

CS 3891/5891

Spring 2018

Assignment 7

Adam

The MNIST database contains the dataset for this problem. Let ld be the last digit of your student ID. Develop an image recognition algorithm using logistic regression based on gradient descent that can correctly classify handwritten images as ld or non- ld .

1. *Preprocessing*

- Typically, pictures are reshaped to column vectors. The images in the dataset are of size (28,28) and should be reshaped to column vectors of size (28x28,1).
- For scaling of picture datasets, it is simpler and more convenient and works almost as well to just divide every row of the dataset by 255 (the maximum value of a pixel channel).
- For this exercise, you need to change the labels of the training and testing data sets. A label of an image should be 1 if the image shows ld and 0 otherwise.

2. *Adam*

- Train a 3-layer neural network to classify the data using Adam.
- You can start with 2 hidden layers with 20 and 10 units respectively
- Use ReLU in the hidden layers and sigmoid in the output layer.
- Plot the learning curve (cost function vs. number of iterations).
- Compute the training and test error.
- Start with the suggested hyperparameter values and investigate the impact of the hyperparameters.

Submission

- A report describing your solution
- Your software
- Jupyter notebook (optional)