Shiraz University

Neural Networks and Deep Learning (Farvardin 1401)

Assignment #1: Classification with Single Layer Neural Networks

Due date: 19th Farvardin 1401

In this Assignment, you are asked to train and test 1) a single-layer continuous-neuron perceptron neural network and 2) a Learning Vector Quantization to classify Handwritten Math Symbols.

Dataset:

- ➤ This dataset contains 1900 handwritten digits and arithmetic operators.
- ➤ Total number of classes: 19
- ➤ Most images resolution are 400×400 pixels and the others are 155×135.
- ➤ Each class contains 100 PNG images.

Your Task:

- First convert PNG images with 3 channels (RGB) to grayscale images with 256 intensities.
- Then resize images to 100×100.
- Select 80% images of <u>each class</u> as train data and use the other 20% as test data.

- ➤ **Part A: Continuous-neuron Perceptron**
  - Train a single-layer continuous-neuron perceptron neural network.
  - To examine the generalization, use test pictures and report the Accuracy, Precision and Recall.

- To examine its robustness to noise, degrade the training images with 10% and 20% of noise (e.g. salt and pepper). Use them as new test data for the trained net and report the accuracy.

> **Part B: Learning Vector Quantization (LVQ)**
- Train an LVQ neural network while using SOM as its initial code-book vectors.
- Repeat Part A steps and report the Accuracy, Precision and Recall on test data and noisy train data and compare them with Part A.

Notes:
> **Pay extra attention to the due date. It will not extend.**
> **Be advised that submissions after the deadline would not grade.**
> **Prepare your full report in PDF format and include the figures and results.**
> **Feel free to use any predefined functions.**
> **Email your files as a folder in this format (HW#_student#_name_family.zip).**
> **Email: soroushmehrpou@gmail.com**