```
import matplotlib.pyplot as plt
import numpy as np
import os
import PIL
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras import layers
from tensorflow.python.keras.layers import Dense, Flatten
from tensorflow.keras.models import Sequential
from tensorflow.keras.optimizers import Adam
```

Preparando dados

```
import pathlib
dataset_url = "https://storage.googleapis.com/download.tensorflow.org/example_images/flower_photos.tgz"
data_dir = tf.keras.utils.get_file('flower_photos', origin=dataset_url, untar=True)
data_dir = pathlib.Path(data_dir)
```

```
Downloading data from https://storage.googleapis.com/download.tensorflow.org/example_images/flower_photos.tgz
228813984/228813984 ━━━━━━━━━━━━━━━━━━━━ 2s 0us/step
```

```
print(data_dir)
```

```
/root/.keras/datasets/flower_photos
```

```
roses = list(data_dir.glob('roses/*'))
print(roses[0])
PIL.Image.open(str(roses[0]))
```

```
/root/.keras/datasets/flower_photos/roses/5273722065_c85d8543c2_m.jpg
```

```
img_height, img_width=180, 180
batch_size = 32
train_ds = tf.keras.preprocessing.image_dataset_from_directory(
  data_dir,
  validation_split=0.2,
  subset="training",
  seed=123,
  label_mode='categorical',
  image_size=(img_height, img_width),
  batch_size=batch_size)
```

```
Found 3670 files belonging to 5 classes.
Using 2936 files for training.
```

```
val_ds = tf.keras.preprocessing.image_dataset_from_directory(
  data_dir,
  validation_split=0.2,
  subset="validation",
  seed=123,
  label_mode='categorical',
  image_size=(img_height, img_width),
  batch_size=batch_size)
```

```
Found 3670 files belonging to 5 classes.
Using 734 files for validation.
```

```
class_names = train_ds.class_names
print(class_names)
```

```
['daisy', 'dandelion', 'roses', 'sunflowers', 'tulips']
```

```
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 10))
for images, labels in train_ds.take(1):
  for i in range(9):
    ax = plt.subplot(3, 3, i + 1)
    plt.imshow(images[i].numpy().astype("uint8"))
    plt.title(class_names[np.argmax(labels[i])])
    plt.axis("off")
```

roses

dandelion

tulips

sunflowers

dandelion

roses

dandelion

roses

tulips

Treinando o Modelo

```
# prompt: instale ResNet50

!pip install resnet
```

```
Collecting resnet
  Downloading resnet-0.1.tar.gz (5.8 kB)
  Preparing metadata (setup.py) ... done
Requirement already satisfied: keras>=2.0 in /usr/local/lib/python3.10/dist-packages (from resnet) (3.4.1)
Requirement already satisfied: absl-py in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (1.4.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (1.26.4)
Requirement already satisfied: rich in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (13.7.1)
Requirement already satisfied: namex in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (0.0.8)
Requirement already satisfied: h5py in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (3.11.0)
Requirement already satisfied: optree in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (0.12.1)
Requirement already satisfied: ml-dtypes in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (0.4.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from keras>=2.0->resnet) (24.1)
Requirement already satisfied: typing-extensions>=4.5.0 in /usr/local/lib/python3.10/dist-packages (from optree->keras>=2.0->resnet) (4.12.2)
Requirement already satisfied: markdown-it-py>=2.2.0 in /usr/local/lib/python3.10/dist-packages (from rich->keras>=2.0->resnet) (3.0.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in /usr/local/lib/python3.10/dist-packages (from rich->keras>=2.0->resnet) (2.16.1)
Requirement already satisfied: mdurl~=0.1 in /usr/local/lib/python3.10/dist-packages (from markdown-it-py>=2.2.0->rich->keras>=2.0->resnet) (0.1.2)
Building wheels for collected packages: resnet
  Building wheel for resnet (setup.py) ... done
  Created wheel for resnet: filename=resnet-0.1-py3-none-any.whl size=10022 sha256=b69f80f6d6ee15bd2d544098fe5d5b66ab76b34be637bc453f66df62577219ab
  Stored in directory: /root/.cache/pip/wheels/be/62/ef/ac6244da70f4650a13902e0294d88e71cf950b4fb8dbeccb98
Successfully built resnet
Installing collected packages: resnet
Successfully installed resnet-0.1
```

```
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Flatten

# Instead of creating a Sequential model and adding the functional model to it,
# directly use the functional model as your main model
pretrained_model= tf.keras.applications.ResNet50(include_top=False,
                   input_shape=(180,180,3),
                   pooling='avg',classes=5,
                   weights='imagenet')
for layer in pretrained_model.layers:
        layer.trainable=False
```

```
# Create a new Functional model
x = Flatten()(pretrained_model.output)  # Connect Flatten to the output of ResNet50
x = Dense(512, activation='relu')(x)
predictions = Dense(5, activation='softmax')(x)
resnet_model = tf.keras.Model(inputs=pretrained_model.input, outputs=predictions) # Assign the functional model to resnet_model

resnet_model.summary()
```

