

VIETNAM NATIONAL UNIVERSITY HO CHI MINH CITY
UNIVERSITY OF SCIENCE
COMPUTER VISION



DIGITAL IMAGE & VIDEO PROCESSING

LAB 02 REPORT

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1 Function definition sigmoid and corresponding derivative

- Sigmoid and tanh

```
4 class Activation:
5     # sigmoid activation
6     @staticmethod
7     def sigmoid(s):
8         return (torch.exp(s) - torch.exp(-s)) / (torch.exp(s) + torch.exp(-s))
9
10    # tanh activation
11    @staticmethod
12    def tanh(s):
13        return torch.tanh(s)
```

- Derivative of sigmoid and tanh

```
4 class ActivationPrime:
5     # derivative of sigmoid
6     @staticmethod
7     def sigmoid_derivative(s):
8         return (4 * torch.exp(2*s)) / ((1 + torch.exp(2*s)) * (1 + torch.exp(2*s)))
9
10    # derivative of tanh
11    @staticmethod
12    def tanh_derivative(s):
13        return 1 - torch.tanh(s) ** 2
```

2 PyTorch Neural Network

- Required number of epochs, and the corresponding learning rate.

```
19 # train your network
20 net.use(Loss.mse, LossPrime.mse_prime)
21 net.fit(x_train, y_train, epochs=200, alpha=0.4)
22
```

- Training data

```

7
8 # training data
9 x_train = torch.tensor([[[0, 0]], [[0, 1]], [[1, 0]], [[1, 1]]], dtype=torch.float)
10 y_train = torch.tensor([[[0]], [[1]], [[1]], [[0]]], dtype=torch.float)
11

```

3 Result

```

On epoch 185 an average error = tensor(0.0412)
On epoch 186 an average error = tensor(0.0479)
On epoch 187 an average error = tensor(0.0460)
On epoch 188 an average error = tensor(0.0278)
On epoch 189 an average error = tensor(0.0282)
On epoch 190 an average error = tensor(0.0431)
On epoch 191 an average error = tensor(0.0379)
On epoch 192 an average error = tensor(0.0457)
On epoch 193 an average error = tensor(0.0489)
On epoch 194 an average error = tensor(0.0343)
On epoch 195 an average error = tensor(0.0269)
On epoch 196 an average error = tensor(0.0362)
On epoch 197 an average error = tensor(0.0429)
On epoch 198 an average error = tensor(0.0400)
On epoch 199 an average error = tensor(0.0506)
On epoch 200 an average error = tensor(0.0374)
[tensor([[ -0.1399]]), tensor([[ 0.9819]]), tensor([[ 0.9817]]), tensor([[ 0.3682]])]

```