HW# 11
Application of Neural Network (CpE 520)
Due date: Nov. 30th , 2021

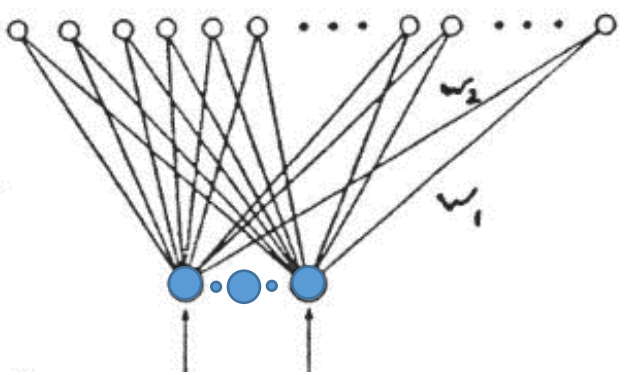
Read Chapter 9, pp. 425-266 on KSOFM, Simon Haykin "Neural Networks and Learning Machines" 3rd addition, Prentice Hall

Problem 1:

1. Train a KSOFM network (see the diagram) with m=40 output nodes (number of centroids) using the MNIST training dataset as input (each digit is 28x28).
2. Start with a one-dimensional window of size 31 for the neighborhood (see my notes for a similar example) and shrink the neighborhood window to 1 as the training is completed. You need to figure out how to use the exponential neighborhood decay with appropriate parameters as shown in my notes. You can also decrease the learning rate α(t) as shown in my notes.
3. After you finished training, display the 40 centroids in the order they appear on the network grid. That is each output node has an associated centroids to be displayed.

http://yann.lecun.com/exdb/mnist/

40 output nodes on a 1-D grid



28x28 input MNIST digit

$$h_{jJ^*} = \exp(-\frac{d_{jJ^*}^2}{2\sigma(t)^2})$$

$$\sigma(t) = \sigma_0 \exp(-\frac{t}{\tau_1}) \quad t = 0,1,2,...$$

$$\alpha(t) = \alpha_0 \exp(-\frac{t}{\tau_2}) \quad t = 0,1,2,...$$