Model: "functional_1"

Layer (type)	Output Shape	Param #	Connected to
input_layer_12 (InputLayer)	(None, 180, 180, 3)	0	-
conv1_pad (ZeroPadding2D)	(None, 186, 186, 3)	0	input_layer_12[0][0]
conv1_conv (Conv2D)	(None, 90, 90, 64)	9,472	conv1_pad[0][0]
conv1_bn (BatchNormalization)	(None, 90, 90, 64)	256	conv1_conv[0][0]
conv1_relu (Activation)	(None, 90, 90, 64)	0	conv1_bn[0][0]
pool1_pad (ZeroPadding2D)	(None, 92, 92, 64)	0	conv1_relu[0][0]
pool1_pool (MaxPooling2D)	(None, 45, 45, 64)	0	pool1_pad[0][0]
conv2_block1_1_conv (Conv2D)	(None, 45, 45, 64)	4,160	pool1_pool[0][0]
conv2_block1_1_bn (BatchNormalization)	(None, 45, 45, 64)	256	conv2_block1_1_conv[0…
conv2_block1_1_relu (Activation)	(None, 45, 45, 64)	0	conv2_block1_1_bn[0][…
conv2_block1_2_conv (Conv2D)	(None, 45, 45, 64)	36,928	conv2_block1_1_relu[0…
conv2_block1_2_bn (BatchNormalization)	(None, 45, 45, 64)	256	conv2_block1_2_conv[0…
conv2_block1_2_relu (Activation)	(None, 45, 45, 64)	0	conv2_block1_2_bn[0][…
conv2_block1_0_conv (Conv2D)	(None, 45, 45, 256)	16,640	pool1_pool[0][0]
conv2_block1_3_conv (Conv2D)	(None, 45, 45, 256)	16,640	conv2_block1_2_relu[0…
conv2_block1_0_bn (BatchNormalization)	(None, 45, 45, 256)	1,024	conv2_block1_0_conv[0…
conv2_block1_3_bn (BatchNormalization)	(None, 45, 45, 256)	1,024	conv2_block1_3_conv[0…
conv2_block1_add (Add)	(None, 45, 45, 256)	0	conv2_block1_0_bn[0][… conv2_block1_3_bn[0][…

