ABISHEK SANKARARAMAN

CONTACT INFORMATION

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EDUCATION

The University of Texas at Austin
Ph.D. in Electrical and Computer Engineering — Jan. 2013 - Present
- Advisor: François Baccelli

Indian Institute of Technology, Madras
B.Tech in Electrical Engineering
M.Tech in Communication Systems and Signal Processing
Minor in Mathematics — 2008 - 2013
- Graduated ranked 1^{st} in the Department.

WORK EXPERIENCE

Wireless Networking and Communications Group (WNCG), UT Austin — Austin, TX
Graduate Research Assistant. Advisor: François Baccelli — Jan 2014-Present

Simons Center for Network Mathematics — Austin, TX
Graduate Research Assistant. Advisor: François Baccelli — Jan 2014-Present

Huawei Research Labs — Santa Clara, CA
Data Science Intern. Manager: Hui Zang — May - Aug, 2015

IBM Research, India — Bengaluru, India
Undergraduate Research Intern. Advisor: Balakrishnan Narayanaswamy — May-Aug, 2012

RWTH Aachen University — Aachen, Germany
DAAD Undergraduate Researcher. Advisor: Rainer Leupers — May-Sep, 2011

PREPRINTS

Interference Queuing Networks on Grids
A.Sankararaman, F.Baccelli and S.Foss
arXiv:1710.09797, 2017 (In preperation to submit to The Annals of Applied Probability)
Link to Paper

PUBLICATIONS

Community Detection on Euclidean Random Graphs
A.Sankararaman and F.Baccelli
In *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, January 2018.
Invited Paper in 55th *Allerton Conference*, October 2017.
Link to Paper

Spatial Birth-Death Wireless Networks
A.Sankararaman and F.Baccelli
In *IEEE Transactions on Information Theory*, 63(6):39643982, 2017.
Preliminary Version in 54*th Allerton Conference*, October 2016.
Link to Paper

Performance-Oriented Association in Large Cellular Networks with Technology Diversity A.Sankararaman, J.woo Cho and F.Baccelli
In *2016 28th Internation Teletraffic Congress (ITC 28)*, Vol. 1, pp 94-102. Sep 2016, IEEE.
Link to Paper

CSMA k-SIC : A class of distributed MAC protocols and their performance evaluation A.Sankararaman and F.Baccelli
In *2015 IEEE Conference on Computer Communications (INFOCOM)*, pages 2002-2010, April 2015.
Link to Paper

Congestion Control of Smart Distribution Grids using State Estimation
Abishek. S and Balakrishnan Narayanaswamy
In *5th Conference on Communication Systems and Networks (COMSNETS)*, Jan 2013, IEEE.
Link to Paper

Research Projects

Community Detection on Spatial Graphs June, 2016 - Present

- Formulated a mathematical model of a planted community spatial random graph.
- Developed novel spatial graph clustering algorithm to estimate embedded communities.
- Developed new mathemtical ideas based on percolation to analyze performance of our algorithm.
- Established an information-theoretic lower bound using coupling arguments to show our algorithm is optimal upto constant factors.
- The details can be found in the paper - *Community Detection on Euclidean Random Graphs.*

Interference Networks on the Continuum Space and Grids Aug-2014 - Present

- Proposed a novel 'interacting queuing model' to capture the coupling between space and time in wireless networks. Specifically, when a wireless link access the spectrum, it causes interference to other nearby links, and hence their rate of communication is lowered. This in turn implies they access the spectrum longer and cause more interference, thereby leading to a cascading effect in space and time.
- We model this phenomenon both in continuum space as well as discrete grids. In both cases, we establish *sharp phase-transitions.* The highlight of the results is when we established a phase-transition for an *infinite version* of this problem. This result is of significance both to mathematics and engineering design of networks.
- The details can be found in the following two papers - *Spatial Birth-Death Wireless Networks* and *Interference Queuing Networks on Grids.*

Data Analytics for Cell-Phone Data May - Aug, 2015

Huawei Research Labs, Santa-Clara, CA

- Worked with the data-science team to build a pipe-line for analyzing cell phone call logs of users.
- Built and executed Community Detection algorithms on the call and text graph.
- Mentor: Hui Zang

State Estimation in Smart Grids May - Dec, 2012

IBM Research, India, Bengaluru, India

- Studied the problem of how to infer the readings (voltages and current) in a power network using minimal noisy measurements.
- We solve this inference problem iteratively by drawing an analogy with associated problems in the internet which the TCP algorithm solves.
- The results of our findings was publised in the paper *Congestion Control of Smart Distribution Grids using State Estimation.*
- Mentor: Balakrishnan Narayanaswamy

Teaching Experience

Teaching Assistant, *Advanced Probability - Inference and Learning*
The University of Texas at Austin Spring 2018

Teaching Assistant, *Statistical Signal Processing*
The University of Texas at Austin Spring 2014

Talks and Presentations

- *Interference Queuing Networks on Grids*
  Talk at Heriot-Watt University, Edinburgh UK Feb 2018

- *Community Detection on Euclidean Random Graphs*
  Talk at Indian Institute of Technology Madras, Chennai Jan 2018
  Talk at ACM-SIAM SODA Conference, New Orleans, LA Jan 2018
  Talk at The University of Texas at Austin May 2017

- *A Model of Spatial Birth Death Process*
  Talk at Indian Institute of Technology Madras, Chennai — Jan 2017
  Talk at Princeton University — Nov 2016
  Talk at Allerton Conference on Communication Control and Computing — Oct 2016
  Talk at INRIA - Ecole Normale Supérieure, Paris — Sep 2016

- *Technology Diversity - A Framework for Base Station Association in Large Cellular Networks*
  Talk at 28th, International Teletraffic Congress (ITC-28), Würzburg, Germany — Sep 2016

- *CSMA k-SIC: A Class of MAC Protocols*
  Talk at IEEE INFOCOM, Hong Kong — May 2015

Professional Services

- Reviewer for Performance Evaluation — 2017-18
- Reviewer for IEEE Transactions on Information Theory — 2016
- Reviewer for IEEE Transactions on Wireless Communications — 2015

Honours and Awards

- DAAD, WISE Scholar, 2011.
- Top one percent, National Standard Examination in Physics and Chemistry (NSEP) and (NSEC), 2007-08.
- All India Rank 805, IIT-JEE 2008.

Advanced Coursework

- **Electrical Engineering and Computer Science** Probability and Statistics, Advanced Probability - Learning and Inference, Data Structures and Algorithms, Large Scale Optimization Algorithms, Randomized Algorithms, Machine Learning, Deep Learning (On Coursera).
- **Mathematics**: Linear Algebra, Abstract Algebra, Real Analysis, Measure theoretic probability, Stochastic Processes - I and II, Markov Chains and Mixing, Stochastic Geometry, Point Processes, Random Graphs, Dynamical Systems.

Online Presence

- Research Webpage
- Github