INT246: Soft Computing Techniques

L:2 T:0 P:2 Credits:3

Course outcomes: Through this course students should be able to

CO1 :: describe the soft computing techniques in building the intelligent machines.
CO2 :: explain different neural networks for classification and clustering problems.
CO3 :: use fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
CO4 :: compare and contrast genetic algorithms and swarm intelligence for optimization problems.
CO5 :: justify the performance and time complexity of hybrid systems.
CO6 :: develop the optimal models using available soft computing tools to solve real world problems.

Unit I   Introduction : artificial intelligence, artificial neural networks, genetic algorithms, swarm intelligent systems, expert systems
Neural network concepts : introduction to neural networks, biological neural networks to artificial neural networks, classification of neural networks, McCulloch-Pitts neuron model, learning rules, perceptron networks.

Unit II   Neural networks : backpropagation neural networks, kohonen neural network, learning vector quantization, radial basis function neural networks, support vector machines.

Unit III   Fuzzy systems : basic definition and terminology, set-theoretic fuzzy operations, fuzzy sets and operations on fuzzy sets, fuzzy relations, fuzzy rules and fuzzy reasoning, fuzzy inference system, fuzzy based expert system.

Unit IV   Genetic algorithms : introduction to genetic algorithms, genetic operators, working of genetic algorithm, applications of genetic algorithm, genetic programming.

Unit V   Hybrid systems : hybrid systems, neuro-fuzzy systems, fuzzy genetic algorithms, neuro-genetics systems.

Swarm intelligence : swarm intelligence, cuckoo search, ant colony optimization, swarm intelligence in bees

Unit VI   Nature Inspired Optimization Techniques and Applications : Firefly Algorithm with application, Crow Search Algorithm, Hybrid Wolf-Bat Algorithm, Whale Search Algorithm, Moth-flame Optimization, Grasshopper Optimization

Text Books: 1. SOFT COMPUTING WITH MATLAB PROGRAMMING by NP PADHY , SP SIMON, OXFORD UNIVERSITY PRESS

References: 1. PRINCIPLES OF SOFT COMPUTING by S N SIVANANDAM, S N DEEPA, WILEY
2. NEURO-FUZZY AND SOFT COMPUTING: A COMPUTATIONAL APPROACH TO LEARNING AND MACHINE INTELLIGENCE by JANG, SUN & MIZUTANI, PRENTICE HALL
3. NEURAL NETWORKS, FUZZY SYSTEMS AND EVOLUTIONARY ALGORITHMS : SYNTHESIS AND APPLICATIONS by RAJASEKARAN, S., PAI, G. A. VIJAYALAKSHMI, PHI Learning

List of Practical's

1. Programs using Numpy, Pandas and Matplotlib
2. Implementation of McCulloch Pitts neural network
3. Implementation of Perceptron.
4. Implementation of Back-propagation neural network
5. Implementation of self-organizing map
6. Implementation of linear vector quantization
7. Implementation of radial basis network
8. Implementation of fuzzy sets and operations on fuzzy sets.
9. Implementation of fuzzy membership function.
10. Implementation of fuzzy expert systems.
11. Implementation of genetic algorithms.
12. Implementation of neuro-fuzzy hybrid system.
13. Implementation of neuro-genetic hybrid system.
14. Implementation of artificial ant colony optimization.
15. Implementation of artificial bee colony optimization.