conv2_block1_out (Activation)	(None, 45, 45, 256)	0	conv2_block1_add[0][0]
conv2_block2_1_conv (Conv2D)	(None, 45, 45, 64)	16,448	conv2_block1_out[0][0]
conv2_block2_1_bn (BatchNormalization)	(None, 45, 45, 64)	256	conv2_block2_1_conv[0…
conv2_block2_1_relu (Activation)	(None, 45, 45, 64)	0	conv2_block2_1_bn[0][…
conv2_block2_2_conv (Conv2D)	(None, 45, 45, 64)	36,928	conv2_block2_1_relu[0…
conv2_block2_2_bn (BatchNormalization)	(None, 45, 45, 64)	256	conv2_block2_2_conv[0…
conv2_block2_2_relu (Activation)	(None, 45, 45, 64)	0	conv2_block2_2_bn[0][…
conv2_block2_3_conv (Conv2D)	(None, 45, 45, 256)	16,640	conv2_block2_2_relu[0…
conv2_block2_3_bn (BatchNormalization)	(None, 45, 45, 256)	1,024	conv2_block2_3_conv[0…
conv2_block2_add (Add)	(None, 45, 45, 256)	0	conv2_block1_out[0][0… conv2_block2_3_bn[0][…
conv2_block2_out (Activation)	(None, 45, 45, 256)	0	conv2_block2_add[0][0]
conv2_block3_1_conv (Conv2D)	(None, 45, 45, 64)	16,448	conv2_block2_out[0][0]
conv2_block3_1_bn (BatchNormalization)	(None, 45, 45, 64)	256	conv2_block3_1_conv[0…
conv2_block3_1_relu (Activation)	(None, 45, 45, 64)	0	conv2_block3_1_bn[0][…
conv2_block3_2_conv (Conv2D)	(None, 45, 45, 64)	36,928	conv2_block3_1_relu[0…
conv2_block3_2_bn (BatchNormalization)	(None, 45, 45, 64)	256	conv2_block3_2_conv[0…
conv2_block3_2_relu (Activation)	(None, 45, 45, 64)	0	conv2_block3_2_bn[0][…
conv2_block3_3_conv (Conv2D)	(None, 45, 45, 256)	16,640	conv2_block3_2_relu[0…

(Conv2D)			
conv2_block3_3_bn (BatchNormalization)	(None, 45, 45, 256)	1,024	conv2_block3_3_conv[0…
conv2_block3_add (Add)	(None, 45, 45, 256)	0	conv2_block2_out[0][0… conv2_block3_3_bn[0][…
conv2_block3_out (Activation)	(None, 45, 45, 256)	0	conv2_block3_add[0][0]
conv3_block1_1_conv (Conv2D)	(None, 23, 23, 128)	32,896	conv2_block3_out[0][0]
conv3_block1_1_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block1_1_conv[0…
conv3_block1_1_relu (Activation)	(None, 23, 23, 128)	0	conv3_block1_1_bn[0][…
conv3_block1_2_conv (Conv2D)	(None, 23, 23, 128)	147,584	conv3_block1_1_relu[0…
conv3_block1_2_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block1_2_conv[0…
conv3_block1_2_relu (Activation)	(None, 23, 23, 128)	0	conv3_block1_2_bn[0][…
conv3_block1_0_conv (Conv2D)	(None, 23, 23, 512)	131,584	conv2_block3_out[0][0]
conv3_block1_3_conv (Conv2D)	(None, 23, 23, 512)	66,048	conv3_block1_2_relu[0…
conv3_block1_0_bn (BatchNormalization)	(None, 23, 23, 512)	2,048	conv3_block1_0_conv[0…
conv3_block1_3_bn (BatchNormalization)	(None, 23, 23, 512)	2,048	conv3_block1_3_conv[0…
conv3_block1_add (Add)	(None, 23, 23, 512)	0	conv3_block1_0_bn[0][… conv3_block1_3_bn[0][…
conv3_block1_out (Activation)	(None, 23, 23, 512)	0	conv3_block1_add[0][0]
conv3_block2_1_conv (Conv2D)	(None, 23, 23, 128)	65,664	conv3_block1_out[0][0]
conv3_block2_1_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block2_1_conv[0…
conv3_block2_1_relu	(None, 23, 23, 128)	0	conv3_block2_1_bn[0][

