CMSC 491N/691N **Introduction to Neural Networks** **Spring 2001**
Section 0101 Thursday 7:00-9:30 PM PHYS-201

Project Two

This project assignment involves applying Kohonen Self-Organizing-Map (SOM) model to solve a 10-city geometric traveling salesman problem (TSP). The 10 cities, A, B,..., J, are represented by 10 points on a unit square plane, whose coordinates are listed below.

A: (0.556, 0.560)
B: (0.099, 0.775)
C: (0.895, 0.546)
D: (0.059, 0.864)
E: (0.208, 0.748)
F: (0.055, 0.217)
G: (0.434, 0.660)
H: (0.835, 0.696)
I: (0.679, 0.210)
J: (0.126, 0.597)

The goal is to find the shortest tour that visits every city exactly once and then returns to the starting city (the shortest Hamilton circuit in graph theoretic term). The length of a tour is defined as the sum of the lengths of all edges on that tour, and the length of an edge is defined as the Euclidean distance of the two adjacent points.

Implementation
You are asked to implement a SOM network to solve this problem, using the algorithm given in the textbook (pp. 170-172). The network should have 10 output units, as there are 10 cities. Since the computation result is a circuit, these units should have a linear topology, with the first and the last also connected. The following are the suggestions for the network parameters.

- *Initial weights*: small but different values in [-0.1, 0.1].
- *Learning rate* (alpha): start with 0.5, slowly reduced at the rate of 0.001 per epoch.
- *Neighborhood radius* (R): start with 1, reduced to 0 after 100 epochs

You should test these parameters and make necessary changes if needed. You can use any language for this project.

Report
Besides the description of the project and the source code, you should include the following in the project report:

- The final selections of the parameters, including the schedules of the reductions of learning rate and radius.
- A sequence of at least four maps, including the initial and the final ones, generated during the simulation in the way described in the textbook (pp.186-187) and discussed in the class.
- The tour you find (a sequence of cities) and its length. (You should resolve by hand any ambiguity concerning some cities in the final map.)
- Any other issues you wish to report and discuss.

The due day: May 10, the last day of this class.

Policy for late submission: 20 points off within one week of the due day. No project will be accepted after May 17.