ADS2 Problem Set 2.10

Supervised learning: MNIST digit classification

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Training a supervised learning model for digit classification

In this problem set you will follow up what you accomplished in the practical and the previous sessions. If you have not, please complete them first. You will explore variations of the procedure established in the practical but should otherwise follow the same sequence.

1. Data normalisation. In the practical you normalised data by dividing all feature values by 255 to ensure that they fall between 0 and 1. This is not the only way to do normalisation. Now try different (wider, narrower) ranges as well as training your model without normalisation. What classification performance do you get? Is it better or worse? Why do you think is that the case?

2. You can experiment with other ANN parameters, e.g. number of iterations.
   `nn = nnet(train_data, train_labels_matrix, size = 7, maxit = 1000, softmax = TRUE)`
   will train a neural network with 7 hidden layer neurons and 1000 iterations.
   (How) does the convergence of the errors change?
   (How) does training and validation classification accuracy change?

3. If you computed features in several different ways, try to train models for all of them (or at least those you think are good). Discuss how they compare to each other.

Remember to always take your best performing model and apply it to the testing data (e.g. again its first 1000 examples), calculating the features and normalizing them in the same way.

You can also train your model with the full data set, not just 1000 examples, if your computer is fast enough for that. This may improve your classification performance.