conv3_block2_1_relu (Activation)	(None, 23, 23, 128)	0	conv3_block2_1_bn[0][…
conv3_block2_2_conv (Conv2D)	(None, 23, 23, 128)	147,584	conv3_block2_1_relu[0…
conv3_block2_2_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block2_2_conv[0…
conv3_block2_2_relu (Activation)	(None, 23, 23, 128)	0	conv3_block2_2_bn[0][…
conv3_block2_3_conv (Conv2D)	(None, 23, 23, 512)	66,048	conv3_block2_2_relu[0…
conv3_block2_3_bn (BatchNormalization)	(None, 23, 23, 512)	2,048	conv3_block2_3_conv[0…
conv3_block2_add (Add)	(None, 23, 23, 512)	0	conv3_block1_out[0][0… conv3_block2_3_bn[0][…
conv3_block2_out (Activation)	(None, 23, 23, 512)	0	conv3_block2_add[0][0]
conv3_block3_1_conv (Conv2D)	(None, 23, 23, 128)	65,664	conv3_block2_out[0][0]
conv3_block3_1_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block3_1_conv[0…
conv3_block3_1_relu (Activation)	(None, 23, 23, 128)	0	conv3_block3_1_bn[0][…
conv3_block3_2_conv (Conv2D)	(None, 23, 23, 128)	147,584	conv3_block3_1_relu[0…
conv3_block3_2_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block3_2_conv[0…
conv3_block3_2_relu (Activation)	(None, 23, 23, 128)	0	conv3_block3_2_bn[0][…
conv3_block3_3_conv (Conv2D)	(None, 23, 23, 512)	66,048	conv3_block3_2_relu[0…
conv3_block3_3_bn (BatchNormalization)	(None, 23, 23, 512)	2,048	conv3_block3_3_conv[0…
conv3_block3_add (Add)	(None, 23, 23, 512)	0	conv3_block2_out[0][0… conv3_block3_3_bn[0][…
conv3_block3_out (Activation)	(None, 23, 23, 512)	0	conv3_block3_add[0][0]

conv3_block4_1_conv (Conv2D)	(None, 23, 23, 128)	65,664	conv3_block3_out[0][0]
conv3_block4_1_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block4_1_conv[0…
conv3_block4_1_relu (Activation)	(None, 23, 23, 128)	0	conv3_block4_1_bn[0][…
conv3_block4_2_conv (Conv2D)	(None, 23, 23, 128)	147,584	conv3_block4_1_relu[0…
conv3_block4_2_bn (BatchNormalization)	(None, 23, 23, 128)	512	conv3_block4_2_conv[0…
conv3_block4_2_relu (Activation)	(None, 23, 23, 128)	0	conv3_block4_2_bn[0][…
conv3_block4_3_conv (Conv2D)	(None, 23, 23, 512)	66,048	conv3_block4_2_relu[0…
conv3_block4_3_bn (BatchNormalization)	(None, 23, 23, 512)	2,048	conv3_block4_3_conv[0…
conv3_block4_add (Add)	(None, 23, 23, 512)	0	conv3_block3_out[0][0… conv3_block4_3_bn[0][…
conv3_block4_out (Activation)	(None, 23, 23, 512)	0	conv3_block4_add[0][0]
conv4_block1_1_conv (Conv2D)	(None, 12, 12, 256)	131,328	conv3_block4_out[0][0]
conv4_block1_1_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block1_1_conv[0…
conv4_block1_1_relu (Activation)	(None, 12, 12, 256)	0	conv4_block1_1_bn[0][…
conv4_block1_2_conv (Conv2D)	(None, 12, 12, 256)	590,080	conv4_block1_1_relu[0…
conv4_block1_2_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block1_2_conv[0…
conv4_block1_2_relu (Activation)	(None, 12, 12, 256)	0	conv4_block1_2_bn[0][…
conv4_block1_0_conv (Conv2D)	(None, 12, 12, 1024)	525,312	conv3_block4_out[0][0]
conv4_block1_3_conv (Conv2D)	(None, 12, 12, 1024)	263,168	conv4_block1_2_relu[0…

