Abhishek Chakraborty

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Education

PhD Avionics. Indian Institute of Space Science and Technology, [**April 2018 (Expected)**]
Thesis: On the evolution of finite sized complex networks
Advisor: Dr. B. S. Manoj

ME Electronics and Communication Engineering. Birla Institute of Technology Mesra, [**2012**]
Specialization: Wireless Communication
Thesis: Capacity enhancement in indoor wireless communication systems
Advisor: Dr. Sanjay Kumar

BTech Electronics and Communication Engineering. Maulana Abul Kalam Azad University of Technology [Formerly West Bengal University of Technology], [**2007**]
Institute: College of Engineering & Management, Kolaghat
Project: Design and development of code for radiation pattern measurement of microstrip antenna
Advisor: Dr. Debendra Kumar Panda

Research Interests

- ◇ Network Science
- ◇ Complex Networks
- ◇ Small-World Networks and Scale-Free Networks
- ◇ Communication Networks
- ◇ Wireless Mesh Networks
- ◇ Algorithms for Complex Networks

List of Publications

◇ **Book**

B1 B. S. Manoj, **Abhishek Chakraborty**, and Rahul Singh, "Complex Networks: A Networking and Signal Processing Perspective," Prentice Hall PTR, New Jersey, USA, February 2018.

◇ **Book Chapter**

BC1 P. Singh, **A. Chakraborty**, and B. S. Manoj, "Complex network entropy," Chapter in the book titled "Soft Computing Applications in Sensor Networks," Edited by Sankar K. Pal and Sudip Misra, pp. 243-263, CRC Press (USA), August 2016.

◇ **Refereed International Journals**

J7 R. Singh, **A. Chakraborty**, and B. S. Manoj, "GFT centrality: A new node importance measure for complex networks," *Elsevier Physica A: Statistical Mechanics and its Applications*, vol. 487, pp. 185-195, December 2017.

J6 P. Singh, **A. Chakraborty**, and B. S. Manoj, "Link influence entropy," *Elsevier Physica A: Statistical Mechanics and its Applications*, vol. 465, pp. 701-713, January 2017.

J5 D. S. Yadav, **A. Chakraborty**, and B. S. Manoj, "A multi-backup path protection scheme for survivability in elastic optical networks," *Elsevier Optical Fiber Technology*, vol. 30, pp. 167-175, July 2016.

J4 **A. Chakraborty**, Vineeth B. S., and B. S. Manoj, "Analytical identification of anchor nodes in a small-world network," *IEEE Communications Letters*, vol. 20, no. 6, pp. 1215-1218, June 2016.

J3 **A. Chakraborty** and B. S. Manoj, "The reason behind the scale-free world," *IEEE Sensors Journal*, vol. 14, no. 11, pp. 4014-4015, November 2014.

J2 N. Gaur, **A. Chakraborty**, and B. S. Manoj, "Delay optimized small-world networks," *IEEE Communications Letters*, vol. 18, no. 11, pp. 1939-1942, November 2014.

J1 S. Das, **A. Chakraborty**, and S. Kumar, "Capacity calculation and sub-optimal power allocation scheme for OFDM-based systems," *Communications and Network*, vol. 4, no. 4, pp. 292-297, November 2012.

◇ **Refereed International Conferences**

C8 G. Suresh, **A. Chakraborty**, and B. S. Manoj, "Deterministic evolution through indexed leaf node based attachment in complex networks," Accepted to *IEEE NCC 2018*.

C7 R. Singh, **A. Chakraborty**, and B. S. Manoj, "On spectral analysis of node centralities," in *Proc. IEEE ANTS 2016*, pp. 1-5, November 2016.

C6 R. Singh, **A. Chakraborty**, and B. S. Manoj, "Graph Fourier transform based on directed Laplacian," in *Proc. SPCOM 2016*, pp. 1-5, June 2016.

C5 P. Singh, **A. Chakraborty**, and B. S. Manoj, "Conflict graph based community detection," in *Proc. IEEE COMSNETS 2016*, pp. 1-7, January 2016.

C4 **A. Chakraborty**, Vineeth B. S., and B. S. Manoj, "Influence of greedy reasoning on network evolution," in *Proc. Indo-US Bilateral Workshop on Large Scale Complex Network Analysis 2015 (LSCNA 2015)*, pp. 81-84, December 2015.

C3 **A. Chakraborty** and B. S. Manoj, "An efficient heuristics to realize near-optimal small-world networks," in *Proc. IEEE NCC 2015*, pp. 1-5, February 2015.

C2 Arun K. P., **A. Chakraborty**, and B. S. Manoj, "Communication overhead of an OpenFlow wireless mesh network," in *Proc. IEEE ANTS 2014*, pp. 73-78, December 2014.

C1 N. Gaur, **A. Chakraborty**, and B. S. Manoj, "Load-aware routing for non-persistent small-world wireless mesh networks," in *Proc. IEEE NCC 2014*, pp. 1-6, February 2014.

◇ **Technical Reports**

T3 **A. Chakraborty**, Vineeth B. S., and B. S. Manoj, "Optimal link addition for achieving small-world properties in linear wireless sensor networks," *Technical Report*, Systems and Networks Lab, Department of Avionics, IIST (ID: IIST-SNL-102-2017-09-21), 2017.

T2 **A. Chakraborty**, S. Babu, and B. S. Manoj, "On achieving capacity-enhanced small-world networks," *Technical Report*, Systems and Networks Lab, Department of Avionics, IIST (ID: IIST-SNL-101-2017-09-21), 2017.

