Psychology 617 (Spring 2004)

Neural Network Models in Psychology

Time: Tuesday and Thursday 8:30 - 10:18 am

Place: 250 TO (Townshend Hall)

Instructor: Jay Myung, 240B Lazenby, 2-1862, myung.1@osu.edu, Office hours: Monday & Wednesday at 11- noon

Description

This is an introductory course on connectionist (neural network) models in psychology, with focus on the theoretical foundations of neural network modeling. The course is intended for the students who have no prior experience with connectionist modeling and will emphasize mathematical properties of various connectionist models. Topics to be covered include: perception, linear associator, backpropagation networks, Hopfield net, Kohonen's maps, Grossberg's ART, and oscillatory networks. Some examples of connectionist models in categorization, priming, visual perception, and language will be discussed.

Prerequisites

- Psychology 321 and 608; or graduate standing; or permission of instructor

Texts and Websites


8. (USC Courseweb): CS542: Neural Computation with Artificial Neural Networks.  
   (http://www-clmc.usc.edu/courses/CS542).

9. (On-line course in neural nets): Neural Nets by Kevin Gurney  
   (http://www.shef.ac.uk/psychology/gurney/notes/index.html)
Evaluation

Students will be evaluated based on one exam, five homework assignments, one class presentation, and class participation in discussion.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Homework (five)</td>
<td>50%</td>
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<tr>
<td>Midterm exam (Thu, May 20)</td>
<td>30%</td>
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<tr>
<td>Class paper presentation*</td>
<td>10%</td>
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<tr>
<td>Class participation of discussion</td>
<td>10%</td>
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To get an A or A-, your total percentage must be at least 80%.

(*: 30-min presentation of a summary of the paper in discussion)

Course Schedule

Week 1 (Mar 30, Apr 1):

Tue:  Introduction: “Brain as a Computing Machine”


Thu: Single neuron computation, Chs. 1 & 2

Demonstration of neural network software


Week 2 (Apr 6, 8):

Tue:  Linear associator network, Chs. 6, 7

Review of vector and matrix algebra


Thu:  Perceptron, Ch. 8

Week 3 (Apr 13, 15):

Tue: **HW#1 due**

Backpropagation network, Ch. 9


Week 4 (Apr 20, 22):

Tue: **HW#2 due**

Model evaluation and model selection in connectionist modeling


Week 5 (Apr 27, 29):

Tue: **HW#3 due**

Reinforcement learning network, Ch. 9


Week 6 (May 4, 6):

Tue: Hopfield network, Ch. 12


Week 7 (May 11, 13):

Tue: **HW#4 due**

Kohonen’s feature maps, Ch. 14

Thu: Grossberg’s ART network


Week 8 (May 18, 20):


Thu: **Midterm Exam** (May 20, Thu at 8:30 - 10:18)

Week 9 (May 25, 27):

Tue: **HW#5 due**

Neural oscillators and perception


Week 10 (Jun 1, 3):

Tue: Neural networks as statistical models


Thu: Neural networks as theories of mind