(Conv2D)			
conv4_block1_0_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block1_0_conv[0…
conv4_block1_3_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block1_3_conv[0…
conv4_block1_add (Add)	(None, 12, 12, 1024)	0	conv4_block1_0_bn[0][… conv4_block1_3_bn[0][…
conv4_block1_out (Activation)	(None, 12, 12, 1024)	0	conv4_block1_add[0][0]
conv4_block2_1_conv (Conv2D)	(None, 12, 12, 256)	262,400	conv4_block1_out[0][0]
conv4_block2_1_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block2_1_conv[0…
conv4_block2_1_relu (Activation)	(None, 12, 12, 256)	0	conv4_block2_1_bn[0][…
conv4_block2_2_conv (Conv2D)	(None, 12, 12, 256)	590,080	conv4_block2_1_relu[0…
conv4_block2_2_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block2_2_conv[0…
conv4_block2_2_relu (Activation)	(None, 12, 12, 256)	0	conv4_block2_2_bn[0][…
conv4_block2_3_conv (Conv2D)	(None, 12, 12, 1024)	263,168	conv4_block2_2_relu[0…
conv4_block2_3_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block2_3_conv[0…
conv4_block2_add (Add)	(None, 12, 12, 1024)	0	conv4_block1_out[0][0… conv4_block2_3_bn[0][…
conv4_block2_out (Activation)	(None, 12, 12, 1024)	0	conv4_block2_add[0][0]
conv4_block3_1_conv (Conv2D)	(None, 12, 12, 256)	262,400	conv4_block2_out[0][0]
conv4_block3_1_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block3_1_conv[0…
conv4_block3_1_relu (Activation)	(None, 12, 12, 256)	0	conv4_block3_1_bn[0][…
conv4_block3_2_conv	(None, 12, 12, 256)	590,080	conv4_block3_1_relu[0…

conv4_block3_2_conv (Conv2D)	(None, 12, 12, 256)	590,080	conv4_block3_1_relu[0…
conv4_block3_2_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block3_2_conv[0…
conv4_block3_2_relu (Activation)	(None, 12, 12, 256)	0	conv4_block3_2_bn[0][…
conv4_block3_3_conv (Conv2D)	(None, 12, 12, 1024)	263,168	conv4_block3_2_relu[0…
conv4_block3_3_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block3_3_conv[0…
conv4_block3_add (Add)	(None, 12, 12, 1024)	0	conv4_block2_out[0][0… conv4_block3_3_bn[0][…
conv4_block3_out (Activation)	(None, 12, 12, 1024)	0	conv4_block3_add[0][0]
conv4_block4_1_conv (Conv2D)	(None, 12, 12, 256)	262,400	conv4_block3_out[0][0]
conv4_block4_1_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block4_1_conv[0…
conv4_block4_1_relu (Activation)	(None, 12, 12, 256)	0	conv4_block4_1_bn[0][…
conv4_block4_2_conv (Conv2D)	(None, 12, 12, 256)	590,080	conv4_block4_1_relu[0…
conv4_block4_2_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block4_2_conv[0…
conv4_block4_2_relu (Activation)	(None, 12, 12, 256)	0	conv4_block4_2_bn[0][…
conv4_block4_3_conv (Conv2D)	(None, 12, 12, 1024)	263,168	conv4_block4_2_relu[0…
conv4_block4_3_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block4_3_conv[0…
conv4_block4_add (Add)	(None, 12, 12, 1024)	0	conv4_block3_out[0][0… conv4_block4_3_bn[0][…
conv4_block4_out (Activation)	(None, 12, 12, 1024)	0	conv4_block4_add[0][0]
conv4_block5_1_conv (Conv2D)	(None, 12, 12, 256)	262,400	conv4_block4_out[0][0]

