심층학습
[실습01] MLP-행렬곱 구현

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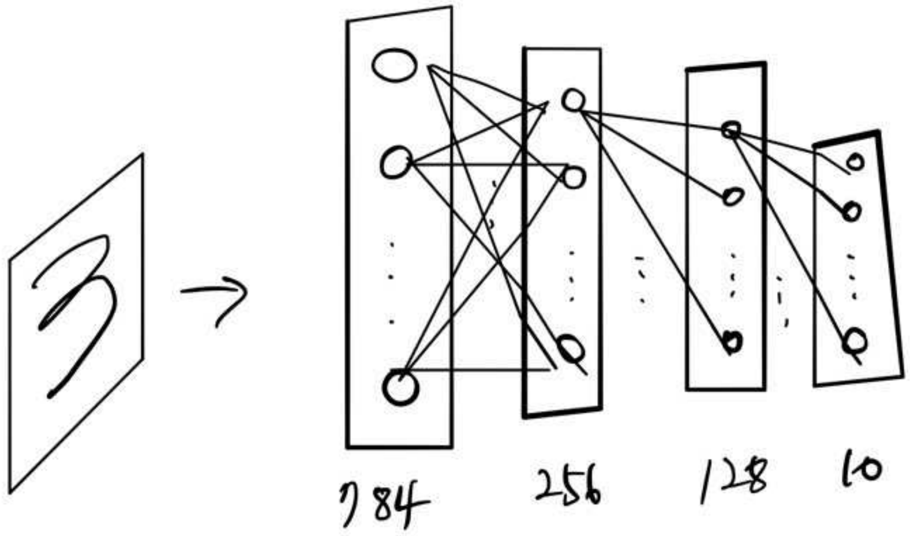
MLP 를 행렬곱으로 구현하기

- 데이터셋: MNIST
- Multi-layered perceptron (MLP)
  - 2 hidden layers
- Forward propagation



1. 라이브러리 임포트

```python
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline

import torch
import torchvision.datasets as dset
import torchvision.transforms as transforms
```

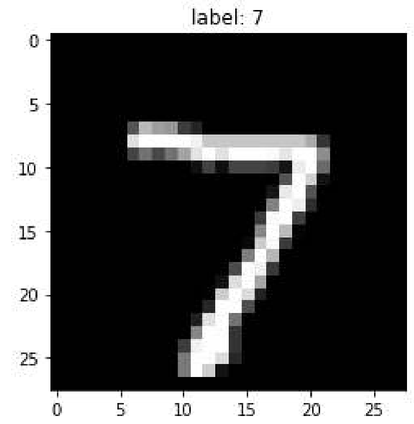
2. MNIST test dataset 가져오기

```python
# "": 현재 폴더에 MNIST 있음
mnist_test=dset.MNIST("", train=False,transform=transforms.ToTensor(),   #test 용으로 쓰겠다.
                      target_transform=None, download=True)
```

3. 대략적인 데이터 형태

```python
print "mnist_test 길이:", len(mnist_test)

# 데이터 하나 형태
image, label = mnist_test.__getitem__(0)  # 0번째 데이터
print "image data 형태:", image.size()
print "label: ", label

# 그리기
img = image.numpy()  # image 타입을 numpy 로 변환 (1,28,28)
plt.title("label: %d" %label )
plt.imshow(img[0], cmap='gray')
plt.show()
```

```
mnist_test 길이: 10000
image data 형태: torch.Size([1, 28, 28])
label:  7
```



