LING572 Hw10: NN and Backpropagation
Due: 11pm on March 20, 2019

The NN code is under dropbox/18-19/572/hw10/code/:

- hw10.sh: the shell script that calls hw10_script.py.

  - To run hw10.sh, the command line is "hw10.sh config_file output_file"
  - config_file specifies the architecture of the NN (see **config.yml**). Note that in `config.yml`, if you are using more than 1 hidden layer, that `hidden_neurons` must be a **whitespace** separated list of integers: no commas or anything like that. There will be an error if there is a mismatch between # `hidden_layers` and length of the list `hidden_neurons`.
  - output_file will be a file consisting of "# correct / # instances" per epoch. For the final accuracy, just report the final line as a percentage.
  - The script will print runtime to stdout.

- hw10_script.py: the python script that reads in the training data and test set, and calls network.py to do training and testing.

- network.py: the NN code that is modified from the package we used in hw9

Q1 (25 points): Run hw10.sh with different config file settings (i.e., changing the values in **config.yml**) and fill in Table 1. The **activation** value in the config file should be set to 0 (for sigmoid function). For the learning rate, keep it as 0.5.

Table 1: Classification accuracy with **sigmoid** activation function

Expt id	# of hidden layer	# of neurons in hidden layers	# of epoches	mini-batch size	test accuracy	CPU time (in minutes)
1	1	30	30	10		
2	1	30	30	50		
3	1	30	100	10		
4	1	60	30	10		
5	2	30, 30	30	10		
6	2	40, 20	30	10		
7	3	20, 20, 20	30	10		

Q2 (50 points): Modify `network.py` and `config.yml` under that directory so that the new code will use tanh when **activation** value in the config file is set to 1. For the learning rate, keep it as 0.5.

- Fill out Table 2, which is the same as Table 1, except that it uses **tanh** as the activation function.

- In the readme.[txt | pdf], explain which functions (or which lines) in which file(s) you have changed.

Table 2: Classification accuracy with **tanh** activation function

Expt id	# of hidden layer	# of neurons in hidden layers	# of epoches	mini-batch size	test accuracy	CPU time (in minutes)
1	1	30	30	10		
2	1	30	30	50		
3	1	30	100	10		
4	1	60	30	10		
5	2	30, 30	30	10		
6	2	40, 20	30	10		
7	3	20, 20, 20	30	10		

- Submit the modified python code. Please keep the file names unchanged.

Submission: Submit the following to Canvas:

- Your note file *readme.(txt | pdf)* that includes Tables 1 and 2, and any notes that you want the TA to read.

- hw.tar.gz that includes all the files specified in /dropbox/18-19/572/hw10/submit-file-list, plus any source code (and binary code) used by the shell scripts.

- Make sure that you run **check_hw10.sh** before submitting your hw.tar.gz.