CSH 512: Artificial Neural Networks

Teaching Scheme	Examination Scheme
Lectures: 4 hrs/Week	Class Test -20 Marks
Tutorials: 2 hr/Week	Teachers Assessment – 10 Marks
	Attendance – 20 Marks
Credits: 6	End Semester Exam – 100 marks

Prerequisite: - Machine Learning

Course Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective
3. To give design methodologies for artificial neural networks
4. To provide knowledge for network tunning and overfitting avoidance
5. To explore neural network implementations.

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6. To demonstrate neural network applications on real-world tasks

Detailed Syllabus

Unit-1 **Fundamental of Neural Networks:** Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single Layer NN System, Applications.
Unit-2 **Multilayer NN System and Backpropagation Networks:** Background, Backpropagation Learning, Backpropagation Algorithm, Learning in Multilayer NN Systems. Applications of Backpropagation Algorithm.
Unit-3 **Associative Memory:** Introduction, Auto-associative Memory, Bi-directional Hetro-associative memory. Applications of Associative Memory.
Unit-4 **Self-Organizing Maps (SOMs):** Introduction to supervised and unsupervised learning. Competitive Learning, SOMs and their working principles, applications.
Unit-5 **Adaptive Resonance Theory:** Stability-Plasticity Dilemma, ART Networks, Iterative Clustering, Unsupervised Learning, ART Networks and their working principles, applications.
Unit-6 **Introduction to Soft Computing:** Basics of Soft Computing, Components of Soft Computing. Introduction to Fuzzy Logic, Genetic Algorithms.
Text and Reference Books 1. Neural Networks, Fuzzy Logic and Genetics Algorithms- Synthesis and Applications by 2. Rajasekaran and G.A. Vijaylakshmi Pai, Prentice Hall. 3. Neural Networks: A Comprehensive Foundation by Simon S. Hakin, Prentice Hall. 4. Fundamental of Neural networks: Architecture, Algorithms and Applications by Laurene V. Fausett, Prentice Hall.

Course Outcomes:

After completing the course, students will be able to:

1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
3. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
4. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
5. Reveal different applications of these models to solve engineering and other problems.

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