conv4_block5_1_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block5_1_conv[0…
conv4_block5_1_relu (Activation)	(None, 12, 12, 256)	0	conv4_block5_1_bn[0][…
conv4_block5_2_conv (Conv2D)	(None, 12, 12, 256)	590,080	conv4_block5_1_relu[0…
conv4_block5_2_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block5_2_conv[0…
conv4_block5_2_relu (Activation)	(None, 12, 12, 256)	0	conv4_block5_2_bn[0][…
conv4_block5_3_conv (Conv2D)	(None, 12, 12, 1024)	263,168	conv4_block5_2_relu[0…
conv4_block5_3_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block5_3_conv[0…
conv4_block5_add (Add)	(None, 12, 12, 1024)	0	conv4_block4_out[0][0… conv4_block5_3_bn[0][…
conv4_block5_out (Activation)	(None, 12, 12, 1024)	0	conv4_block5_add[0][0]
conv4_block6_1_conv (Conv2D)	(None, 12, 12, 256)	262,400	conv4_block5_out[0][0]
conv4_block6_1_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block6_1_conv[0…
conv4_block6_1_relu (Activation)	(None, 12, 12, 256)	0	conv4_block6_1_bn[0][…
conv4_block6_2_conv (Conv2D)	(None, 12, 12, 256)	590,080	conv4_block6_1_relu[0…
conv4_block6_2_bn (BatchNormalization)	(None, 12, 12, 256)	1,024	conv4_block6_2_conv[0…
conv4_block6_2_relu (Activation)	(None, 12, 12, 256)	0	conv4_block6_2_bn[0][…
conv4_block6_3_conv (Conv2D)	(None, 12, 12, 1024)	263,168	conv4_block6_2_relu[0…
conv4_block6_3_bn (BatchNormalization)	(None, 12, 12, 1024)	4,096	conv4_block6_3_conv[0…
conv4_block6_add (Add)	(None, 12, 12, 1024)	0	conv4_block5_out[0][0… conv4_block6_3_bn[0][…

conv4_block6_out (Activation)	(None, 12, 12, 1024)	0	conv4_block6_add[0][0]
conv5_block1_1_conv (Conv2D)	(None, 6, 6, 512)	524,800	conv4_block6_out[0][0]
conv5_block1_1_bn (BatchNormalization)	(None, 6, 6, 512)	2,048	conv5_block1_1_conv[0…
conv5_block1_1_relu (Activation)	(None, 6, 6, 512)	0	conv5_block1_1_bn[0][…
conv5_block1_2_conv (Conv2D)	(None, 6, 6, 512)	2,359,808	conv5_block1_1_relu[0…
conv5_block1_2_bn (BatchNormalization)	(None, 6, 6, 512)	2,048	conv5_block1_2_conv[0…
conv5_block1_2_relu (Activation)	(None, 6, 6, 512)	0	conv5_block1_2_bn[0][…
conv5_block1_0_conv (Conv2D)	(None, 6, 6, 2048)	2,099,200	conv4_block6_out[0][0]
conv5_block1_3_conv (Conv2D)	(None, 6, 6, 2048)	1,050,624	conv5_block1_2_relu[0…
conv5_block1_0_bn (BatchNormalization)	(None, 6, 6, 2048)	8,192	conv5_block1_0_conv[0…
conv5_block1_3_bn (BatchNormalization)	(None, 6, 6, 2048)	8,192	conv5_block1_3_conv[0…
conv5_block1_add (Add)	(None, 6, 6, 2048)	0	conv5_block1_0_bn[0][… conv5_block1_3_bn[0][…
conv5_block1_out (Activation)	(None, 6, 6, 2048)	0	conv5_block1_add[0][0]
conv5_block2_1_conv (Conv2D)	(None, 6, 6, 512)	1,049,088	conv5_block1_out[0][0]
conv5_block2_1_bn (BatchNormalization)	(None, 6, 6, 512)	2,048	conv5_block2_1_conv[0…
conv5_block2_1_relu (Activation)	(None, 6, 6, 512)	0	conv5_block2_1_bn[0][…
conv5_block2_2_conv (Conv2D)	(None, 6, 6, 512)	2,359,808	conv5_block2_1_relu[0…