4. sigmoid, softmax 함수 구현

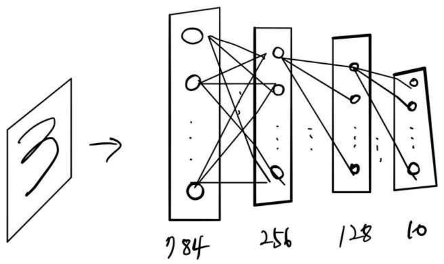
$$g(z) = \frac{1}{1+e^{-z}}$$

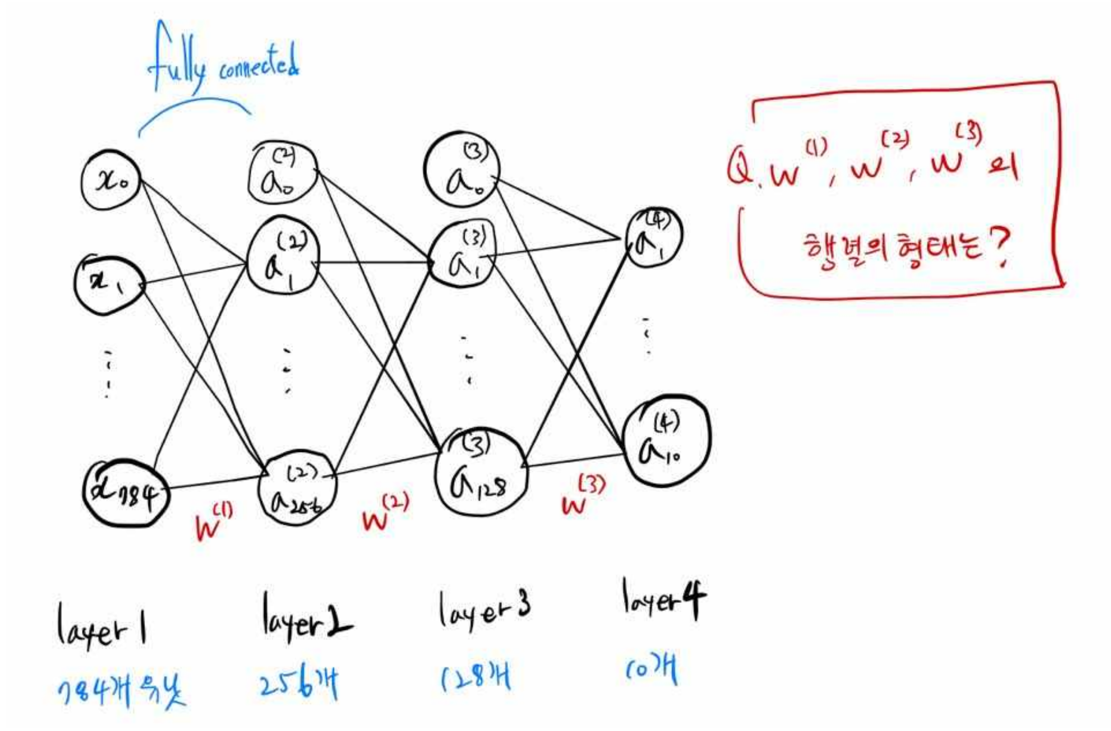
```
def sigmoid(x):

```

$$softmax(x)_i = \frac{e^{x_i}}{\Sigma_j e^{x_j}}$$

```
def softmax(x):


```

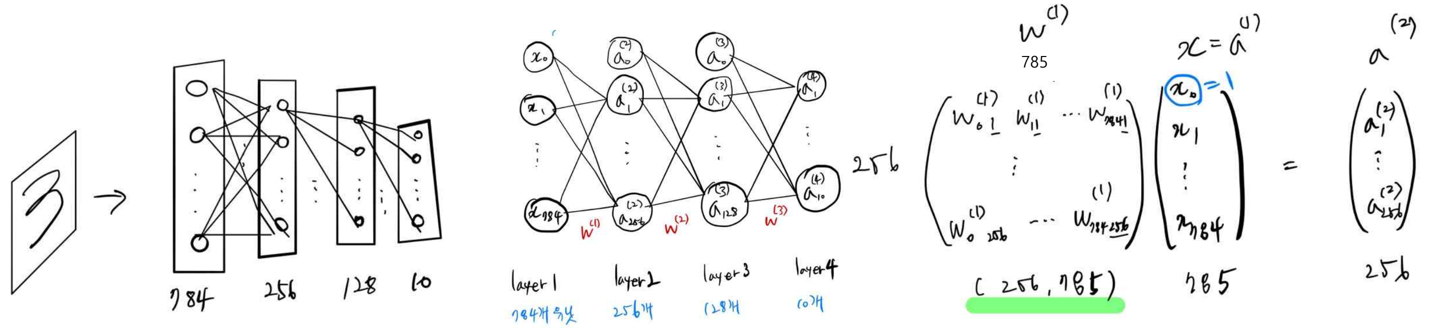
5. 모델 선언


784
256
128
10


fully connected
W(1)
W(2)
W(3)
layer1
layer2
layer3
layer4
784개 유닛
256개
128개
10개
Q. W(1), W(2), W(3)의
행렬의 형태는?

