

UNIVERSITY OF ALABAMA IN HUNTSVILLE
Department of Electrical and Computer Engineering

EE 610
Introduction to the Theory
and Applications of Fuzzy Systems

Spring 1996

Three credits

Mondays: 4:00–6:50 pm

Instructor: Payman Arabshahi, EB 217-F. E-mail: payman@ebs330.eb.uah.edu, Tel: (205) 895-6380, Fax: (205) 895-6803.

Textbook: Timothy Ross, *Fuzzy Logic with Engineering Applications*, McGraw-Hill, 1994.

Abstract: The concept of fuzzy sets was first introduced in 1965 by Lotfi A. Zadeh. It is based on relative membership of elements in sets, and seeks in part to provide an accurate and useful model of uncertainty. Since its advent, and especially over the past decade, systems relying on one form or another of fuzzy control or pattern recognition have gained prominence. In numerous cases they have become commercial, especially in Japan, and lately, in the US. In this course we trace the development of fuzzy set theory from its elementary mathematical underpinnings to more advanced topics and applications, especially in the areas of decision making, pattern recognition, and control.

Course Outline

- Crisp sets and fuzzy sets.
- Operations on fuzzy sets
- Fuzzy relations
- Fuzzy measures
- Adaptive Fuzzy Processing.
- Uncertainty and information.
- Applications in
 - Optimization
 - Diagnosis
 - Control
 - Pattern Recognition
 - Information Retrieval

Prerequisite

An inquisitive mind!

Grading

Midterm 30%
Project 40%
Final 30%

Notes

- Homework will be assigned on a weekly basis and solutions handed out one week after assignment. Homeworks will not be graded. However, approximately half of the problems in the exams will be similar to those in the homeworks.

Project Description

There are two options for the project for this course.

Emulator Option

Students choosing this topic will emulate a fuzzy system (in software) for a topic of their choosing. Possible applications include fuzzy expert systems, fuzzy control and fuzzy pattern recognition. Students will prepare a written report on their project, explaining in detail the theoretical development, experimental work, and analysis of the results obtained. Those students doing emulator projects that are publishable will receive an automatic 4.0 in the course.

Paper Review Option

A journal paper dealing with fuzzy systems will be assigned by the instructor. The student will write a detailed report on the paper, showing his/her mastery and understanding of the contents of the paper. All relevant mathematical derivations and computer simulations (if any) will be included in the report.

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In all cases source code of any computer software written for the projects will be included as appendix in the report. More details about report format and assignment of papers will be provided in class. Reference material on fuzzy systems will be available for checkout.

References

1. T. Terano, K. Asai and M. Sugeno, *Fuzzy Systems Theory and Its Applications*. Academic Press, 1992.
2. J.C. Bezdek and S.K. Pal, *Fuzzy Models for Pattern Recognition*. IEEE Press, 1992.
3. D. Driankov, H. Hellendoorn, & M. Reinfrank, *An Introduction to Fuzzy Control*. Springer-Verlag, 1993.
4. *Proceedings of the 1992-94 IEEE International Conferences on Fuzzy Systems*.
5. *IEEE Transactions on Fuzzy Systems*.