Лабораторная работа №2. Введение в проектирование нейронных сетей с помощью Python
По предмету "Киберфизические системы и технологии"

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дата: сентябрь 2022

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[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import os
import random
import scipy
import torch
import cv2

torch.cuda.synchronize()
torch.cuda.empty_cache()

cuda = torch.device('cuda')
print(torch.cuda.get_device_properties(cuda))
```

```
_CudaDeviceProperties(name='NVIDIA GeForce RTX 3080 Laptop GPU', major=8,
minor=6, total_memory=8191MB, multi_processor_count=48)
```

[33]:
```
mnist_train = np.genfromtxt(f"dataset/mnist_train.csv", delimiter=',',␣
 ↪dtype=np.uint8)
mnist_test = np.genfromtxt(f"dataset/mnist_test.csv", delimiter=',',␣
 ↪dtype=np.uint8)
```

[40]:
```
print(mnist_train.shape)
print(mnist_test.shape)

images_train = np.float64(np.reshape(mnist_train[:, 1:], (mnist_train.
 ↪shape[0], 28, 28))) / 255
numbers_train = np.zeros((mnist_train.shape[0], 1))
images_test = np.float64(np.reshape(mnist_test[:, 1:], (mnist_test.
 ↪shape[0], 28, 28))) / 255
numbers_test = np.zeros((mnist_test.shape[0], 1))

print(images_train.shape)
print(numbers_train.shape)
print(images_test.shape)
print(numbers_test.shape)


number = 1000
print(images_train[number, :, :])
plt.imshow(images_train[number, :, :], cmap='gray', vmin=0, vmax=1)
```

```
(60000, 785)
```

```
(10000, 785)
(60000, 28, 28)
(60000, 1)
(10000, 28, 28)
(10000, 1)
[[0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.        ]
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 [0.         0.         0.         0.         0.         0.
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  0.         0.         0.         0.        ]
 [0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.         0.         0.
  0.         0.         0.14117647 0.57254902 0.99607843 1.
  0.98431373 0.37254902 0.02352941 0.         0.         0.
  0.         0.         0.         0.        ]
 [0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.         0.         0.
  0.01176471 0.38039216 0.91764706 0.99607843 0.99607843 0.90980392
  0.99607843 0.99607843 0.1372549  0.         0.         0.
  0.         0.         0.         0.        ]
 [0.         0.         0.         0.         0.         0.
  0.         0.         0.         0.         0.         0.34901961
  0.54901961 0.99607843 0.99607843 0.68235294 0.2627451  0.12941176
  0.78431373 0.99607843 0.74509804 0.         0.         0.
  0.         0.         0.         0.        ]
```

```
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.42352941 0.99215686
 0.99607843 0.92156863 0.2        0.00392157 0.         0.
 0.04705882 0.99607843 0.99215686 0.21960784 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.04705882 0.84705882 0.99607843
 0.95686275 0.21568627 0.         0.         0.         0.
 0.02352941 0.83529412 0.99607843 0.22352941 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.09803922 0.99607843 0.99607843
 0.51764706 0.         0.         0.         0.         0.
 0.         0.65882353 0.99607843 0.22352941 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.17647059 0.99607843 0.95294118
 0.13333333 0.         0.         0.         0.         0.
 0.         0.65882353 0.99607843 0.22352941 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.50196078 0.99607843 0.61568627
 0.         0.         0.         0.         0.         0.
 0.         0.65882353 0.99607843 0.22352941 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.0745098  0.89411765 0.99607843 0.41176471
 0.         0.         0.         0.         0.         0.
 0.02745098 0.89411765 0.99607843 0.22352941 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.22745098 0.99607843 0.99607843 0.34117647
 0.         0.         0.         0.         0.         0.
 0.03921569 0.99607843 0.96470588 0.18431373 0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.22745098 0.99607843 0.99607843 0.03529412
 0.         0.         0.         0.         0.         0.
 0.03921569 0.99607843 0.82352941 0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.22745098 0.99607843 0.99607843 0.03529412
 0.         0.         0.         0.         0.         0.
 0.41176471 0.99607843 0.35686275 0.         0.         0.
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```

