Model Optimization and Tuning Phase Template

Date	8th & 9th July 2024
Team ID	SWTID1720097611
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 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	Early Stopping Patience, patience=6: Early stopping callback will stop training if no improvement is seen for 6 epochs , Optimizer : adam, epochs=20, ANN hidden layer with 256 nodes, activation : relu
	
	 ``python
	vgg = VGG16(input_shape=(224,224,3),include_top=False)
	
	for layers in vgg.layers:
	  layers.trainable = False
	
	x = Flatten()(vgg.output)
	x = Dense(256,activation='relu')(x)
	output = Dense(4,activation='softmax')(x)
	vgg16= Model(vgg.input,output)
	vgg16.summary()
	``

```
my_callbacks = [EarlyStopping(patience=6)]

vgg16.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accuracy'])
vgg16.fit(train_data, epochs=20, validation_data=test_data, steps_per_epoch=len(train_data)//16,
          validation_steps=len(test_data)//16, callbacks=my_callbacks)
```

ResNet50	Early Stopping Patience, patience=6: Early stopping callback will stop training if no improvement is seen for 6 epochs , Optimizer : adam, epochs=15, ANN hidden layer with 256 nodes, activation : relu

```
resnet= ResNet50(input_shape=(224,224,3),include_top=False)

for layers in resnet.layers:
  layers.trainable = False

x=Flatten()(resnet.output)
x=Dense(256,activation='relu')(x)
output=Dense(4,activation='softmax')(x)
resnet50=Model(resnet.input,output)
resnet50.summary()
```

```
resnet50.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accuracy'])

my_callbacks = [EarlyStopping(patience=6)]

resnet50.fit(train_data,epochs=15,validation_data=test_data,steps_per_epoch=len(train_data)//16,
             validation_steps=len(test_data)//16, callbacks=my_callbacks)
```

Inception	Early Stopping Patience, patience=6: Early stopping callback will stop training if no improvement is seen for 6 epochs , Optimizer : adam, epochs=20, ANN hidden layer with 256 nodes, activation : relu

```
inseption = inseptionV3(input_shape=(224,224,3),include_top=False)

for layers in inseption.layers:
  layers.trainable = False

x=Flatten()(inseption.output)
x=Dense(256,activation='relu')(x)
output=Dense(4,activation='softmax')(x)
inseptionV3=Model(inseption.input,output)
```

| | ```
inceptionV3.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accuracy'])

my_callbacks = [EarlyStopping(patience=6)]
inceptionV3.fit(train_data,epochs=20,validation_data=test_data , steps_per_epoch=len(train_data)//16,
                validation_steps=len(test_data)//16, callbacks=my_callbacks)
``` |
| Xception | Early Stopping Patience, patience=6: Early stopping callback will stop training if no improvement is seen for 6 epochs , Optimizer : adam, epochs=15, ANN hidden layer with 256 nodes, activation : relu<br><br>```
xception = Xception(input_shape=(299,299,3),include_top=False)

for layers in xception.layers:
  layers.trainable = False

x=Flatten()(xception.output)
x=Dense(256,activation='relu')(x)
output=Dense(4,activation='softmax')(x)
xception=Model(xception.input,output)
xception.summary()
```<br><br>```
xception.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accuracy'])

my_callbacks = [EarlyStopping(patience=6)]
xception.fit(train_data,epochs=15,validation_data=test_data , steps_per_epoch=len(train_data)//16,
             validation_steps=len(test_data)//16, callbacks=my_callbacks)
``` |

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Xception	Among the four models after applying the Hyperparameter Tuning, this model gave the higher accuracy compared to other three models.