Summer Training Program for Deep Learning

Programming Assignment 1

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1 Problem Description

In this programming assignment, you are expected to implement a deep neural network (DNN) to recognize hand-written digits and classify news. You need to complete the simple classifier which we already handled a lot of works such as data pre-processing, building model, visualization, etc. The provided source code can be executed and produce a preliminary results.

There are two tasks. First is MNIST. The MNIST database [1] of hand-written digits, has a training set of 60,000 examples, and a test set of 10,000 examples. The digits have been size-normalized and centered in a fixed-size image. Second is Reuters news.[2] Dataset of 11,228 newswires from Reuters, labeled over 46 topics.

2 TODO

There are two things you need to do. First, you need to modify the source code we provide so that it can generate a higher accuracy For example, you can try different width, depth, batch size, and activation function, etc. Second, remember to observe the visualization result of each layer and analyze them.

The baseline for MNIST task and Reuters news task are 98.0% and 78.0%, respectively. Do your best and overcome these baselines.

3 How to install Keras

In this work, we recommend you to use Keras since it is really convenient to build a DNN. Here is the guide for Keras installation [3]. You can install Keras from PyPI:

```
$ sudo pip install keras
```

4 How to run the sample code

You can clone the sample code by this command:

```
$ git clone https://github.com/dapy4372/SummerTraining_hw1.git
```

In these two task, we use Keras based on Theano. [4] For MNIST task, you can run the program by this command:

```
$ python mnist_mlp.py
```

First, this program will train a DNN model and get a accuracy on testing data. Second, this program will use t-SNE [5] to do dimension reduction of each hidden layer and output layer and visualize them.

For Reuters task,

```
$ python reuters_mlp.py
```

This program will just train a DNN model and get a accuracy on testing data. You need to do visualization by yourself. (optional)

By GPU acceleration, these programs will be finished in two minutes (the number of epochs is 20). If you don't have GPU resources, please remove the line 4 in this program and you can also finish these task by CPU in a reasonable time.

5 Reminder

- If you need a account on workstation, please contact with teaching assistant, Yang-De Chen, sacredzaro@gmail.com.
- If you have any question, please feel free to contact us or post it on Facebook group.

References

[1] MNIST database
`http://yann.lecun.com/exdb/mnist/`

[2] Reuters News database
`https://keras.io/datasets/`

[3] Keras installation
`https://keras.io/#installation`

[4] Theano
`http://deeplearning.net/software/theano/`

[5] sklearn t-SNE
`http://scikit-learn.org/stable/modules/generated/sklearn.manifold.TSNE.html`

[6] Keras mnist mlp example
`https://github.com/fchollet/keras/blob/master/examples/mnist_mlp.py`

[7] Keras reuters mlp example
`https://raw.githubusercontent.com/fchollet/keras/master/examples/reuters_mlp.py`