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[0.         0.         0.         0.         0.         0.
 0.         0.         0.01960784 0.85882353 0.99607843 0.03529412
 0.         0.         0.         0.         0.         0.09411765
 0.90196078 0.99607843 0.09411765 0.         0.         0.
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 0.         0.         0.         0.84705882 0.99607843 0.03529412
 0.         0.         0.         0.         0.         0.32941176
 0.99607843 0.98431373 0.09019608 0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.84705882 0.99607843 0.14117647
 0.         0.         0.         0.         0.08627451 0.81568627
 0.98431373 0.36862745 0.         0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.50588235 0.99607843 0.47058824
 0.         0.         0.         0.01176471 0.54901961 0.99607843
 0.89803922 0.         0.         0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.3254902  0.99607843 0.87058824
 0.06666667 0.         0.         0.35686275 0.99607843 0.9254902
 0.20784314 0.         0.         0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.07058824 0.92156863 0.99607843
 0.5254902  0.08235294 0.46666667 0.92941176 0.99607843 0.48627451
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.20784314 0.97647059
 0.99607843 0.91764706 0.98823529 0.99607843 0.6745098  0.01176471
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.45490196
 0.92941176 0.99607843 0.99607843 0.52156863 0.07843137 0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.        ]
[0.         0.         0.         0.         0.         0.
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 0.         0.         0.         0.         0.         0.
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[0.         0.         0.         0.         0.         0.
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 0.         0.         0.         0.         0.         0.
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[0.         0.         0.         0.         0.         0.
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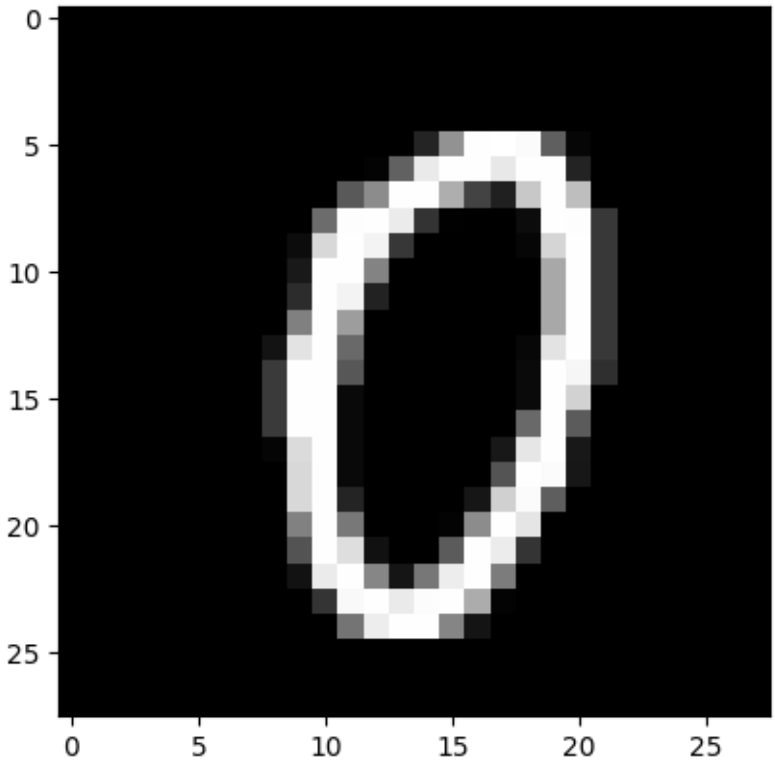
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.         0.         0.
 0.         0.         0.         0.        ]]
```

[40]: <matplotlib.image.AxesImage at 0x1bf1ef474f0>



[27]:

[ ]:
```
mnist_train[:, 0]
```