[1]:
```
import tensorflow as tf
from tensorflow import keras
from keras.models import Sequential
from keras.layers import Dense,Flatten
from tensorflow.keras.preprocessing import image
from keras.applications import VGG16
import numpy as np
```

[2]:
```
base_model = VGG16(weights = "imagenet",include_top = False,input_shape = (224,224,3))
```

[3]:
```
for layer in  base_model.layers:
    layer.trainable = False
```

[4]:
```
num_classes = 6
model = Sequential([
    base_model,
    Flatten(),
    Dense(512,activation="relu"),
    Dense(num_classes,activation="softmax")
])
```

[5]:
```
model.compile(optimizer = "adam",loss="categorical_crossentropy",metrics=["accuracy"])
```

[6]:
```
trainer = image.ImageDataGenerator(
    rescale = 1./255,
    validation_split = 0.2
)
```

[8]:
```
traning_data = trainer.flow_from_directory(
    'flower_photos',
    target_size = (224,224),
    batch_size = 32,
    class_mode = "categorical",
    subset = "training"
)
```

```
Found 2941 images belonging to 6 classes.
```

[9]:
```
model.fit(traning_data,epochs = 5)
```

```
Epoch 1/5
C:\Users\ASUS\AppData\Roaming\Python\Python312\site-packages\keras\src\trainers\data_adapters\py_dataset_adapter.py:121: UserWarning: Your `PyDataset` class should call `super().__init__(**kwargs)` in its constructor. `**kwargs` can include `workers`, `use_multiprocessing`, `max_queue_size`. Do not pass these arguments to `fit()`, as they will be ignored.
  self._warn_if_super_not_called()
92/92 ━━━━━━━━━━━━━━━━━━━━ 166s 2s/step - accuracy: 0.5393 - loss: 3.0423
Epoch 2/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 171s 2s/step - accuracy: 0.9023 - loss: 0.2693
Epoch 3/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 166s 2s/step - accuracy: 0.9530 - loss: 0.1361
Epoch 4/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 174s 2s/step - accuracy: 0.9874 - loss: 0.0459
Epoch 5/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 181s 2s/step - accuracy: 0.9966 - loss: 0.0200
```

[9]:
```
<keras.src.callbacks.history.History at 0x19b1ea5b080>
```

[11]:
```
names = traning_data.class_indices
```

[12]:
```
img_path = "flower_photos/tulips/7166550328_de0d73cfa9.jpg"
```

[13]:
```
img = image.load_img(img_path,target_size=(224,224))
```

[18]:
```
img_array = image.img_to_array(img)
img_array = np.expand_dims(img_array,axis=0)
img_array /= 255
```

[19]:
```
img_array.shape
```

[19]:
```
(1, 224, 224, 3)
```

[20]:
```
y_pred = model.predict(img_array)
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 1s 570ms/step
```

[22]:
```
index = np.argmax(y_pred)

for key , value in names.items():
    if(value == index):
        print(key)
        break
```

```
tulips
```

[23]:
```
for layer in base_model.layers[-4:]:
    layer.trainable = True
```

[24]:
```
model.compile(optimizer = tf.keras.optimizers.Adam(learning_rate=1e-5),loss="categorical_crossentropy",metrics=["accuracy"])
```

[29]:
```
model.fit(traning_data,epochs=5)
```

```
Epoch 1/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 211s 2s/step - accuracy: 1.0000 - loss: 0.0015
Epoch 3/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 205s 2s/step - accuracy: 1.0000 - loss: 6.7210e-04
Epoch 4/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 205s 2s/step - accuracy: 1.0000 - loss: 3.9877e-04
Epoch 5/5
92/92 ━━━━━━━━━━━━━━━━━━━━ 208s 2s/step - accuracy: 1.0000 - loss: 3.0442e-04
```

[29]:
```
<keras.src.callbacks.history.History at 0x19b36372ea0>
```

[36]:
```
img_path = "flower_photos/roses/5990626258_697f007308_n.jpg"
img = image.load_img(img_path,target_size=(224,224))
img_array = image.img_to_array(img)
img_array = np.expand_dims(img_array,axis=0)
img_array /= 255

y_pred = model.predict(img_array)
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 360ms/step
```

[37]:
```
index = np.argmax(y_pred,axis=1)
```

[38]:
```
for key,value in names.items():
    if(value == index):
        print(key)
        break
```

```
roses
```