Network properties: Clustering coefficient, centrality measures for directed and undirected networks.

Graph models: Random graph model, Small world graph model, Network evolution using preferential attachment

Community structure in networks: Communities and community detection in networks, Hierarchical algorithms for community detection, Modularity based community detection algorithms, Label Propagation algorithm

Readings:

1. Mohammed J. Zaki, Wagner Meira Jr.; Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014
2. Albert Barabasi, Network Science , Cambridge University Press, 2016
3. M.E. J. Newman, Networks: An Introduction, , Oxford University Press, 2010.
4. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010

MCSE 304: INFORMATION RETRIEVAL [3-0-1]

Course Objectives: This course aims to equip the students with basic techniques for information retrieval that find use in text analytics. The student will also learn to apply the tools for information extraction.

Course Learning Outcomes:

On completion of the course, the student will be able to

CO1: describe early developments in IR.

CO2: apply measures for evaluating retrieved information.

CO3: choose appropriate model for document processing.

CO4: develop simple information retrieval tools to solve real world problems.

Syllabus:

Unit 1- Introduction: Information, Information Need and Relevance; The IR System; Early developments in IR, User Interfaces.

Unit 2- Retrieval and IR Models: Boolean Retrieval; Term Vocabulary and Postings list; Index Construction; Ranked and other alternative Retrieval Models.

Unit 3- Retrieval Evaluation: Notion of Precision and Recall; Precision-Recall Curve, Standard Performance Measures such as MAP, Reciprocal ranks, F-measure, NDCG, Rank Correlation.

Unit 4- Document Processing: Representation; Vector Space Model; Feature Selection; Stop Words; Stemming; Notion of Document Similarity; Standard Datasets..

Unit 5- Classification and Clustering: Notion of Supervised and Unsupervised Algorithms; Naive Bayes, Nearest Neighbour and Rochio's algorithms for Text Classification; Clustering Methods such as K-Means.

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,