Complex Networks

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Overview

Large complex networks, be it biological, physical, transportation, power-grids, or social, exhibit some commonalities in their structural properties. Numerous studies in the last decade have revealed that all these networks can be broadly classified as scale-free networks that follow the power law distribution. Models used for analyzing these networks or and predicting any phenomenon are non-trivial.

In this workshop, we will first start by analyzing some real networks and their properties like degree distribution, path length, and clustering coefficient. We will study how various phenomenon such as signals, epidemics, virus, influence, rumor, etc. spread in real networks. Some case studies on information and social networks will also be discussed.

Syllabus

Overview of networks and performance evaluation. Definitions of graphs, random networks, degree distribution, binomial distribution, Poisson approximation, clustering, degree correlations, power Laws and Scale-Free Networks, distribution of WWW, hubs, small-world property, heavy-tails, preferential attachment and its variants, Barabási-Albert Model, degree dynamics, phase transitions, percolation theory, weak links, link and node vulnerabilities, attack and defense models. Case studies on Internet, social networks, and social recommender systems.

Course participants will learn these topics through lectures. Also case studies and assignments will be shared to stimulate research motivation of participants.

Modules	**Complex Networks: December 18 – December 22, 2017** **A: Fundamentals of real-world networks : December 18, 2017** **B: Power laws and their properties : December 19, 2017** **C: Modeling of propagation effects in complex networks : December 20-21, 2017** **D: Exposition to real informational and social networks : December 22, 2017** **(Number of participants for the course will be limited to 50)**
You Should Attend If…	▪ you are a network systems engineer or research scientist interested in working on the fundamentals of networked-data and large complex systems ▪ you are a professional in communication networks, data analytics, social networks industry ▪ you are a student or faculty member aspiring to work or working broadly in the area of networked systems, be it communications, social, or cyber-physical
Fees	The participation fees per person for attending the course is as follows: **Students from other Academic Institutes : Rs. 5,000** **Faculty members from other Academic Institutes : Rs. 10,000** **Professionals from Industry/ Research Organizations : Rs. 15,000** **Participants from abroad : US $200** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hour internet facility. Limited accommodation in the guest houses or student hostels may be available on payment basis. Efforts will be made to book accommodation in nearby hotels on request from the participants by November 15, 2017. Traveling, boarding, and lodging expenses should be borne by the participants.

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Beneficiary	IITD CEP ACCOUNT
IFSC Code	SBIN0001077
Account Type	Savings

The Faculty

Prof. Mainak Chatterjee is an associate professor in the Department of Computer Science at the University of Central Florida, in Orlando, Florida. He received the BSc degree in physics (Hons.) from the University of Calcutta, the ME degree in electrical communication engineering from the Indian Institute of Science, Bangalore, and the PhD degree from the Department of Computer Science and Engineering from the University of Texas at Arlington. His research interests include network science, cyber-security, economic issues in wireless networks, applied game theory, cognitive radio networks, dynamic spectrum access, and mobile video delivery. His research has been supported by grants from federal, state, and local agencies. He has published almost 200 conference and journal papers. He got the Best Paper Awards in IEEE Globecom 2008 and IEEE PIMRC 2011, and the AFOSR sponsored Young Investigator Program (YIP) Award. He co-founded the ACM Workshop on Mobile Video (MoVid). He serves on the editorial board of Elsevier's Computer Communications and Pervasive and Mobile Computing Journals. He has served as the TPC co-chair of a dozen conferences. He also serves on the executive and technical program committee of several international conferences.

Prof. Swades De received his PhD in Electrical Engineering from the State Univ. of New York at Buffalo, USA, in 2004, MTech in Optoelectronics and Optical Communications from IIT Delhi in 1998, and BTech in Radiophysics and Electronics from University of Calcutta in 1993. He is currently a Professor in the department of Electrical Engineering at IIT Delhi. He was a tenure-track Assistant Professor of Electrical and Computer Eng. at New Jersey Institute of Technology (2004-2007). He worked as a post-doctoral researcher at ISTI-CNR, Pisa, Italy (2004), and has nearly 5 years industry experience in India on communication hardware and software development (1993-1997, 1999). Dr. De's research interests are broadly in communication networks, with emphasis on performance modeling and analysis. Current directions include energy harvesting communication networks, broadband wireless access and routing, cognitive/white-space access networks, and smart grid networks. Dr. De is a Senior Member of IEEE, IEEE Communications and Computer Societies, and a Fellow respectively of the Indian National Academy of Engineering and the National Academy of Sciences, India. Dr. De currently serves as a Senior Editor of IEEE Communications Letters and Associate Editor respectively of IEEE Wireless Communications Letters, Springer Photonic Network Communications journal, and IETE Technical Review journal.

Course Co-ordinator

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