

README

This is the illustrative document for exercise 2 of Machine Learning Course.

Content

- files
 - network
 - environment
 - run
-

Files in the package

1. *Exercise2_20190919.pdf* - The assignment file.
 2. *MLP_with_BP.py* - The running file.
 3. *network.py* - The MLP class file.
 4. *utils.py* - The util functions file.
 5. *exercise_2_ML_季林成_2017012775_经71.pdf* - The experiment report file.
 6. Given dataset files
 1. *train_10gene.csv*
 2. *train_10gene_sub.csv*
 3. *train_label.csv*
 4. *train_label_sub.csv*
 5. *test_10gene.csv*
 6. *test2_10gene.csv*
 7. *test_label.csv*
 8. *test2_label.csv*
 7. Preprocessing dataset files
 1. *unquoted_(train_10gene/train_10gene_sub/train_lable/train_label_sub/test_10gene/test_label/test2_10gene/test2_label).csv*
 2. *transposed_unquoted_(train_10gene/train_10gene_sub/train_lable/train_label_sub/test_10gene/test_label/test2_10gene/test2_label).csv*
 8. *lr_train_1/2_test_1/2_e300.log* - train log files
 9. *lr_train_1/2_test_1/2_e300.png* - screenshot files
 10. README.md
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Network structure

The network is a three-layered MLP with BP algorithm, seeing *network.py*.

The functions includes forward() backward() and test()

The forward function:

$$\mathbf{x}_1 = \begin{bmatrix} 1 \\ \mathbf{x} \end{bmatrix}$$

$$\mathbf{a}_1 = \mathbf{w}_1 \cdot \mathbf{x}_1$$

$$\mathbf{y}_1 = \text{sig}(\mathbf{a}_1)$$

$$\mathbf{x}_2 = \begin{bmatrix} 1 \\ \mathbf{y}_1 \end{bmatrix}$$

$$\mathbf{a}_2 = \mathbf{w}_2 \cdot \mathbf{x}_2$$

$$\mathbf{y}_2 = \text{sig}(\mathbf{a}_2)$$

$$\mathbf{x}_3 = \begin{bmatrix} 1 \\ \mathbf{y}_2 \end{bmatrix}$$

$$\mathbf{a}_3 = \mathbf{w}_3 \cdot \mathbf{x}_3$$

$$\mathbf{y}_3 = \text{sig}(\mathbf{a}_3)$$

Then returns \mathbf{y}_3 .

The backward function

$$dw_3 = \text{learning rate} * \frac{dw_3}{da_3} \cdot \frac{da_3}{dy_3} \cdot \frac{dy_3}{de} \cdot \frac{de}{dE}$$

$$w_3 = w_3 - dw_3$$

Adjust w_3 , w_2 , and w_1 .

The test function

Same as the forward function except that no self data is changed.

Programming environment

Python 3.7.x(stable), Numpy, Pandas

How to run the code

1. open *MLP_with_BP.py*
2. search for "train_data" (or train_target, test_data, test_target, learning_rate, epochs) to locate the main code block at the end
3. change the setting with new ones
4. run *MLP_with_BP.py*
5. NOTE: when warning info "parell table not identical" appears, please run the code again