CS 333/CMPE 333 : Neural Networks

Instructor's Name:	Asim Karim	**Year:**	2002-2003
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Office Hours:	**TBA**	**Category:**	Junior
TA for the Course:	**TBA**		

Course Code (Units)	**CS 333/CMPE 333 : Neural Networks (4 Units)**
Course Description	A survey of fundamental methods and techniques of the field of artificial neural networks; single-layer and multi-layer feedforward networks; supervised and unsupervised learning; self-organization; recurrent networks; applications to signal processing, pattern classification, and optimization problems. The exercises will be in MATLAB**.**
Core/Elective	Elective
Pre-requisites	MATH 131 – Linear Algebra
Goals	**1.** To introduce the theory and practice of artificial neural networks **2.** To train students in the design and implementation of neural network systems **3.** To expose students to different neural network models and applications
TextBooks, Programming Environment, etc.	Primary A. Neural Networks: A Comprehensive Foundation by Simon Haykin, 2nd (or 1st) edition, Prentice Hall, 1998, ISBN: 0132733501 B. Handouts Supplementary C. Neural and Adaptive Systems: Fundamentals though Simulations by Jose C. Principe et al., John Wiley & Sons, 1999. (CD-ROM version) D. Web resources
Lectures	***Two sessions of 75 minutes each, and one session of 50 minutes per week for 10 weeks***
Grading	Quizzes 10% Assignments (hand + computer) 20% Project (design + implementation) 10% Midterm Exam 25% Final Exam 35%

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Module	Topics	Sessions	Readings
1	**Introduction** • Biological inspiration • Neuron model • Applications	*3*	***A. Chapter 1***
2	**Learning Process** • Overview of different learning approaches • Use of MATLAB and NN simulation software	*3*	***A. Chapters 2***
3	**Correlation Matrix Memory** • Introduction to memory models	*2*	***A. Chapter 3***
4	**Perceptron** • Earlier NN models • Perceptron	*2*	***A. Chapter 4***
5	**Least Mean Square Algorithm** • Learning rules • LMS algorithm and convergence issues	*2*	***A. Chapter 5***
6	**Multilayer Perceptrons** • Backpropagation algorithm • Derivation • Implementation issues	*6*	***A. Chapter 6*** ***C. Chapter 4***
	MIDTERM EXAM		

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Module	Topics	Sessions	Readings
7	**Hopfield networks and Associative Memories** • Associative meory • Learning rules	*2*	***B. Handout***
8	**Hebbian Learning** • Introduction • Self-organized feature analysis • Principal component analysis	*2*	***A. Chapter 9*** ***C. Chapter 6***
9	**Competitive and Kohonen Networks** • Introduction • Self-organizing feature map • Algorithms	*3*	***A. Chapter 10*** ***C. Chapter 7***
10	**Radial-Basis Function Networks** • Introduction • Function approximation • Regularization theory • Algorithms and applications	*4*	***A. Chapter 7*** ***B. Handout*** ***C. Chapter 5***
11	**Applications and Review** • Pattern recognition • Optimization • Signal processing	*3*	***B. Handout***
	FINAL EXAM		