Introduction to Artificial Neural Network and Fuzzy Systems

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Course Overview
Outline

• Overview of the course
• Goals, objectives
• Background knowledge required
• Course conduct
• Content Overview (highlight of each topics)
Knowledge Required

• Linear algebra:
  – Familiar with matrices, vectors, inner product operations,
  – Know what are matrix inversion, eigenvalues, singular values, subspace

• Probability and statistics:
  – Probability, distribution, density function, Bayes rule
  – Understand mean, variance, expectation, normal distribution

• Calculus
  – Familiar with derivatives, integration,
  – Understand gradients, integral by parts
Programming

- Matlab\textsuperscript{\textregistered} will be used for all examples. Neural net toolbox and fuzzy logic toolbox are useful but not required. All Matlab m-files used in class will be posted in the course web page.
- Public domain software will be listed on course web page. These include both Matlab and C program implementation of various neural network paradigms.
- Projects may be conducted using C or C++. Other types of programming languages are acceptable too.
Course Conduct

• Forty 50-minute lectures. All lectures will be video taped.
• Three to four homework sets. Each includes multiple problems. Some problems may require programming.
• One take home final will be given one week prior to due date.
• One individual course project, with project proposal, project report, and power point presentation. Electronic copies of these three items will be posted on course web page.
• Homework, final exam. and project report must be typed written on 8”?11” papers and stapled. Graphs and tables must also be printed. Hand-written annotation of the graph is acceptable.
• Teaching assistant will hold office hours, give tutorials.
Major Topics To Be Covered

- ANN Basics, neurons, learning algorithms
- Perceptron learning, and pattern classification
- Multi-Layer Perceptron (MLP), back-propagation learning, and applications
- Pattern classification, Support vector machine (SVM)
- Clustering, Self-Organization Map
- Radial Basis Network
- Time series prediction, system identification, expert system
- Fuzzy Set Theory and Fuzzy Logic Control
- Genetic Algorithm and Evolution Computing
- Learn vector quantization
- Mixture of Expert network
- Recurrent network