Course: Neural Networks I

EE455/555, SySc 575
MW 6:40-8:30pm
205 Urban Center

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COURSE WEB PAGE:
http://www.sysc.pdx.edu/classes.html
then click on
AI:Neural Networks I

also, visit
www.nwcil.pdx.edu
NW Computational Intelligence Laboratory
207 Harder House / Systems Science
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Neural Networks

Neural networks is a computational and engineering methodology based on emulating how nature has implemented biological brain (in particular, the brain's massively parallel and learning aspects). As such, it holds promise for significant impact on how important classes of scientific and engineering problems are solved. The objective of the two-term sequence is to have the students obtain a working knowledge of this forefront technology.

Neural Networks I (Fall term): Covers basic ideas of the neural network (NN) methodology, a computing paradigm whose design is based on models taken from neurobiology and on the notion of "learning." A variety of NN architectures and associated computational algorithms for accomplishing learning are studied. Experiments with various of the available architectures are performed via a (commercial) simulation package. Students do a project on the simulator, or do a special programming project. Prerequisites: senior standing in EE or CS, or graduate standing.

Texts:

1. *Neural Networks, a Comprehensive Foundation*

(2nd edition.) Simon Haykin, Prentice Hall, 1999.

2. *Neural Computing* (tutorial volume of manual for the NeuralWorks simulation package), Neural-Ware, Inc., 1993. [This is available as a pdf file on the Neuralworks CD -- see below.]

Simulation Package:

NeuralWorks Professional II by NeuralWare
List price $1995

Copy of CD provided to each student as follows:
CD Contains

1) Software, paid via lab fee of $80.
2) Pdf file of Manual, via separate fee of $80.
   Pay via check made out to PSU (or cash); bring to class on day CDs are handed out.

Schedule for Fall, 2003.

While this is the 15th year I am offering this course, neural networks is a rapidly developing field with new text books appearing regularly. I used a different text book virtually every other year, in the past. This time, however, I am sticking with the Haykin book, which was published in 1999.

For the Haykin book, pay close attention to the word 'COMPREHENSIVE' in the title. Covering all the

material in this book would likely take (at least) a full year course.

As far as examinations are concerned, you will be held responsible mostly on the material presented in class. I do not lecture from the text. Selected portions of the texts will be assigned as supplemental readings, in as coordinated a way as possible for us.

The Haykin book, in particular, will serve as an **excellent reference resource** for you as you pursue further study and/or application of this material in your future professional activities.

All assignments will be given in class, and will be available on the course Web Site as they are given.

There will be one in-class midterm exam, and an in-class final exam.

Topics to be covered include:

--Intro/Overview,

--*feed-forward* networks

  --*single-layer:* Perceptrons, Adaline,

  --*multi-layer:* Backpropagation algorithm;

--*feedback* networks/ *associative memories:*

  --Hopfield, BAM, BSB;

--*unsupervised learning/self-organizing* networks:

  --Competitive, Counterprop, LVQ, SOFM, ART.

General ideas applicable to all will be discussed throughout the term, e.g., notions of

  --- *performance criteria*,

  ---*network capacity*,

  ---*ability to generalize well*,

  ---etc.

In addition to the reading assignments, there will be one programming assignment whose purpose will be to 'fix' the ideas of one of the learning algorithms in your understanding; there will be assignments on the simulator to do hands-on experimentation with the types of neural network architectures being studied; and a major project given during the last 3 weeks of the term, based on data and a problem context that I will provide.

To assist you in getting up to speed on the Simulator, we will offer a session (probably in this same room) for an hour+ immediately after class.

Anticipated time slot:
Wednesday, October 9, after class, 8:30 - 10:00 pm

GRADES based on:

Mid-term Exam:	20%
Final Exam:	30%
Homework:	
Depends on what I assign:	(15 -->20%)
Project (last 3-4 weeks):	(35 -->30%)

ASSIGNMENT 1, by Monday 10/6/2003

Read/study following material in Haykin text book:

Table of Contents
Preface
Chapter 1

Note: While Chapter 1 is intended as overview material, the author does include certain details that might not make a lot of sense right now. This is ok; read through the entire chapter. Just plan on coming back and re-reading it later in the term, say in time for the first mid-term. Most (hopefully all) of it will make more sense at that time.

9/29/2003