

```
In [1]: from keras.preprocessing import image
        from keras.applications.vgg16 import preprocess_input
        from keras.applications.vgg16 import VGG16
        import numpy as np
```

Using TensorFlow backend.

```
In [2]: #Passing an image through the full vgg16 model
        model = VGG16(weights = 'imagenet', include_top = True, input_shape = (224,224,3))
        img = image.load_img( '.././datasets/cat.jpg', target_size=(224,224) )
        img = image.img_to_array( img )
        img = np.expand_dims( img, axis=0 )
        img = preprocess_input( img )
        features = model.predict( img )
        features = features.flatten()
        print(len(features)) #Expected 1000 features corresponding to 1000 imagenet classes
```

1000

```
In [3]: model.summary() #To confirm that output of last layer is 1000.
```

| Layer (type) | Output Shape | Param # |
|----------------------------|-----------------------|-----------|
| input_1 (InputLayer) | (None, 224, 224, 3) | 0 |
| block1_conv1 (Conv2D) | (None, 224, 224, 64) | 1792 |
| block1_conv2 (Conv2D) | (None, 224, 224, 64) | 36928 |
| block1_pool (MaxPooling2D) | (None, 112, 112, 64) | 0 |
| block2_conv1 (Conv2D) | (None, 112, 112, 128) | 73856 |
| block2_conv2 (Conv2D) | (None, 112, 112, 128) | 147584 |
| block2_pool (MaxPooling2D) | (None, 56, 56, 128) | 0 |
| block3_conv1 (Conv2D) | (None, 56, 56, 256) | 295168 |
| block3_conv2 (Conv2D) | (None, 56, 56, 256) | 590080 |
| block3_conv3 (Conv2D) | (None, 56, 56, 256) | 590080 |
| block3_pool (MaxPooling2D) | (None, 28, 28, 256) | 0 |
| block4_conv1 (Conv2D) | (None, 28, 28, 512) | 1180160 |
| block4_conv2 (Conv2D) | (None, 28, 28, 512) | 2359808 |
| block4_conv3 (Conv2D) | (None, 28, 28, 512) | 2359808 |
| block4_pool (MaxPooling2D) | (None, 14, 14, 512) | 0 |
| block5_conv1 (Conv2D) | (None, 14, 14, 512) | 2359808 |
| block5_conv2 (Conv2D) | (None, 14, 14, 512) | 2359808 |
| block5_conv3 (Conv2D) | (None, 14, 14, 512) | 2359808 |
| block5_pool (MaxPooling2D) | (None, 7, 7, 512) | 0 |
| flatten (Flatten) | (None, 25088) | 0 |
| fc1 (Dense) | (None, 4096) | 102764544 |
| fc2 (Dense) | (None, 4096) | 16781312 |
| predictions (Dense) | (None, 1000) | 4097000 |

Total params: 138,357,544
 Trainable params: 138,357,544
 Non-trainable params: 0

```
In [4]: #Removing 1 layer should give us 4096 items back
model.layers.pop()
model.summary()
```

| Layer (type) | Output Shape | Param # |
|-------------------------------|-----------------------|-----------|
| input_1 (InputLayer) | (None, 224, 224, 3) | 0 |
| block1_conv1 (Conv2D) | (None, 224, 224, 64) | 1792 |
| block1_conv2 (Conv2D) | (None, 224, 224, 64) | 36928 |
| block1_pool (MaxPooling2D) | (None, 112, 112, 64) | 0 |
| block2_conv1 (Conv2D) | (None, 112, 112, 128) | 73856 |
| block2_conv2 (Conv2D) | (None, 112, 112, 128) | 147584 |
| block2_pool (MaxPooling2D) | (None, 56, 56, 128) | 0 |
| block3_conv1 (Conv2D) | (None, 56, 56, 256) | 295168 |
| block3_conv2 (Conv2D) | (None, 56, 56, 256) | 590080 |
| block3_conv3 (Conv2D) | (None, 56, 56, 256) | 590080 |
| block3_pool (MaxPooling2D) | (None, 28, 28, 256) | 0 |
| block4_conv1 (Conv2D) | (None, 28, 28, 512) | 1180160 |
| block4_conv2 (Conv2D) | (None, 28, 28, 512) | 2359808 |
| block4_conv3 (Conv2D) | (None, 28, 28, 512) | 2359808 |
| block4_pool (MaxPooling2D) | (None, 14, 14, 512) | 0 |
| block5_conv1 (Conv2D) | (None, 14, 14, 512) | 2359808 |
| block5_conv2 (Conv2D) | (None, 14, 14, 512) | 2359808 |
| block5_conv3 (Conv2D) | (None, 14, 14, 512) | 2359808 |
| block5_pool (MaxPooling2D) | (None, 7, 7, 512) | 0 |
| flatten (Flatten) | (None, 25088) | 0 |
| fc1 (Dense) | (None, 4096) | 102764544 |
| fc2 (Dense) | (None, 4096) | 16781312 |
| Total params: 134,260,544 | | |
| Trainable params: 134,260,544 | | |
| Non-trainable params: 0 | | |

```
In [5]: img = image.load_img( '../..../datasets/cat.jpg', target_size=(224,224) )
img = image.img_to_array( img )
img = np.expand_dims( img, axis=0 )
img = preprocess_input( img )
features2 = model.predict( img )
features2 = features2.flatten()
print(len(features2)) #Excepted 4096 features, but still getting 1000. Why?
#No matter how many layers are removed, the output is still 1000
```

1000