Assignment Date	29 September 2022
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Student Roll Number	910619104028
Maximum Marks	2 Marks

Download the Dataset

In [1]:
```
import numpy as np
import tensorflow as tf
from tensorflow.keras import layers
from tensorflow.keras.models import Sequential
import matplotlib.pyplot as plt
import os
```

In [2]:
```
batch_size = 16
```

Image Augmentation

In [3]:
```
data_aug = Sequential(
  [
    layers.RandomFlip("horizontal",input_shape=(180, 180, 3)),
    layers.RandomRotation(0.1),
    layers.RandomZoom(0.1),
  ]
)
```

In [5]:
```
os.listdir("C:\\Users\\Harini\\Flowers-Dataset")
```

Out[5]:
```
['flowers']
```

In [6]:
```
train_data = tf.keras.utils.image_dataset_from_directory(
  "C:\\Users\\Harini\\Flowers-Dataset",
  validation_split=0.25,
  subset="training",
  seed=120,
  image_size=(180, 180),
  batch_size=batch_size)
```

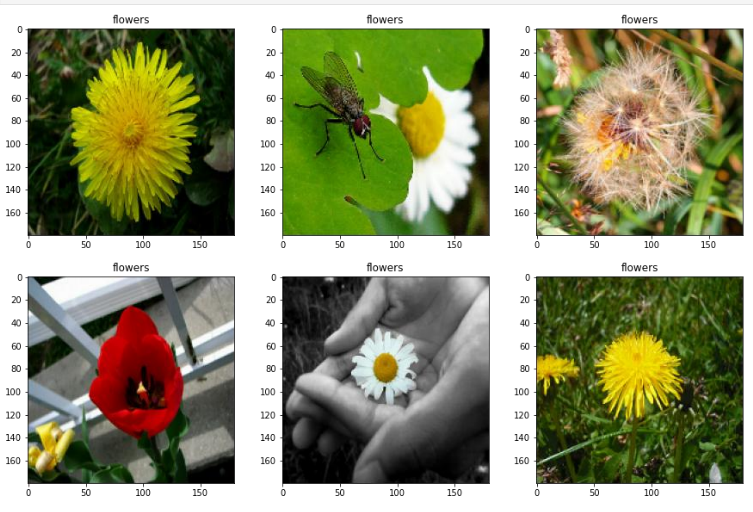
```
Found 4317 files belonging to 1 classes.
Using 3238 files for training.
```

In [7]:
```
val_data_set = tf.keras.utils.image_dataset_from_directory(
 "C:\\Users\\Harini\\Flowers-Dataset",
  validation_split=0.25,
  subset="validation",
  seed=120,
  image_size=(180, 180),
  batch_size=batch_size)
```

```
Found 4317 files belonging to 1 classes.
Using 1079 files for validation.
```

In [8]:
```
class_names = train_data.class_names
```

In [9]:
```
plt.figure(figsize=(15, 15))
for images, labels in train_data.take(1):
  for i in range(6):
    ax = plt.subplot(3, 3, i + 1)
    plt.imshow(images[i].numpy().astype("uint8"))
    plt.title(class_names[labels[i]])
```



In [10]:
```
normalization_layer = layers.Rescaling(1./255)
```

In [11]:
```
dataset_normalized = train_data.map(lambda x, y: (normalization_layer(x), y))
image_batch, labels_batch = next(iter(dataset_normalized))
first_image = image_batch[0]
print(np.min(first_image), np.max(first_image))
```

```
0.0 1.0
```

Create Model

Add Layers (Convolution,MaxPooling,Flatten,Dense-(Hidden Layers),Output)

In [12]:
```
num_classes = len(class_names)

model = Sequential([
  data_aug,
  layers.Rescaling(1./255, input_shape=(180, 180, 3)),
  layers.Conv2D(16, 3, activation='relu'),
  layers.MaxPooling2D(), layers.Conv2D(32,
  3,activation='relu'), layers.Conv2D(32,
  3,activation='relu'),
  layers.MaxPooling2D(), layers.Conv2D(64,
  3, activation='relu'),
  layers.MaxPooling2D(), layers.Flatten(),
  layers.Dense(128, activation='relu'),
  layers.Dense(num_classes)
])
```

