

ARTIFICIAL NEURAL NETWORKS

COURSE DESCRIPTION:

Basic concepts in neural computing; functional equivalence and convergence properties of neural network models; associative memory models; associative, competitive and adaptive resonance models of adaptation and learning; selective applications of neural networks to vision, speech, motor control and planning; neural network modeling environments. Students will understand the basic concepts, principles, mathematical models, and applications of some classical neural network models. Students will gain experience of applying neural networks to problem solving using MATLAB. Students will understand practical applications and have interests by reading articles.

PRE-REQUISITE:

Calculus, Linear algebra, probability and statistics

REQUIRED TEXTBOOK:

Simon Haykin, *Neural Networks and Learning Machines*, 3rd edition, Prentice Hall, Upper Saddle River, NJ, 2008. ISBN 0131471392.

REQUIRED EQUIPMENT:

No

TOPICS AND SCHEDULES:

Weeks	Course content	Type
1	Introduction to Neural Networks	Lecture
2	Rosenblatt's Perceptron	Lecture
3	Model Building through Regression	Lecture
4	The Least-Mean-Square Algorithm	Lecture
5	Multilayer Perceptrons	Lecture
6	Kernel Methods and Radial-Basis Function Networks	Lecture
7	Support Vector Machines	Lecture
8	Regularization Theory	Lecture
9	Midterm Report	Paper Presentation
10	Principal-Components Analysis	Lecture
11	Self-Organizing Maps	Lecture
12	Information-Theoretic Learning Models	Lecture
13	Stochastic Methods Rooted in Statistical Mechanics	Lecture
14	Dynamic Programming	Lecture
15	Neurodynamics	Lecture
16	Bayesian Filtering for State Estimation of Dynamic Systems	Lecture
17	Dynamically Driven Recurrent Networks	Lecture
18	Final Report	Paper Presentation

WORKLOAD:

There will be two paper presentations. Prior to each presentation, students should select at least two SCI journal papers related to the course topics and turn in to the instructor for final selection. Methodology is the most important part of your presentation.

GRADING:

Mid-term Presentation	35%
Final Presentation	35%
Class Participation	30%