

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

Week 1

Lecture 1 – 03/01/2008

- Introduction to the course
- What is soft computing
- Evaluation Criteria

Week 2

Lecture 2 – 07/01/2008

- Introduction to fuzzy sets
- Universe of Discourse
- Membership Function

Lecture 3 – 08/01/2008

- Properties of fuzzy sets
- Examples of fuzzy set
- Support, core, height, normality

Lecture 4 – 09/01/2008

- Properties of fuzzy sets contd.
- Crossover point, singleton set, α -cut, convex fuzzy set

Lecture 5 – 10/01/2008

- Symmetric fuzzy sets
- Open Left, Open Right, Closed
- Examples of fuzzy sets and their properties
- Set operations
- Contained in, Union, Intersection, Complementation

Week 3

Lecture 6 – 14/01/2008

- Exercises on the validity of identities like associative and distributive laws
- Triangular MF

- Trapezoidal MF

Lecture 7 – 15/01/2008

- Gaussian MF
- Bell Function
- Sigmoidal MF

Lecture 8 – 16/01/2008

- Cylindrical Extension of 1D fuzzy set
- Projection
- Composition of 2D fuzzy sets

Lecture 9 – 17/01/2008

- Generalized complementation functions
- Sugeno's and Yager's complements
- Generalized union and intersection – T norms and S norms
- De Morgan's law for T-norms and S-norms.

Week 4

Lecture 10 (A+B)– 22/01/2008

- Extension principle
- Binary fuzzy relation
- Composition of fuzzy relations
- Max-min and Max-product compositions

Lecture 11 – 24/01/2008

- Linguistic variables
- Term sets
- Generation of fuzzy sets with linguistic hedges and connectives
- Concentration and dilation
- Intensification
- Orthogonality

Week 5

Lecture 12 (A+B)– 29/01/2008

- Fuzzy Implication
- Fuzzy implication as fuzzy relation

- Different interpretations of fuzzy implications

Lecture 13 – 30/01/2008

- Class Test 1 held

Lecture 14 – 31/01/2008

- Class Test 1 scripts shown
- Compositional rule of inferencing
- Fuzzy reasoning
- Single antecedent, Single rule

Week 6

Lecture 15 – 04/02/2008

- Fuzzy reasoning
- Multiple Antecedent, Multiple Rule
- Examples

Lecture 16 – 05/02/2008

- Fuzzy Inference systems
- Mamdani Fuzzy Model
- Defuzzification strategies

Lecture 17 – 06/02/2008

- Sugeno Fuzzy Model
- Tsukamoto Fuzzy Model
- Examples

Lecture 18 – 07/02/2008

- Clustering
- K-means Clustering
- Fuzzy Pseudopartition
- Introduction to Fuzzy c-means clustering

Week 7

Lecture 19 – 12/02/2008

- Fuzzy C-means clustering

- Examples

Lecture 20 – 13/02/2008

- Fuzzy Image Processing
- Fuzzy Information Retrieval

Lecture 21 – 14/02/2008

- Brief introduction to Optimization
- Introduction to GA

Week 8

Lecture 22 – 19/02/2008

- Details of Selection, Crossover and Mutation
- Example Walkthrough

Lecture 23 – 20/02/2008

- Other selection operators

Lecture 24 – 21/02/2008

- Recap of portions covered till mid-sem

22/02/2008 – No lecture due to mid sem

23/02/2008-02/03/2008 Mid Sem Exam

Week 9

Lecture 25 – 03/03/2008

- Mid-sem scripts shown
- Encoding of real variables as GA strings

Lecture 26 – 04/03/2008

- Introduction to multiobjective optimization
- Weighted sum of objective
- VEGA
- Pareto-optimality, non-dominating solutions and pareto front

Lecture 27 – 05/03/2008

- Goldberg's and Fonseca's approaches to MOGA

Lecture 28 – 06/03/2008

- Constrained GA

Week 10

Lecture 29 – 10/03/2008

- Introduction to SA

Lecture 30 – 11/03/2008

- SA Algorithm
- Example of SA

Lecture 31 – 12/03/2008

- Introduction to PSO

Lecture 32 – 13/03/2008

- Variations of PSO Algorithm

Week 11

Lecture 33 – 17/03/2008

- PSO Example

Lecture 34 – 18/03/2008

- Introduction to neural networks
- Single layer perceptrons

Lecture 35 – 19/03/2008

- Problems with single layer perceptrons
- Introduction to multilayer perceptrons

Lecture 36 – 20/03/2008

- Structure of multilayer perceptrons

- Back propagation algorithm

Week 12

Lecture 37 – 24/03/2008

- Numerical problem solving for MLP

Lecture 38 – 25/03/2008

- Hough Transform for line and circle extraction
- Extraction of fuzzy features from Hough transform

Lecture 39 – 26/03/2008

- Hough transform for circle detection
- Construction of fuzzy MLP input from basic fuzzy sets

Lecture 40 – 27/03/2008

- MLP with fuzzy output
- Character recognition with MLP having fuzzy input and output

Week 13

Lecture 41 – 31/03/2008

- Feature selection using GA
- FQI
- Block diagram

Lecture 42 – 01/04/2008

- Introduction to unsupervised learning
- Competitive learning

Lecture 43 – 02/04/2008

- Stability Plasticity problem in competitive learning
- Problem solving for competitive learning

Lecture 44 – 03/04/2008

- Kohonen Map

Week 14

Lecture 45 – 07/04/2008

- LVQ1

Lecture 46 – 08/04/2008

- LVQ2, LVQ3
- Hebbian Learning

Lecture 47 – 09/04/2008

- Problem solving on Kohonen map and LVQ

Lecture 48 – 10/04/2008

- Problem solving
- Summary and feedback

Week 15

Lecture 49 – 15/04/2008

- Student seminar on Term project

Lecture 50 – 16/04/2008

- Student seminar on Term project

Lecture 51 – 17/04/2008

- Problem solving