04

January 23, 2024

Prerequisites: * python 3.6 or newer (e.g. from here http://conda.io) * pytorch and torchvision: https://pytorch.org/ * Pillow: https://pillow.readthedocs.io/en/stable/ * ipython and notebook * numpy, scipy and matplotlib

[1]:
```
import torch
from PIL import Image
import numpy as np
```

[2]:
```
torch.zeros(10)
```

[2]:
```
tensor([0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

[3]:
```
torch.ones(10)
```

[3]:
```
tensor([1., 1., 1., 1., 1., 1., 1., 1., 1., 1.])
```

[4]:
```
torch.ones([4,5])
```

[4]:
```
tensor([[1., 1., 1., 1., 1.],
        [1., 1., 1., 1., 1.],
        [1., 1., 1., 1., 1.],
        [1., 1., 1., 1., 1.]])
```

[5]:
```
v = torch.ones(5)
print( v.dtype, v.shape )
```

```
torch.float32 torch.Size([5])
```

[6]:
```
v = torch.arange(100)
v
```

[6]:
```
tensor([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
        18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35,
        36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53,
        54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71,
        72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89,
        90, 91, 92, 93, 94, 95, 96, 97, 98, 99])
```

[7]:
```
v.shape
```

[7]:
```
torch.Size([100])
```

[8]:
```
m = v.view((10,10))
m
```

[8]:
```
tensor([[ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9],
        [10, 11, 12, 13, 14, 15, 16, 17, 18, 19],
        [20, 21, 22, 23, 24, 25, 26, 27, 28, 29],
        [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
        [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
        [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
        [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
        [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
        [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
        [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

[9]:
```
m.shape
```

[9]:
```
torch.Size([10, 10])
```

[10]:
```
I = Image.open('cat.jpg')
I
```

[10]:

[11]:
```
np.array(I)
```

[11]:
```
array([[[194, 206, 220],
        [194, 206, 220],
        [194, 206, 220],
        …,
        [159, 181, 205],
        [156, 180, 204],
        [155, 179, 203]],

       [[195, 207, 221],
        [195, 207, 221],
        [195, 207, 221],
        …,
        [159, 181, 205],
        [156, 180, 204],
        [155, 179, 203]],

       [[196, 208, 222],
        [196, 208, 222],
        [195, 207, 221],
        …,
        [159, 181, 205],
        [156, 180, 204],
        [155, 179, 203]],

       …,

       [[236, 239, 244],
        [236, 239, 244],
        [236, 239, 244],
        …,
        [226, 234, 237],
        [225, 233, 236],
        [224, 232, 235]],

       [[236, 239, 244],
        [236, 239, 244],
        [236, 239, 244],
        …,
        [224, 232, 235],
        [225, 233, 236],
        [224, 232, 235]],

       [[236, 239, 244],
        [236, 239, 244],
```

```
        [236, 239, 244],
        …,
        [219, 227, 230],
        [220, 228, 231],
        [219, 227, 230]]], dtype=uint8)
```

[12]:
```
np.array(I).shape
```

[12]:
```
(853, 1280, 3)
```

[13]:
```
from torchvision import transforms
image_to_tensor = transforms.ToTensor()
image_tensor = image_to_tensor(I)
image_tensor
```

[13]:
```
tensor([[[0.7608, 0.7608, 0.7608,  …, 0.6235, 0.6118, 0.6078],
         [0.7647, 0.7647, 0.7647,  …, 0.6235, 0.6118, 0.6078],
         [0.7686, 0.7686, 0.7647,  …, 0.6235, 0.6118, 0.6078],
         …,
         [0.9255, 0.9255, 0.9255,  …, 0.8863, 0.8824, 0.8784],
         [0.9255, 0.9255, 0.9255,  …, 0.8784, 0.8824, 0.8784],
         [0.9255, 0.9255, 0.9255,  …, 0.8588, 0.8627, 0.8588]],

        [[0.8078, 0.8078, 0.8078,  …, 0.7098, 0.7059, 0.7020],
         [0.8118, 0.8118, 0.8118,  …, 0.7098, 0.7059, 0.7020],
         [0.8157, 0.8157, 0.8118,  …, 0.7098, 0.7059, 0.7020],
         …,
         [0.9373, 0.9373, 0.9373,  …, 0.9176, 0.9137, 0.9098],
         [0.9373, 0.9373, 0.9373,  …, 0.9098, 0.9137, 0.9098],
         [0.9373, 0.9373, 0.9373,  …, 0.8902, 0.8941, 0.8902]],

        [[0.8627, 0.8627, 0.8627,  …, 0.8039, 0.8000, 0.7961],
         [0.8667, 0.8667, 0.8667,  …, 0.8039, 0.8000, 0.7961],
         [0.8706, 0.8706, 0.8667,  …, 0.8039, 0.8000, 0.7961],
         …,
         [0.9569, 0.9569, 0.9569,  …, 0.9294, 0.9255, 0.9216],
         [0.9569, 0.9569, 0.9569,  …, 0.9216, 0.9255, 0.9216],
         [0.9569, 0.9569, 0.9569,  …, 0.9020, 0.9059, 0.9020]]])
```

[14]:
```
image_tensor.shape
```

[14]:
```
torch.Size([3, 853, 1280])
```

[15]:
```
tensor_to_image = transforms.ToPILImage()
tensor_to_image(image_tensor)
```

[15]:

[ ]: