

ECE 8990 Introduction to Neural Networks (Spring 2009)

Objective

To introduce the well-known and widely used neural networks including their architectures, training algorithms, and applications in areas such as signal processing and pattern classification.

Time / Room

TuTr 2:00-3:15pm / Simrall 213

Instructor

Dr. Jenny Q. Du (Simrall 238), Phone: 662-325-2035, Email: du@ece.msstate.edu.

Office Hours

TuTr 3:30-5:00pm

Course Website

www.ece.msstate.edu/~du/ECE8990

Textbook

Laurene Fausett, *Fundamentals of Neural Networks, Architectures, Algorithms and Applications*, Prentice Hall, 1994.

Recommended Books

- S. Haykin, *Neural Networks, A Comprehensive Foundation*, 2nd ed., Prentice-Hall, 1999.
- J. C. Principe, *et al.*, *Neural and Adaptive Systems, Fundamentals Through Simulations*, John Wiley & Sons, 2000.
- J. A. Freeman and D. M. Skapura, *Neural Networks, Algorithms, Applications and Programming Techniques*, Addison Wesley, 1992.
- C. M. Bishop, *Neural Networks for Pattern Recognition*, Oxford University Press, 1995.
- B. D. Ripley, *Pattern Recognition and Neural Networks*, Cambridge University press, 1996.

Recommended Journals

IEEE Transactions on Neural Networks
Neural Networks
Neural Computing and Applications
Neural Computation

Course Policies

- **Grading** — Final grades: A (100-90), B (89-80), C (79-70), D (69-60), F (59-0)

1 mid-term exam	30 %
3 projects	45 %
final project	25 %

- **Exams** — The exam is “close book” and “close notes”. Only calculators with simple calculation functions are allowed. No make-up exam will be provided except extraordinary situations. Arrangements must be made in advance with appropriate documentation.
- **Project Reports** — Completed project reports should be turned in at the beginning of class on their due date. No late turn-in will be graded. Projects and homework should be finished

independently. Direct copying from others or from solution manual is unacceptable. The final project includes oral presentation in addition to the project report.

- **Software** — MATLAB is required software for the projects.
- **Correspondence** — Correspondence for this course will be conducted via email and the course website. Each student is required to routinely check his/her email account and the course website for announcements, handouts, etc.
- **Attendance** — Students are expected to attend each class and be punctual. Good attendance will help borderline students.
- **Honesty** — Academic dishonesty will result in an “F” in this course. The detailed Honor Code of MSU can be found at: <http://students.msstate.edu/honorcode/>.
- **Cell Phone** — It is required that cell phones are turned off during classes and exams.

Tentative Course Outline (subject to change)

- Introduction about neural networks (Chapter 1)
 - Typical Architectures
 - Training Algorithms
 - Activation Functions
- Simple neural networks for pattern classification (Chapter 2)
 - Hebb Net
 - Perceptron
 - Adaline
- Pattern association (Chapter 3)
 - Heteroassociative memory neural network
 - Autoassociative neural network
 - Iterative autoassociative neural network
 - Bidirectional autoassociative neural network
- Neural networks based on competition (Chapter 4)
 - Fixed-weight competitive neural network
 - Self-organizing maps
 - Learning vector quantization
- Adaptive resonance theory (Chapter 5)
 - ART1
 - ART2
- Backpropagation neural networks (Chapter 6)
 - Standard backpropagation
 - Variations
- Other neural networks
 - Boltzmann machine
 - Probabilistic neural network
 - Radial basis function neural network
 - Others