

EE774/874 Introduction to neural networks

Syllabus

Description:

This course will provide an introduction to the theory and application of neural networks. First the mathematical foundations of neurocomputing will be addressed. Next, this fundamental mathematical knowledge will be expanded through the examination of neural network architectures and learning rules. Students will examine various single- and multi-layer feedforward and recurrent network architectures as well as supervised, unsupervised, and reinforcement learning rules. The course will also discuss example applications of neural networks.

Course objectives:

- i. Introduce students to the mathematical foundations of neurocomputing.
- ii. Examine neural network architectures and learning rules (various single- and multi-layer feedforward and recurrent network architectures as well as supervised, unsupervised, and reinforcement learning rules).
- iii. Introduce students to computer-aided analysis and design tools for neurocomputing within the Matlab suite.
- iv. Discuss example applications of neural networks.

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Website: <http://www.ece.unh.edu/courses/ece774/>

Textbook: Frederic Ham and Ivica Kostanic, *Principles of neurocomputing for science & engineering*, McGraw-Hill, 2001.

Prerequisites:

1. Calculus, linear algebra, differential equations.
2. Matlab experience.

Course Grading:

The course grade will be calculated based on the performance on three exams and the homework assignments. Performance on the exams and homework assignments will be worth the following percentages of the final grade:

Exam #1	15%
Exam #2	15%
Final Exam	30%
Homework	40%

Note that, in order to get a passing grade in the course (D- for undergraduate students and B- for graduate students), undergraduate students will have to get at least 60% of the maximum number of points on the final exam, while graduate students will have to get at least 70% of the maximum number of points.

Homework:

Students will be assigned Matlab-based homework problems as well as mathematical proof problems. The homework assignments are designed to clarify the issues discussed in lectures. Assignments handed in late will be penalized by subtracting 20% of the maximum number of points from the points scored for every day the assignment is late.

Academic Honesty:

Students are encouraged to collaborate on homework assignments and projects. Collaboration can take the form of discussing problems, tools, etc. However, work submitted to the instructor must be the student's own creation, unless explicit exemption is granted by the instructor. Plagiarism will incur a penalty, from zero credit for the given assignment to a failing grade in the course, and will be reported to the ECE Department Chair and CEPS College Dean. Avoiding plagiarism is the responsibility of the student. If unsure whether a practice constitutes plagiarism, students should check with the instructor.

Recitation:

There will be a weekly one-hour recitation meeting. The recitation will be used to discuss Matlab and mathematical proof problems. The meeting time for this recitation will be announced in class.

Office Hours:

The time of the instructor's office hours will be announced in class. Students can also make an appointment to see the instructor. To make an appointment students should send the instructor email with a proposed meeting time.

Relationship of course to program outcomes

The matrix below shows how course objectives support the EE and CE program outcomes. The following scale is used: 0 = no support; 1 = weak support; 2 = moderate support; 3 = strong support.

Program outcomes	Course objectives			
	i. (Math)	ii. (NN)	iii. (Matlab)	iv. (applications)
An ability to apply knowledge of mathematics, science, and engineering	3	3	2	3
An ability to design and conduct experiments, as well as to analyze and interpret data	3	3	3	3
An ability to design a system, component, or process to meet desired needs	1	3	3	3
An ability to function on multi-disciplinary teams	0	0	0	1
An ability to identify, formulate, and solve engineering problems	3	3	2	3
An ability to communicate effectively	0	0	0	0
An understanding of professional and ethical responsibility	0	0	0	0
The broad education necessary to understand the impact of engineering solutions in a global and societal context	1	0	0	1
A recognition of the need for, and ability to engage in life-long learning	2	2	0	2
A knowledge of contemporary issues	0	0	0	0
An ability to use techniques, skills, and modern engineering tools necessary for engineering practice	3	1	3	1