Lectures for the course: Soft Computing Applications (IT 60108)

Week 1

Lecture 1 – 03/01/2007

- Introduction to the course
- Evaluation Criteria Explained
- Attendance Requirement Stated
- Text Books and Research Materials to form part of the syllabus
- Class Test date announced
- Syllabus described

Lecture 2 – 04/01/2007

- Components of soft computing
- Introduction to fuzzy sets
- Membership function
- Examples of fuzzy sets

Week 2

Lecture 3 – 08/01/2007

- Representation of fuzzy set memberships
- Continuous universe and discrete universe
- Support, Core, Normality, Crossover point, $\alpha$-cuts, Convex fuzzy sets, Bandwidth

Lecture 4 (A+B) – 10/01/2007

- Subset of fuzzy sets
- Union, intersection and complementation of fuzzy sets
- Fuzzy set operations
- Triangular, trapezoidal and Gaussian fuzzy membership functions

Lecture 5– 11/01/2007

- Alternative definition of fuzzy union and intersection
- Exercises on the validity of identities like associative and distributive laws
- Interpretation of fuzzy union and intersection

Week 3
Lecture 6 – 15/01/2007

• Gaussian, Bell and Sigmoid Membership functions

Lecture 7 (A+B) – 17/01/2007

• MF of two dimensions
• Cylindrical extension and projection
• Generalized complementation functions
• Sugeno’s and Yager’s complements

Lecture 8– 18/01/2007

• Generalized union and intersection – T norms and S norms
• De Morgan’s law for T-norms and S-norms.

Week 4

Lecture 9 – 22/01/2007

• Extension Principle
• Introduction to binary fuzzy relation

Lecture 10 (A+B) – 24/01/2007

• Binary Fuzzy Relation
• Composition of Binary Fuzzy Relations
• Max-min and Max-product composition

Lecture 11– 25/01/2007

• Linguistic Variables
• CON and DIL operators
• INT operator
• Orthogonal sets

Week 5

Lecture 12 – 29/01/2007

• Fuzzy IF-THEN rules

Lecture 13 (A+B) – 31/01/2007

• Class Test 1
Lecture 14 – 01/02/2007

• Fuzzy Reasoning

Week 6

Lecture 15 – 05/02/2007

• Fuzzy Inferencing
• Mamdani Fuzzy Model
• Class test scripts were shown

Lecture 16 (A+B) – 07/02/2007

• Takagi Sugeno Fuzzy Model

Lecture 17 – 08/02/2007

• Tsukamoto Fuzzy Model

Week 7

Lecture 18 – 12/02/2007

• Kmeans Clustering
• Fuzzy C means Clustering

Lecture 19 (A+B) – 14/02/2007

• Fuzzy Image Processing Application
• Fuzzy Information Retrieval Application

Lecture 20 – 15/02/2007

• Classes off due to mid-sem

Week 8

Lecture 21 – 26/02/2007

• Introduction to Genetic Algorithm

Lecture 22 – (A+B) – 28/02/2007

• GA operators – Selection, Crossover, Mutation
Lecture 23 – 01/03/2007
- Walkthrough of a typical GA generation creation using all the three operators

Week 9

Lecture 24 – 05/03/2007
- Different types of selection operations

Lecture 25 – (A+B) – 07/03/2007
- Multiobjective GA – Introduction
- Pareto optimality
- VEGA

Lecture 26 – 08/03/2007
- MOGA
- Goldberg’s Approach

Week 10

Lecture 27 – 12/03/2007
- Constrained GA

Lecture 28 – (A+B) – 14/03/2007
- Introduction to SA

Lecture 29 – 15/03/2007
- Walkthrough of SA

Week 11

Lecture 30 – 19/03/2007
- Introduction to neural networks
- Single Layer Perceptron
- XOR Problem

Lecture 31 – (A+B) – 21/03/2007
• Multilayer Perceptron
• Back propagation Algorithm

Lecture 32 – 22/03/2007

• Pattern recognition using MLP

Week 12

Lecture 33 – 26/03/2007

• Feature Extraction from Character Patterns
• Hough Transform
• Fuzzy Features

Lecture 34 – (A+B) – 28/03/2007

• Combining fuzzy features using t-norms
• Use of fuzzy features for classification

Lecture 35 – 29/03/2007

• MLP, Fuzzy Sets and Classification
• Fuzzy MLP input
• Fuzzy MLP output

Week 13

Lecture 36 – 02/04/2007

• Complete system for character recognition using MLP with fuzzy input/output
• FQI
• GA for feature selection

Lecture 37 – (A+B) – 04/04/2007

• Unsupervised learning neural networks
• Competitive learning
• Stability-plasticity problem

Lecture 38 – 05/04/2007

• Kohonen Self-organizing map
**Week 14**

No class

**Week 15**

**Lecture 39 – 16/04/2007**

- Hebbian Learning

**Lecture 40 – (A+B) – 18/04/2007**

- Learning Vector Quantization
- Summary and Feedback

**Lecture 41 – 19/04/2007**

- Numericals on Fuzzy C Means and MLP