

Homework 4
Computer Vision
Spring 2021
Skidmore College
Instructor: Michael Eckmann

=====

Starting from the provided code in starter.py implement the learning of a Neural Network with 3 layers of the following size:

2 input units
4 hidden units
and
1 output unit

Note: the 2 and 4 exclude the bias unit but your network should be implemented with a bias unit on both the input layer and the hidden layer.

Implement functions for sigmoid and sigmoidprime.

Code in starter.py is provided that reads in 200 training examples into desMat and ytrain.

Note:

desMat.shape is (200, 1, 3)

desMat[0] is
array([[1. , 0.01850413, 0.89230375]])

desMat[0].transpose() is:
array([[1.],
 [0.01850413],
 [0.89230375]])

x in the pseudocode assumes a column vector of 3 values like desMat[0].transpose() shape

If you write the learning code correctly, and you leave these hyperparameters as they are:

NUM_EPOCHS = 1000

learnRate = 0.08

batchSize = 10

L = 3

2 input units, 4 hidden units, 1 output unit

s1 = 2

s2 = 4

s3 = 1

you should get the test data to be 99% accurate. That is 2 of the 200 test examples will be wrong.

Implement the printing of the cost for 1 epoch and instead of printing it every epoch, print it 100 times total.

For example: if NUM_EPOCHS is 2000 then every 20 epochs print the cost like:

epoch 20 of 2000 cost = _____

.
. .
.

epoch 240 of 2000 cost = _____

epoch 260 of 2000 cost = _____

.
. .
.

epoch 2000 of 2000 cost = _____

or if it is easier --- you can start printing on epoch 0 and last would be 1980 of 2000

=====

Extra credit:

Implement functions for relu and reluprime and allow your code to have a hyperparameter boolean that selects whether to use sigmoid in the hidden layer or relu on the hidden layer.

Note: I got good results when I always had the output layer use sigmoid.

Then if you use relu in hidden layer and change these hyperparameters to these values:

NUM_EPOCHS = 2500

learnRate = 0.03

you should get the test data to be 99.5% accurate. That is only 1 of the 200 test examples will be wrongly predicted.