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In [ ]: from tensorflow.keras.applications import VGG16
from tensorflow.keras.preprocessing import image
from tensorflow.keras.applications.vgg16 import preprocess_input
import numpy as np
import matplotlib.pyplot as plt

model = VGG16(weights='imagenet', include_top=False)
model.summary()

img_path = 'sample.jpg'
img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)

layer_outputs = [layer.output for layer in model.layers[:5]]
from tensorflow.keras.models import Model
activation_model = Model(inputs=model.input, outputs=layer_outputs)
activations = activation_model.predict(x)

first_layer_activation = activations[0]
plt.matshow(first_layer_activation[0, :, :, 0], cmap='viridis')
plt.show()
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/vgg16/vgg16_weights_tf_dim_ordering_tf_kernels_notop.h5
58889256/58889256 2s 0us/step
Model: "vgg16"

| Layer (type) | Output Shape | Param # |
|-----------------------------|-------------------------|-----------|
| input_layer_11 (InputLayer) | (None, None, None, 3) | 0 |
| block1_conv1 (Conv2D) | (None, None, None, 64) | 1,792 |
| block1_conv2 (Conv2D) | (None, None, None, 64) | 36,928 |
| block1_pool (MaxPooling2D) | (None, None, None, 64) | 0 |
| block2_conv1 (Conv2D) | (None, None, None, 128) | 73,856 |
| block2_conv2 (Conv2D) | (None, None, None, 128) | 147,584 |
| block2_pool (MaxPooling2D) | (None, None, None, 128) | 0 |
| block3_conv1 (Conv2D) | (None, None, None, 256) | 295,168 |
| block3_conv2 (Conv2D) | (None, None, None, 256) | 590,080 |
| block3_conv3 (Conv2D) | (None, None, None, 256) | 590,080 |
| block3_pool (MaxPooling2D) | (None, None, None, 256) | 0 |
| block4_conv1 (Conv2D) | (None, None, None, 512) | 1,180,160 |
| block4_conv2 (Conv2D) | (None, None, None, 512) | 2,359,808 |
| block4_conv3 (Conv2D) | (None, None, None, 512) | 2,359,808 |
| block4_pool (MaxPooling2D) | (None, None, None, 512) | 0 |
| block5_conv1 (Conv2D) | (None, None, None, 512) | 2,359,808 |
| block5_conv2 (Conv2D) | (None, None, None, 512) | 2,359,808 |
| block5_conv3 (Conv2D) | (None, None, None, 512) | 2,359,808 |
| block5_pool (MaxPooling2D) | (None, None, None, 512) | 0 |

```
Total params: 14,714,688 (56.13 MB)
Trainable params: 14,714,688 (56.13 MB)
Non-trainable params: 0 (0.00 B)
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```

```
FileNotFoundError                                     Traceback (most recent call last)
/tmp/ipython-input-382938378.py in <cell line: 0>()
      9
     10 img_path = 'sample.jpg'
--> 11 img = image.load_img(img_path, target_size=(224, 224))
     12 x = image.img_to_array(img)
     13 x = np.expand_dims(x, axis=0)

/usr/local/lib/python3.12/dist-packages/keras/src/utils/image_utils.py in lo
d_img(path, color_mode, target_size, interpolation, keep_aspect_ratio)
    233         if isinstance(path, pathlib.Path):
    234             path = str(path.resolve())
--> 235         with open(path, "rb") as f:
    236             img = pil_image.open(io.BytesIO(f.read()))
    237     else:

FileNotFoundError: [Errno 2] No such file or directory: 'sample.jpg'
```

Exp-13 : Understanding the Architecture of a Pre-Trained Model.

Aim:

To study and analyze the structure of pre-trained CNN model such as VGG16 or ResNet 50.

Description

Pre-trained models are trained on large datasets and can be reused for feature extraction or fine-tuning.

They contain multiple convolutional and fully connected layers designed for hierarchical feature learning.

Procedure:

- 1.) Import a pre-trained model (e.g., keras.applications.VGG16).
- 2.) Display layer names, types, and output shapes.
- 3.) Analyze the number of parameters and filter sizes.
- 4.) Visualize intermediate feature maps for a sample image.

Pseudocode:

Load VGG16

Print model summary;

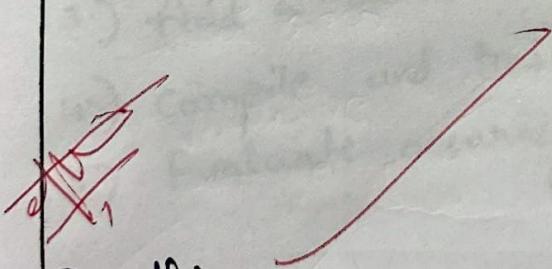
Select an input image.

Extract outputs from selected layers

Visualize feature maps.

~~Observation:~~

Early layers capture edges and colors, while deeper layers detect shapes and objects. The networks show hierarchical representation learning.



~~Result:~~

The pre-trained CNN architecture was successfully analyzed, revealing how deep networks learn and organize visual features.

Output: to work with all separate bin files
Model Architecture: PPOV to save lobam, 6019

Permer (

conv1: conv2d(7, 64, kernel-size = (7, 7), stride = (2, 2), padding = (3, 3), bias = false)

plf(Cn1): ---

softmax layer followed by sigmoid layer
softmax layer consists of two parallel branches (forward and backward)
softmax layer consists of two parallel branches (forward and backward)

Model summary:

layer (type) output shape para: embedd

layer (type) [-1, 64, 118, 112] 9408

conv2d-1 [-1, 64, 112, 112] 922

batch Norm2d-2 [-1, 64, 56, 56] 0

MaxPool2D-4 [0, 1000] 513,000

linear-68

Total para: 11,689,512

Grainable paras: 11689,512

Non-grainable paras: 0

parallel execution is fast
parallel execution is fast
parallel execution is fast