conv5_block2_2_bn (BatchNormalization)	(None, 6, 6, 512)	2,048	conv5_block2_2_conv[0…
conv5_block2_2_relu (Activation)	(None, 6, 6, 512)	0	conv5_block2_2_bn[0][…
conv5_block2_3_conv (Conv2D)	(None, 6, 6, 2048)	1,050,624	conv5_block2_2_relu[0…
conv5_block2_3_bn (BatchNormalization)	(None, 6, 6, 2048)	8,192	conv5_block2_3_conv[0…
conv5_block2_add (Add)	(None, 6, 6, 2048)	0	conv5_block1_out[0][0… conv5_block2_3_bn[0][…
conv5_block2_out (Activation)	(None, 6, 6, 2048)	0	conv5_block2_add[0][0]
conv5_block3_1_conv (Conv2D)	(None, 6, 6, 512)	1,049,088	conv5_block2_out[0][0]
conv5_block3_1_bn (BatchNormalization)	(None, 6, 6, 512)	2,048	conv5_block3_1_conv[0…
conv5_block3_1_relu (Activation)	(None, 6, 6, 512)	0	conv5_block3_1_bn[0][…
conv5_block3_2_conv (Conv2D)	(None, 6, 6, 512)	2,359,808	conv5_block3_1_relu[0…
conv5_block3_2_bn (BatchNormalization)	(None, 6, 6, 512)	2,048	conv5_block3_2_conv[0…
conv5_block3_2_relu (Activation)	(None, 6, 6, 512)	0	conv5_block3_2_bn[0][…
conv5_block3_3_conv (Conv2D)	(None, 6, 6, 2048)	1,050,624	conv5_block3_2_relu[0…
conv5_block3_3_bn (BatchNormalization)	(None, 6, 6, 2048)	8,192	conv5_block3_3_conv[0…
conv5_block3_add (Add)	(None, 6, 6, 2048)	0	conv5_block2_out[0][0… conv5_block3_3_bn[0][…
conv5_block3_out (Activation)	(None, 6, 6, 2048)	0	conv5_block3_add[0][0]
avg_pool (GlobalAveragePooling2D)	(None, 2048)	0	conv5_block3_out[0][0]
flatten_5 (Flatten)	(None, 2048)	0	avg_pool[0][0]
dense_10 (Dense)	(None, 512)	1,049,088	flatten_5[0][0]

dense_10 (Dense)	(None, 512)	1,049,088	flatten_5[0][0]
dense_11 (Dense)	(None, 5)	2,565	dense_10[0][0]

Total params: 24,639,365 (93.99 MB)
Trainable params: 1,051,653 (4.01 MB)
Non-trainable params: 23,587,712 (89.98 MB)

```
resnet_model.compile(optimizer=Adam(learning_rate=0.001),loss='categorical_crossentropy',metrics=['accuracy'])


epochs=10
history = resnet_model.fit(
  train_ds,
  validation_data=val_ds,
  epochs=epochs
)
```

```
Epoch 1/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 556s 6s/step - accuracy: 0.6635 - loss: 1.1206 - val_accuracy: 0.8556 - val_loss: 0.4085
Epoch 2/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 543s 6s/step - accuracy: 0.8854 - loss: 0.3084 - val_accuracy: 0.8624 - val_loss: 0.3580
Epoch 3/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 572s 6s/step - accuracy: 0.9387 - loss: 0.1637 - val_accuracy: 0.8678 - val_loss: 0.3609
Epoch 4/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 559s 6s/step - accuracy: 0.9670 - loss: 0.1080 - val_accuracy: 0.8488 - val_loss: 0.4712
Epoch 5/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 514s 5s/step - accuracy: 0.9816 - loss: 0.0707 - val_accuracy: 0.8719 - val_loss: 0.3565
Epoch 6/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 491s 5s/step - accuracy: 0.9948 - loss: 0.0280 - val_accuracy: 0.8801 - val_loss: 0.3740
Epoch 7/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 544s 6s/step - accuracy: 0.9975 - loss: 0.0162 - val_accuracy: 0.8910 - val_loss: 0.3816
Epoch 8/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 555s 6s/step - accuracy: 0.9991 - loss: 0.0106 - val_accuracy: 0.8896 - val_loss: 0.3929
Epoch 9/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 545s 6s/step - accuracy: 0.9992 - loss: 0.0087 - val_accuracy: 0.8842 - val_loss: 0.3805
Epoch 10/10
92/92 ━━━━━━━━━━━━━━━━━━━━ 585s 6s/step - accuracy: 1.0000 - loss: 0.0036 - val_accuracy: 0.8801 - val_loss: 0.3899
```