5. 모델 선언

```python
# Multi-layered perceptron
# # of units in each layer: 28*28 - 256 - 128 - 10
class MyMLP:
    def __init__(self, n_input, n_hidden1, n_hidden2, n_output):
        # W^(1): layer1 -> layer2 에 매핑되는 Weight
        self.W1 = np.zeros((n_hidden1, n_input), dtype=np.float32)  # W1(256, 28*28)
        self.b1 = np.zeros((n_hidden1,), dtype=np.float32)

        self.W2 = np.zeros((n_hidden2, n_hidden1), dtype=np.float32)  # W2(128, 256)
        self.b2 = np.zeros((n_hidden2,), dtype=np.float32)

        self.W3 = np.zeros((n_output, n_hidden2), dtype=np.float32)  # W3(10, 128)
        self.b3 = np.zeros((n_output), dtype=np.float32) # b3

    def __call__(self, x):
        # (1,28,28) -> (28*28)
        x = x.reshape(-1)  # 일렬로 피기

        h1  = sigmoid(np.dot(self.W1, x) + self.b1)   # W1(256, 28*28), x(28*28), b1(256) -> h1(256)
        h2  = np.dot(self.W2, h1) + self.b2  # W2(128, 256), h1(256), b2(128) -> h2(128)
        out = np.dot(self.W3, h2) + self.b3  # W3(10, 128), h2(128), b3(10) -> out(10)

        return softmax(out)  # (10)
```



6. 모델 생성

```
model = MyMLP(28*28, 256, 128, 10)
```

```
print model.W1.shape, model.b1.shape
print model.W2.shape, model.b2.shape
print model.W3.shape, model.b3.shape
```

```
(256, 784) (256,)
(128, 256) (128,)
(10, 128) (10,)
```

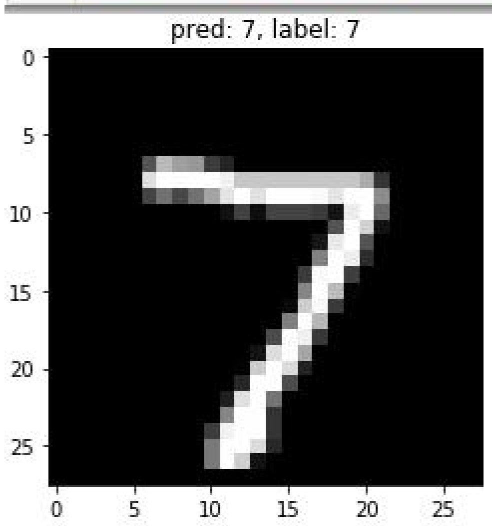
7. 미리 학습된 weight 로드

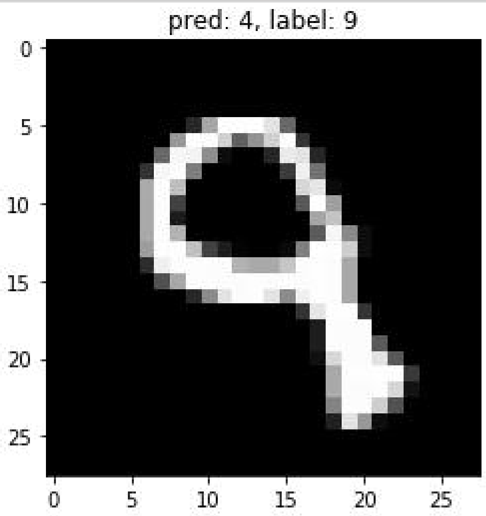
```
weights = np.load('./nets/mlp_weight.npz')
model.W1 = weights['W1']
model.b1 = weights['b1']
model.W2 = weights['W2']
model.b2 = weights['b2']
model.W3 = weights['W3']
model.b3 = weights['b3']

print model.W1.shape, model.b1.shape
print model.W2.shape, model.b2.shape
print model.W3.shape, model.b3.shape
```

```
(256, 784) (256,)
(128, 256) (128,)
(10, 128) (10,)
```

8. 테스트

```python
mysum = 0

m = len(mnist_test)
cnt = 0
for i in range(m):
    image, label = mnist_test.__getitem__(i)  # 0번째 데이터
    output = model(image)

    if (i%1000==0):
        img = image.numpy()  # image 타입을 numpy 로 변환 (1,28,28)
        pred_label = np.argmax(output)
        plt.title("pred: %d, label: %d" %(pred_label, label) )
        plt.imshow(img[0], cmap='gray')
        plt.show()

    cnt += 1
    mysum += (np.argmax(output) == label)
print "정확도: %.2f" %( (float(mysum) / cnt) * 100.0 )
```






```
정확도: 91.91
```

오늘의 과제

- '[실습01] MLP-행렬곱 구현' 를 실습한다.
  - Sigmoid, softmax 함수 구현 포함
  - P.3 ~ 9
- HTML 파일을 다운받아 e-campus 에 제출한다.
- 마감: e캠퍼스 참조