

Homework 4

March 14, 2018

Problem 1. Design an RBF NN that approximates the mapping $z = f(x, y)$, given by

$$z = \cos(3x)\sin(2y)$$

over the area determined by $-1 \leq x \leq 1$ and $-1 \leq y \leq 1$.

[github](#): [MNIST Neural Network matlab](#)

(20 pts)

Problem 2. In this problem you will train a neural network to classify hand-written digits. The steps that will be used for solving this problem will be similar to your project. We provided the required dataset and you will have to design a neural network architecture.

1. Understand the data. We provided the code to visualize the data. Check the dimension of input and targets. If they are not in correct dimensions, make changes so that they can be used for training. Also check if the data can be normalized.
2. Start with a random model (choose optimization model, learning rate, number of hidden layers etc.)
3. Train the model. Observe training and validation accuracies. Make sure they are not over-fitting or under-fitting.
4. If the model is either over-fitting or under-fitting, make changes to your initial model for improving the accuracies and explain the changes you made.
5. Finally, if you think that the accuracy cannot be further improved, test your trained model on test data.
6. Give the details of your model along with learning curves.

Note: The best classification accuracy for MNIST dataset is ≈ 0.99 . This kind of accuracy is possible only when using convolutional neural networks. Since we are using only neural networks, you need not worry about getting very high accuracy.

(80 pts)

You can use MATLAB toolbox for this homework.