T1 **A. Chakraborty**, Vineeth B. S., and B. S. Manoj, "A study on constrained long-ranged link addition in complex networks," *Technical Report*, Systems and Networks Lab, Department of Avionics, IIST (ID: IIST-SNL-100-2017-09-21), 2017.

Research Experiences

PhD Thesis. Indian Institute of Space Science and Technology, [**August, 2012 – Present**]
Title: On the evolution of finite sized complex networks

Any complex physical system, man-made or natural, consists of entities each of which interacts with other entities in the system. Such complex systems can be modeled as network graphs where the entities are nodes and their interactions are edges of the network graph. Earlier studies reported the possible mechanisms for the evolution of complex networks where size of the network is growing, in the context of nodes and edges, with time. However, the characteristics of finite sized complex systems, which can be seen in many real-world networks are not studied in depth.

This thesis aims to study the characteristics behind the evolution of finite sized complex networks which can be seen in many real-world networks such as relationships in community networks, transportation networks, computer networks, and wireless sensor networks to name a few. Here, *finite sized networks* mean that such complex physical systems are not growing in size when total number of nodes is concerned. We find that one of the key reasons behind many complex network formations is greedy optimal/near-optimal decision based optimization of certain network parameters such as minimizing average path length. We also apply our observations from finite sized complex networks to design efficient, when reducing end-to-end transmission delay as well as enhancing average network flow capacity are concerned, finite sized real-world networks.

ME Thesis. Birla Institute of Technology Mesra, **[2012]**
Title: Capacity enhancement in indoor wireless communication systems

We analytically derived the closed-form expressions of the system capacity in the context of single cell and multiple adjacent cells wireless indoor environments. The closed-form expressions also considered the optimal power constraints into account for better evaluation of the network system capacity. To further improve the system capacity, singular value decomposition technique was also incorporated to introduce space as another degree of freedom.

BTech Project. Maulana Abul Kalam Azad University of Technology [Formerly West Bengal University of Technology], **[2007]**
Title: Design and development of code for radiation pattern measurement of microstrip antenna

We developed a Matlab based simulator to visualize the E-plane and H-plane radiation patterns, at a given frequency, in the context of cavity model of the microstrip antenna. The length and width optimizations were also taken into consideration while designing the algorithm. Our algorithm is an approximation model which compares well with the IE3D based simulation model.

Professional Experiences

Senior Project Fellow, [August, 2017 – Present]
Department of Avionics, Indian Institute of Space Science and Technology

- ◇ Responsibilities include research in applications of complex networks in the design of an integrated enterprise network security system.
- ◇ Also responsible for investigation on the behavior of malwares, by designing call transition matrix extracted from dataset of successive API calls, using complex network analysis.

Teaching Assistant, [2012 – 2017]
Department of Avionics, Indian Institute of Space Science and Technology

- ◇ Digital Communication Laboratory (AV332).
- ◇ Computer Networks Laboratory (AV341).
- ◇ Wireless Mesh Networks Course (AV484).

Teaching Assistant, [2010 – 2012]
Department of Electronics and Communication Engineering, Birla Institute of Technology Mesra

- ◇ Digital Electronics Laboratory (EC4102).
- ◇ Wireless Communication and Networking Laboratory (EC7102).

Programmer Analyst, [December, 2007 – July, 2009]
Cognizant, Inc. Kolkata, India

- ◇ Team member working on managing and administering database for banking domain.
- ◇ Responsible for module maintenance, monitoring, and problem fixing through automated tools provided by Cognizant.

Skills

Programming: MATLAB, Python, and Network Simulator 2
Data Visualization Tools: Gephi and Pajek
Language: Bengali (native), English (fluent), and Hindi (fluent)

Awards & Recognitions

- Recipient of the Springer Best Student Paper Award for the research paper titled "Graph Fourier transform based on directed Laplacian" at the 2016 11^{th} International Conference on Signal Processing and Communications (SPCOM 2016), IISc Bangalore, India, June 2016.
- Recipient of the Student Travel Grant to attend ACM MobiHoc 2013, Bangalore, India, from July 29, 2013 to August 01, 2013.
- Recipient of the IIST Scholarship (Sponsored by Department of Space, GoI) from August, 2012 to July, 2017.
- Recipient of the MHRD Scholarship (Sponsored by MHRD, GoI) from July, 2010 to May, 2012.
- Qualified GATE (**G**raduate **A**ptitude **T**est in **E**ngineering, All India Entrance examination to Master's program, conducted by MHRD, GoI) Examination, 2010 with 94.13 Percentile.

Professional Affiliations/Activities

- Chair, IEEE Student Branch at Indian Institute of Space Science and Technology [**2012**]
- Graduate Student Member, IEEE [**Since January, 2012**]
- Student Member, IEEE Communications Society [**January – December, 2013, March, 2016 – Present**]
- Student Member, ACM [**Since August, 2012**]
- Student Member of the International Conference of Devices and Communication (ICDeCom) at Birla Institute of Technology Mesra [**2011**]
- Reviewer of the following International Journals:
  - IEEE Transactions on Communications
  - IEEE Communications Letters
  - IEEE Sensors Journal
- Reviewer of the following International Conferences:
  - IEEE GHTC-SAS 2013
  - IEEE RAICS 2013, 2015

References

References are available upon request.