

Exercises 2 – MLP, Kohonen, RBF

Problem 1: MLP (50)

In this practice we want to classify Farsi digits by using the Hoda Farsi Digit Dataset.



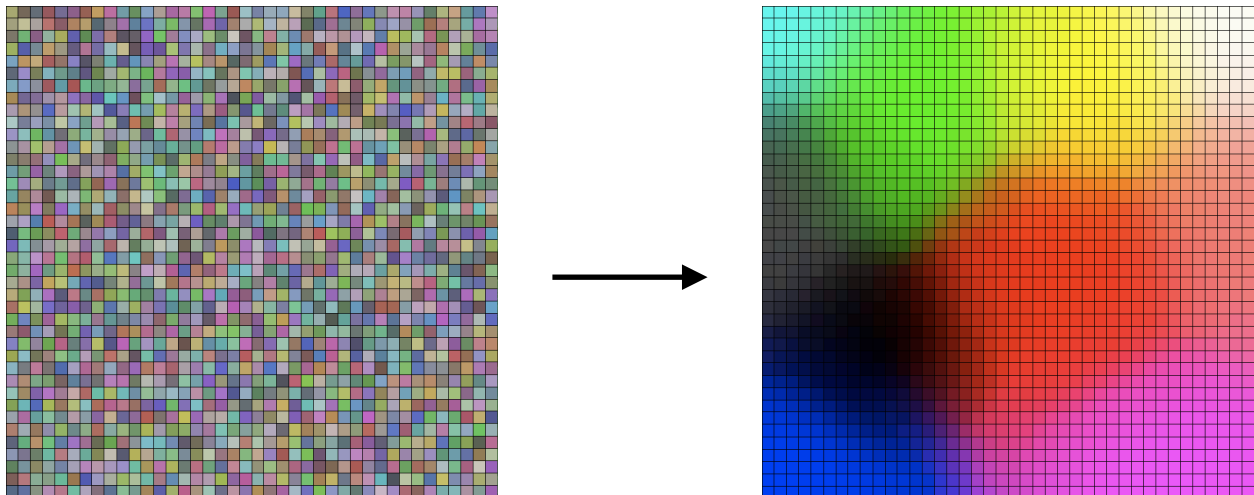
- (a) Use the [Hoda Dataset Reader](#) and show one sample data from each train and test dataset. (5)
- (b) Design an MLP by using Keras, and train it on Hoda dataset.
 - I. Calculate the Precision, Recall, and F1-Score for the whole dataset and each class individually. (10)
 - II. Plot the error for both train and test dataset during the learning. (10)
- (c) Describe what «Drop-out» is. Then recalculate section (b), this time by using a drop-out for the network, and compare the results with the previous results. (10)
- (d) Describe what «Validation Set» is. Then recalculate section (b), this time by using a validation set, and compare the results with the previous results. (10)
- (e) What is «Batch Size»? Briefly describe the different types of it. Using what kind of batch size results the fastest training phase? (5)

Problem 2: Kohonen (30)

Train a Kohonen's Self-Organizing Feature Map (SOFM) which can map a dataset of 3-Dimensional data into a 2-Dimensional space.

First, create 1600 colors in RGB space randomly. All Red, Green, and Blue values must be between 0 and 255. Then feed this dataset of 3D data to the network and represent it into a 40x40 map of nodes, which can be shown as a picture with height and width of 40 pixel.

The goal is to take the 3D color vectors and map them onto a 2D surface in such a way that similar colors will end up in the same area of the 2D surface.



Problem 3: RBF (20)

Train an RBF Neural Network for function approximation.

Use this network and predict the $F(x) = x^3$, then compare the output of the network with the results of the function $F(x)$ and plot the comparison for the data in range of $x \in [-2, 2]$.

Please pay attention to the followings:

- This homework has 100 marks.
- You should send your homework to iust.ci972@gmail.com. You only need to email a zip file named as p2_94520000_lastname.zip. The zip file should contain a document to fully explain your code and the answer to other questions, the code itself and images containing your program execution and charts.
- You should submit your homework before Ordibehesht 15th (11:59 pm Ordibehesh 14th). You have 3 extra days to submit your homework after the given deadline during this semester. If you exceed your 3 extra days, you will lose 10 percent of your mark by each day.
- Please subscribe to our telegram channel (@CAI972) to get the latest news about your homework.

Good Luck