.5704
Epoch 3/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 81s 298ms/step - Accuracy: 0.9824 - loss: 0.0561 - val_Accuracy: 0.8112 - val_loss: 0.5597
Epoch 4/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 65s 295ms/step - Accuracy: 0.9881 - loss: 0.0424 - val_Accuracy: 0.8825 - val_loss: 0.2959
Epoch 5/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 69s 316ms/step - Accuracy: 0.9666 - loss: 0.0901 - val_Accuracy: 0.8125 - val_loss: 0.6562
Epoch 6/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 65s 298ms/step - Accuracy: 0.9793 - loss: 0.0572 - val_Accuracy: 0.8438 - val_loss: 0.5171
Epoch 7/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 83s 303ms/step - Accuracy: 0.9835 - loss: 0.0381 - val_Accuracy: 0.8850 - val_loss: 0.2947
Epoch 8/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 80s 293ms/step - Accuracy: 0.9788 - loss: 0.0685 - val_Accuracy: 0.8988 - val_loss: 0.3231
Epoch 9/9
214/214 ━━━━━━━━━━━━━━━━━━━━ 113s 438ms/step - Accuracy: 0.9866 - loss: 0.0336 - val_Accuracy: 0.8725 - val_loss: 0.4082
<keras.src.callbacks.history.History at 0x7bba8e549000>
```

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
VGG16 (Transfer Learning)	Selected because it achieves high accuracy with fewer epochs, uses pretrained "ImageNet" features effectively, avoids overfitting (due to augmentation and freezing initial layers), reduces training time compared to building CNN from scratch, and is suitable for medical image classification.