Complex Network Analysis

20thNovember- 24th November 2017, Department of CSE, IIT Patna

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Overview

Complex Network Analysis (a.k.a. Network Science) is a rapidly emerging area of interest for both theory and practice. With the phenomenal growth of the Internet, web, social networks, information on biological networks, etc., it is imperative that we need a course that covers the algorithms, techniques and tools to analyze such large-scale networks, visualize and extract useful information (like communities in the networks, robustness to information diffusion, diameter of the network, etc). Network Science deals with the analysis and visualization of large complex network graphs and the development of efficient algorithms to study the characteristics of networks involving hundreds and thousands of nodes.

Objectives: The primary objectives of the course are to:
1. Analyze the characteristics of complex networks using graph theoretic metrics and paradigms;
2. Generate simulated networks from theoretical models and evaluate their characteristics in comparison with real-world networks;
3. Apply various centrality metrics and related algorithms to determine the topological significance of the nodes in a network;
4. Extract clusters of related nodes using efficient community detection algorithms and evaluate the effectiveness of the partitioning;
5. Use hands-on tools and spectral analysis techniques to analyze datasets corresponding to complex real-world networks

Modules	Course Duration: : *20thNovember- 24th November 2017*
	This course will cover following topics:
	1. Degree distribution analysis;
	2. Node and Edge betweenness centrality metrics;
	3. Bipartivity of network graphs;
	4. Assortativity and correlation analysis of centrality metrics;
	5. Page Rank and HITS algorithms for link analysis;
	6. Community detection algorithms and Homophily;
	7. Random graph network model;
	8. Scale-free networks;
	9. Small-world networks
	10. Computationally-light node and edge centrality metrics.
You Should Attend If…	▪ You are an executive/ engineer/ researcher from manufacturing, service and government organizations including R&D laboratories. ▪ You are a student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions. ▪

Fees	The participation fees for taking the course is as follows: **Participant from abroad: US $200** **Not-for-profit R&D and Educational Institutions: Rs. 2000/-** **Industry/ Research Organizations: Rs. 2000/-** **Academic Institutions (Full time students): Rs. 1000/-** **Note: The course fee will be made half for SC/ST students.** The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility in the campus. The participants will be provided with accommodation and food on payment basis.

The Faculty

Dr. Natarajan Meghanathan is a Professor in the Department of Electrical and Computer Engineering and Computer Science, Jackson State University, Jackson, Mississippi, USA. His areas of research interest are: Complex Network Analysis, Wireless Ad hoc and Sensor Networks, Machine Learning and Cyber Security. He has published more than 175 peer-reviewed journals and conference articles and more than 25 book chapters. He serves as the editor-in-chief for three international journals and also serves in the editorial board and program committees for several international conferences. His website and email addresses are: http://www.jsums.edu/nmeghanathan and natarajan.meghanathan@jsums.edu.

Course Coordinator/ Host Faculty

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