Project Development Phase
Model Performance Test

Date	18 November 2022
Team ID	PNT2022TMID39261
Project Name	Project – Fertilizer Recommendation System For Disease Prediction
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot

1.	Model Summary	TOTAL PARAMS : 896
		TRAINABLE PARAMS : 896
		NON-TRAINABLE PARAMS: 0
			In [21]:
			`model=Sequential()`
			`model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))`
			`model.add(MaxPooling2D(pool_size=(2,2)))`
			`model.add(Flatten())`
			`model.summary()`
			
			Model: "sequential_1"
			_____
			Layer (type) Output Shape Param #
			=====
			conv2d_1 (Conv2D) (None, 62, 62, 32) 896
			
			max_pooling2d_1 (MaxPooling (None, 31, 31, 32) 0
			2D)
			
			flatten_1 (Flatten) (None, 30752) 0
			
			=====
			Total params: 896
			Trainable params: 896
			Non-trainable params: 0
			_____

2.	Accuracy	FRUIT
		Training Accuracy –
		96.42%
		Validation Accuracy -
		93.77%
		VEGETABLE
		Training Accuracy – 96.20%
		Validation Accuracy - 97.04%
			In [24]:
			`model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])`
			`model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test),epochs=10)`
			
			Epoch 1/10
			225/225 [==========] - 48s 210ms/step - loss: 0.7816 - accuracy: 0.7689 - val_loss: 0.2860 - val_accuracy: 0.9075
			Epoch 2/10
			225/225 [==========] - 48s 213ms/step - loss: 0.3019 - accuracy: 0.8919 - val_loss: 0.2428 - val_accuracy: 0.9229
			Epoch 3/10
			225/225 [==========] - 49s 215ms/step - loss: 0.2165 - accuracy: 0.9244 - val_loss: 0.1576 - val_accuracy: 0.9419
			Epoch 4/10
			225/225 [==========] - 56s 251ms/step - loss: 0.1623 - accuracy: 0.9411 - val_loss: 0.1291 - val_accuracy: 0.9561
			Epoch 5/10
			225/225 [==========] - 48s 214ms/step - loss: 0.1310 - accuracy: 0.9543 - val_loss: 0.2992 - val_accuracy: 0.9009
			Epoch 6/10
			225/225 [==========] - 55s 243ms/step - loss: 0.1258 - accuracy: 0.9549 - val_loss: 0.1496 - val_accuracy: 0.9537
			Epoch 7/10
			225/225 [==========] - 50s 222ms/step - loss: 0.1341 - accuracy: 0.9495 - val_loss: 0.1607 - val_accuracy: 0.9401
			Epoch 8/10
			225/225 [==========] - 48s 214ms/step - loss: 0.0981 - accuracy: 0.9673 - val_loss: 0.1117 - val_accuracy: 0.9632
			Epoch 9/10
			225/225 [==========] - 50s 221ms/step - loss: 0.0812 - accuracy: 0.9707 - val_loss: 0.1764 - val_accuracy: 0.9460
			Epoch 10/10
			225/225 [==========] - 50s 224ms/step - loss: 0.1026 - accuracy: 0.9642 - val_loss: 0.1918 - val_accuracy: 0.9377

MODEL SUMMARY

FRUIT

In [21]:

```
model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_1 (Conv2D)           (None, 62, 62, 32)        896

 max_pooling2d_1 (MaxPooling  (None, 31, 31, 32)       0
 2D)

 flatten_1 (Flatten)         (None, 30752)             0

=================================================================
Total params: 896
Trainable params: 896
Non-trainable params: 0
_________________________________________________________________
```

