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MC5014 COMPUTATIONAL INTELLIGENCE

DETAILED SYLLABUS

UNIT I INTRODUCTION TO COMPUTATIONAL INTELLIGENCE

Evolution of Computing – Introduction to Artificial Intelligence –– Turing test – Prepositional and Predicate Calculus - Expert system – Introduction – MYCIN – PROSPECTOR – Robotics – From Conventional AI to Computational Intelligence – Issues in Artificial Intelligence - Machine Learning Basics – Intelligence of ants - Artificial Life – BOTS – Comparison of various expert systems

UNIT II KNOWLEDGE REPRESENTATION METHODS

Introduction – rough sets – set approximation – analysis of decision tables – Application of LERS software – Type – 1 fuzzy sets – definition – basic operations on fuzzy sets – The extension principle – Triangular norms and negations – Fuzzy Relations – Approximate reasoning – fuzzy Inference systems – Application of fuzzy sets – Type – 2 fuzzy sets – Footprint of uncertainty – basic operations on fuzzy sets – Type – 2 fuzzy relations – Type reduction – type 2 fuzzy Inference systems – Comparison of Fuzzy Inference systems.

UNIT III NEURAL NETWORKS AND LEARNING ALGORITHMS

Machine learning using Neural Network, Adaptive Networks – Feed Forward Networks Defuzzification – Supervised Learning Neural Networks – backpropagation Algorithm – Levenberg- Marquardt algorithm – Recurrent neural networks – BAM networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Case Study : Neural Network explanation facility.

UNIT IV DATA CLUSTERING METHODS AND ALGORITHMS

Introduction – Hard and fuzzy partitions – Distance Measures – Hard C- Means algorithm – Fuzzy C- Means algorithm – Possibilistic C- Means algorithm - Fuzzy Maximum Likelihood Estimates (FMLE) algorithm – Neuro Fuzzy systems - Mamdani Fuzzy Model – modelling problems - - Logical type - Takagi – Sugeno- Kang Fuzzy Model – comparison of neuro – fuzzy systems – Model evaluation criteria, complexity. Fuzzy Expert Systems – Fuzzy Decision Making – Case study: EEG spike detection.

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UNIT V EVOLUTIONARY COMPUTATION AND NEURO-FUZZY SYSTEMS

Evolutionary computation – GA – Particle Swarm Optimization – Ant colony Optimization – Artificial Immune Systems – Honey- Bee Optimization – Memetic Algorithms – Optimization problems – TSP, JSSP - evolutionary algorithms – Flexible neuro – fuzzy systems – Introduction – soft triangular norms – Parameterized triangular norms – Adjustable triangular norms – Flexible systems – Learning algorithms – Simulation examples –Hybrid Techniques -Neuro-Fuzzy Control – Case study : Evolutionary medical diagnosis A simple project using any one of the above domains with tools like MATLAB, Python 2 and Weka tool 3.7 .

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OBJECTIVES

- To understand the fundamentals of computational intelligence
- To know about the various knowledge representation methods
- To understand the features of neural network and its implementation
- To study about various data clustering methods
- To gain knowledge in evolutionary computation and neuro – fuzzy systems