Compile The Model

compiling model with categorical cross entropy and adam optimizer

In [13]:
```
model.compile(optimizer='adam',
loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
metrics=['accuracy'])
```

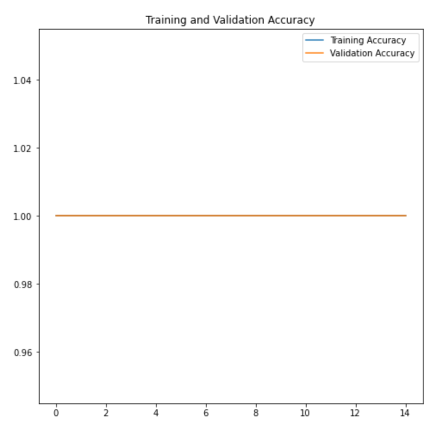
Fit The Model

In [14]:
```
epochs=15
history = model.fit(train_data,validation_data=val_data_set,epochs=epochs)
```

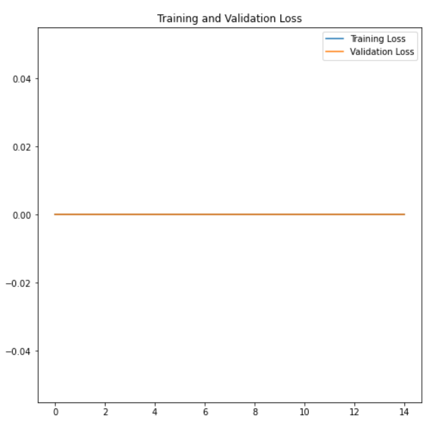
```
Epoch 1/15
203/203 [==============================] - 33s 154ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 2/15
203/203 [==============================] - 28s 140ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 3/15
203/203 [==============================] - 29s 141ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 4/15
203/203 [==============================] - 29s 143ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 5/15
203/203 [==============================] - 28s 139ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 6/15
203/203 [==============================] - 29s 140ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 7/15
203/203 [==============================] - 28s 140ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 8/15
203/203 [==============================] - 29s 144ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 9/15
203/203 [==============================] - 28s 137ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 10/15
203/203 [==============================] - 28s 137ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 11/15
203/203 [==============================] - 28s 139ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 12/15
203/203 [==============================] - 29s 142ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 13/15
203/203 [==============================] - 28s 140ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 14/15
203/203 [==============================] - 29s 143ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
Epoch 15/15
203/203 [==============================] - 29s 141ms/step - loss: 0.0000e+00 - accuracy: 1.0000 - val_loss: 0.0000e+00 - val_accuracy: 1.0000
```

In [15]:
```
epochs_range = range(epochs)

plt.figure(figsize=(8, 8))
plt.plot(epochs_range, history.history['accuracy'], label='Training Accuracy')
plt.plot(epochs_range, history.history['val_accuracy'], label='Validation Accuracy')
plt.legend()
plt.title('Training and Validation Accuracy')
plt.show()
```



In [16]:
```
plt.figure(figsize=(8, 8))
plt.plot(epochs_range, history.history['loss'], label='Training Loss')
plt.plot(epochs_range, history.history['val_loss'], label='Validation Loss')
plt.legend()
plt.title('Training and Validation Loss')
plt.show()
```



Save The Model

In [17]:
```
model.save("./flowers.h5")
```

In [18]:
```
model.load_weights('./flowers.h5')
```

Test The Model

In [19]:
```
from tensorflow.keras.preprocessing import image
import numpy as np
```

```
In [20]: img=image.load_img('C:\\Users\\Harini\\Flowers-Dataset\\flowers\\rose\\5172171681_5934378f08.jpg',target_size=(70,70))
         img
```

Out[20]:

```
In [ ]:
```