ACCURACY

In [24]:

```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test),epochs=10)
```

```
Epoch 1/10
225/225 [==============================] - 48s 210ms/step - loss: 0.7816 - accuracy: 0.7689 - val_loss: 0.2860 - val_accuracy: 0.9075
Epoch 2/10
225/225 [==============================] - 48s 213ms/step - loss: 0.3019 - accuracy: 0.8919 - val_loss: 0.2428 - val_accuracy: 0.9229
Epoch 3/10
225/225 [==============================] - 49s 215ms/step - loss: 0.2165 - accuracy: 0.9244 - val_loss: 0.1576 - val_accuracy: 0.9419
Epoch 4/10
225/225 [==============================] - 56s 251ms/step - loss: 0.1623 - accuracy: 0.9411 - val_loss: 0.1291 - val_accuracy: 0.9561
Epoch 5/10
225/225 [==============================] - 48s 214ms/step - loss: 0.1310 - accuracy: 0.9543 - val_loss: 0.2992 - val_accuracy: 0.9009
Epoch 6/10
225/225 [==============================] - 55s 243ms/step - loss: 0.1258 - accuracy: 0.9549 - val_loss: 0.1496 - val_accuracy: 0.9537
Epoch 7/10
225/225 [==============================] - 50s 222ms/step - loss: 0.1341 - accuracy: 0.9495 - val_loss: 0.1607 - val_accuracy: 0.9401
Epoch 8/10
225/225 [==============================] - 48s 214ms/step - loss: 0.0981 - accuracy: 0.9673 - val_loss: 0.1117 - val_accuracy: 0.9632
Epoch 9/10
225/225 [==============================] - 50s 221ms/step - loss: 0.0812 - accuracy: 0.9707 - val_loss: 0.1764 - val_accuracy: 0.9460
Epoch 10/10
225/225 [==============================] - 50s 224ms/step - loss: 0.1026 - accuracy: 0.9642 - val_loss: 0.1918 - val_accuracy: 0.9377
```

VEGETABLE

In [67]:

```
model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.summary()
```

```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_2 (Conv2D)           (None, 62, 62, 32)        896

 max_pooling2d_2 (MaxPooling  (None, 31, 31, 32)       0
 2D)

 flatten_2 (Flatten)         (None, 30752)             0

=================================================================
Total params: 896
Trainable params: 896
Non-trainable params: 0
_________________________________________________________________
```

ACCURACY

In [72]:

```
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test),epochs=10)
```

```
Epoch 1/10
475/475 [==============================] - 112s 236ms/step - loss: 0.2086 - accuracy: 0.9240 - val_loss: 0.1517 - val_accuracy: 0.9505
Epoch 2/10
475/475 [==============================] - 111s 234ms/step - loss: 0.1863 - accuracy: 0.9351 - val_loss: 0.1752 - val_accuracy: 0.9412
Epoch 3/10
475/475 [==============================] - 110s 231ms/step - loss: 0.1707 - accuracy: 0.9411 - val_loss: 0.1543 - val_accuracy: 0.9464
Epoch 4/10
475/475 [==============================] - 108s 226ms/step - loss: 0.1647 - accuracy: 0.9447 - val_loss: 0.1307 - val_accuracy: 0.9540
Epoch 5/10
475/475 [==============================] - 117s 247ms/step - loss: 0.1350 - accuracy: 0.9542 - val_loss: 0.1719 - val_accuracy: 0.9368
Epoch 6/10
475/475 [==============================] - 112s 235ms/step - loss: 0.1596 - accuracy: 0.9416 - val_loss: 0.0827 - val_accuracy: 0.9737
Epoch 7/10
475/475 [==============================] - 113s 238ms/step - loss: 0.1243 - accuracy: 0.9579 - val_loss: 0.0832 - val_accuracy: 0.9737
Epoch 8/10
475/475 [==============================] - 113s 238ms/step - loss: 0.1269 - accuracy: 0.9567 - val_loss: 0.1029 - val_accuracy: 0.9634
Epoch 9/10
475/475 [==============================] - 4239s 9s/step - loss: 0.1299 - accuracy: 0.9542 - val_loss: 0.0536 - val_accuracy: 0.9845
Epoch 10/10
475/475 [==============================] - 100s 210ms/step - loss: 0.1047 - accuracy: 0.9620 - val_loss: 0.0875 - val_accuracy: 0.9704
```