Instruction Manual

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Thank you for using my program! Here are some instructions before you start.

Project: Digit Recognition based on Artificial Neural Network(ANN)

Python version: python 3.7.3
Environment: python3.7 environment
                      'numpy', 'matplotlib', 'sklearn' packages are loaded

Notice: After you unzip the compressed folder '1-ZhowZiyang.zip', please do not move any folders and files. All required programs are in the folder named 'program'. You can open it and see them. Besides, in 'program' folder, there are two folders, 'data' and 'model' , which are used to save experiment data and trained model parameters. Please do not move or delete them.

How to test program：

You can run all programs in sequence to examine the results. Or you can examine my test programs using your data.

In 'model' folder, I saved model parameters I got before, so you can run all test program directly. Please change the file name of your test data to **test_feature.txt** (task2) and **test_set.txt** (task 3 and task 4), and **replace the original test data in the folder 'data'**. Then you can run test programs to get recognition results.

How to run programs:

Method 1:

If you have Python installed on your system, you can double-click to run '. py' files by setting the open mode to python. In this way, you can double-click to run all programs directly. This is the most convenient and efficient method to exam programs. You can try this method in future lectures.

Method 2:

If method 1 failed, you can use command line terminal to run programs.

Step 1: Open the command line terminal, cd to the 'program' folder storage directory as following:

```
C:\Users\lenovo>cd desktop/1-ZhouZiyang/program

C:\Users\lenovo\Desktop\1-ZhouZiyang\program>
```

Step 2:   type 'python' and the program file name to operate these programs：

```
C:\Users\lenovo\Desktop\1-ZhouZiyang\program>python problem1-test.py
```

Then you can get required output and plots in command line terminal.

You can run the following programs in sequence to examine the results：

problem1-train.py

This program shows 2 plots. The first one shows data points with 2 features of 10 digits in one plane and the second plot shows those digits in 10 planes separately. After you close the first plot, the second plot will appear.

problem1-test.py

This program is the same as the program **program1-train.py**, but it uses test data as input.

Problem2-train.py

This program compares ANN models with different hidden-layer units. It can show model accuracy with 3-fold cross-verification and parameters of best model in command line terminal. And it will show a plot of classification results using train data.

problem2-test.py

This program reads model parameters trained in **problem2-train.py** and uses those to predict test data. It will show prediction accuracy and randomly choose 10 data to verify recognition results in command line terminal. Then there will be a figure to show recognition result in 2-dimensional plane.

problem3-1-train.py

This program compares two ANN models and shows the learning accuracy using train data with 3-fold cross-verification.

problem3-test.py

This program reads model parameters trained in **problem3-1-train.py** and uses those to predict test data. It will show prediction accuracy in command line terminal.

problem3-2-train.py

This program will take no more than one minute to run to get the plots. Please wait patiently. It will show in-sample error and test-data error plots in iterations.

problem4-train.py

This program will also spend some time to train 4 ANN models. And you can get compare results in in command line terminal.

problem4-test.py

This program reads model parameters trained in **problem3-1-train.py** and uses those to predict test data. It will show prediction accuracy of 4 ANN models in command line terminal.

If there are any problems during the operation, please contact me:

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THANK YOU! GOOD LUCK!