Unit-6: Link Analysis: Page Rank, HITs, Web Crawling. Applications.

Readings:

1. R. Baeza-Yaets, B. Ribeiro-Neto, **Modern Information Retrieval: The Concept and Technology behind Search**, Latest Edition, Addison-Wesley, 1999.

2. C. D. Manning, P. Raghvan, H. Schutze, **Introduction to Information Retrieval,** Cambridge University Press, 2008.

3. D. A. Grossman, O. Frieder, **Information Retrieval: Algorithms and Heuristics,** 2nd Ed., Springer, 2004.

4. S. Buettcher, Charles L.A. Clarke, G. V. Carmack, **Information Retrieval: Implementing and Evaluating Search Engines,** MIT Press.

5. B. Croft, D. Metzler, T. Strohman, **Search Engines: Information Retrieval in Practice,** Addison Wesley

MCSE306: SOFT COMPUTING [3-0-1]

Course Objectives:

This course provides insights of soft computing frameworks applicable to bring its precision solutions for wide range of complex scientific applications.

Course Leaning Outcomes:

CO1: applying soft computing techniques towards various real-time case studies.

CO2: idea to design hybrid soft techniques over conventional computing methods.

CO3: Identify and select suitable Soft Computing methods to solve scientific complex problems where standard computing procedures are in intractable forms.

Syllabus:

UNIT-I Soft Computing: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, Predicate Calculus, Rules of Interference, Overview of neural networks, estimating regularization parameter Kohnen's self-organizing networks, Hopfield network, applications of neural networks.

UNIT-II Fuzzy Logic Computing: Introduction of fuzzy sets and fuzzy reasoning, Basic functions on fuzzy sets, relations, rule based models and linguistic variables, fuzzy controls, Fuzzy decision making, , inferencing, defuzzification, fuzzy clustering, fuzzy rule based classifier, applications of fuzzy logics.

UNIT-III Evolutionary Algorithms: Introduction to evolutionary algorithms, Basic principles of Evolutionary Algorithms, Evolutionary strategies, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees,

Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization, concept of multi-objective optimization problems (MOOPs), Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

Readings:

1. Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition.
2. B. Yegnanrayana, "Artificial Neural Networks" , PHI.
3. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House,1994
4. Zimmermann, "Fuzzy Set Theory and its Application", 3rd Edition.
5. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall, 1998.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
7. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.

MCSE307: QUANTUM COMPUTING AND ITS APPLICATIONS [3-0-1]

Course Objectives: This course provides a foundation for quantum computing, Post-Quantum Cryptography and quantum machine learning. It covers the fundamental concepts of quantum mechanics, quantum algorithms, and their applications in various areas, including cryptography, cybersecurity, machine learning, finance, the energy sector, etc. Students will gain a theoretical understanding of quantum computing and practical skills in implementing quantum algorithms for various tasks.

Course Learning Outcomes: On completing this course, the student will be able to:

CO1: Understand the basic principles of quantum mechanics and their relevance to quantum computing.
CO2: Comprehend quantum algorithms and their applications.
CO3: Apply quantum optimization techniques in problem-solving.
CO4: Demonstrate practical skills in quantum computing in various areas, including cryptography and machine learning.

Syllabus:

Unit-I Fundamentals of Quantum Computing: Mathematical foundations: Vectors, Vector space, Inner product; Qubits, Introduction to quantum mechanics and its relevance to Quantum gates, superposition principle, and entanglement Quantum parallelism and interference, No cloning theorem, quantum teleportation.

Unit-II Post-Quantum Security: Deutsch-Jozsa algorithm, Simon's algorithm, Bernstein-Vazirani, RSA algorithm and factorization attack on RSA, Shor's algorithm for integer factorization, Grover's algorithm for unstructured search, Hash preimage attack with Grover's algorithm, Quantum Fourier transform and its applications, Harrow–Hassidim–Lloyd (HHL) algorithm, Quantum attack resistant Digital Signatures.