

MATH637, Spring 2019

Homework 3: More learning with MNIST

Due Friday, May 10th, 5:00pm

The goal of this homework is to apply what we have learnt in the previous weeks to the MNIST dataset. See Homework 2 for more information about how to pre-process the dataset. As in Homework 2, you can random sample 5000 images for training if some of the program is too slow to run.

1. Deep learning

Construct a deep neural network with 2 fully-connected **hidden layers** to classify the hand-written digits using the functions provided by tensorflow.keras. Using validation accuracy on the test set (as in Homework 2) to see how the numbers of nodes in the layers influence the accuracy.

A sample of the codes for a network with one hidden layer can be found in the supplementary of Lecture 20.

2. Manifold learning

Pick two algorithms for manifold learning that you like and apply them to the dataset to visualize it in a two-dimensional space. Compare the performances.



Figure 1: Sample images from MNIST test dataset.