# pooling\_setup

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### 0.0.1 1) A typical setup for Pooling layers

```
[95]: import torch
import torch.nn as nn

layer_with_pooling = nn.Sequential(
          nn.Conv2d(1, 16, 3, 1, 1),
          nn.MaxPool2d(2, 2),
          nn.Conv2d(16, 32, 3, 1, 1),
          nn.MaxPool2d(2, 2)
)
    example_input = torch.randn(5, 1, 28, 28)
    example_output = layer_with_pooling(example_input)
    print(example_output.size())
```

torch.Size([5, 32, 7, 7])

## 0.0.2 2) without pooling layers

torch.Size([5, 32, 28, 28])

#### 0.0.3 3) without pooling layers but with stride=2

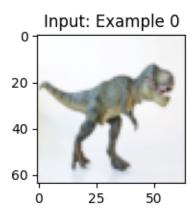
torch.Size([5, 32, 7, 7])

#### 0.0.4 4) Ví dụ sử dụng tích chập trên ảnh màu trex.png

```
[127]: import torch
       import torch.nn as nn
       from PIL import Image
       import numpy as np
       import matplotlib.pyplot as plt
       from torchvision import transforms
       layer_with_pooling = nn.Sequential(
           nn.Conv2d(3, 16, 3, 1, 1), # 3 là số kênh ảnh màu của ảnh đầu vào
           nn.MaxPool2d(2, 2),
           nn.Conv2d(16, 32, 3, 1, 1),
           nn.MaxPool2d(2, 2)
       # chuyển ảnh màu thành tensor sử dung transforms từ torchvision
       transform = transforms.Compose([
           transforms.Resize((64, 64)),
           transforms.ToTensor()
       1)
       # Đọc ảnh bằng thư viện PIL
       img = Image.open("trex.png")
       img = transform(img)
       # plt.imshow(np.transpose(img.detach().numpy(), (1, 2, 0)))
       example_input = torch.stack([img],dim=0)
       example_output = layer_with_pooling(example_input)
       print("Kich thước feature map khi qua CNN:",example_output.size())
```

Kích thước feature map khi qua CNN: torch.Size([1, 32, 16, 16])

```
[130]: import matplotlib.pyplot as plt
       # hiển thi ảnh đầu vào đã transform
       plt.figure(figsize=(2, 2))
       plt.title('Input: Example 0')
       plt.imshow(np.transpose(img.detach().numpy(),(1,2,0)))
       # hiển thị feature map của dữ liệu mẫu đầu tiên
       plt.figure(figsize=(10, 7))
       plt.title('Output: Example 0')
       plt.axis('off')
       for i, _ in enumerate(example_output):
           for j, _ in enumerate(example_output[i]):
               # v\tilde{e} example_output[i][j] tr\hat{e}n lưới có 8 cột v\hat{a} 4 hàng (do 8*4 = 32 = 32
        ⇔số feature map cuối cùng)
               plt.subplot(4, 8, j+1)
               plt.imshow(example_output[i,j].detach().numpy(), cmap='gray')
               plt.axis('off')
               plt.title(f'channel {j+1}')
           break
       plt.show()
```



channel 1 channel 2 channel 3 channel 4 channel 5 channel 6 channel 7 channel 8

channel 9 channel 10 channel 11 channel 12 channel 13 channel 14 channel 15 channel 16

channel 17 channel 18 channel 19 channel 20 channel 21 channel 22 channel 23 channel 24

channel 25 channel 26 channel 27 channel 28 channel 29 channel 30 channel 31 channel 32