

ABISHEK SANKARARAMAN

The University of Texas at Austin

CONTACT INFORMATION

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RESEARCH INTERESTS

Probability and Stochastic Process, Stochastic Geometry, Randomized Algorithms, Wireless Networks

EDUCATION

The University of Texas at Austin

September 2013 -

PhD in Communications Networks and Systems

GPA - 4.0/4.0

Indian Institute of Technology Madras, Chennai

July 2008 - May 2013

B.Tech in Electrical Engineering

M.Tech in Communications

Minor in Mathematics

CGPA - 9.23 out of 10 (Highest CGPA in Dual Degree Communications)

PUBLICATIONS

1. **A. Sankararaman**, F. Baccelli “CSMA k -SIC - A Class of Distributed MAC Protocols and their Performance Evaluation”, Proceedings of *IEEE INFOCOM* 2015, [*Accepted*]
2. **Abishek.S**, B.Narayanaswamy “Congestion Control of Smart Distribution Grids using State Estimation,” In Proceedings of *E6 Workshop, IEEE COMSNETS*, January, 2013

TALKS

“Topology Discovery of Sparse Random Graphs”, Seminar Talk, IIT Madras

May-2013

RESEARCH PROJECTS

Dense Wireless Networks - CSMA and SIC based Scheduling

Advisor : Prof. Francois Baccelli

- The focus of this project is to propose distributed algorithms for Medium Access Control in Dense Wireless Networks.

However, most protocols in use widely today treat Interference as ‘noise’ which is not Information Theoretically optimal. The goal, is to propose and develop tools to analyze protocols that employ more suitable schemes such as Joint Decoding or Successive Interference Cancellation (SIC).

- We proposed and evaluated a class of distributed protocols called CSMA k -SIC protocols which in a systematic fashion incorporate SIC on top of existing 802.11 CSMA architectures.
- The results to appear in the proceedings of Infocom 2015.

Network Tomography - Sufficient Conditions for Discovery

Aug 2012 - May 2013

Advisor: Dr. Radhakrishna Ganti, Department of Electrical Engineering, IIT Madras

- Conducted research on efficient network (graph) reconstruction techniques using aggregated end-to-end measurements (primarily delays) between a subset of nodes in a graph.
- Proved theoretical results on the minimal amount of resources sufficient to guarantee near accurate sparse random graph reconstruction. (*Thesis is available on my web page*).

Smart Grids - State Estimation and Congestion Control

May - July 2012

Advisor: Dr. Balakrishnan Narayanaswamy, IBM Research, Bengaluru.

- Research problem - Techniques to reduce *congestion* in electric distribution grids by *scheduling* electric loads.
- Congestion control was proven to be achieved by first solving the *State Estimation* problem to estimate grid voltages on all nodes, and then using subsequently using only the estimates for control action.

- Formulated the estimation of a smart grid's distribution system as an inference problem on a probabilistic graph model (factor graph) which has well known solutions (Belief propagation).
- Validated the performance of the loopy BP (an approximate algorithm for non-trees structure) by showing a way to relax it as a convex optimization problem .
- Proposed and proved centralized scheduling strategies that is optimal.
(*Optimality was with respect to the total power losses in the grid*).

Event based Virtual MPSoC Debugging

May - July 2011

Advisor: Dr.Rainer Leupers, RWTH Aachen, Germany

- Defined and implemented a debug and control interface for MPSoC (*Multi Processor System on Chip*) debugging on virtual embedded systems
- Designed and developed processor IP *independent* interface to facilitate non-intrusive access to simulated systems.
- **Tested** the system on two virtual processors, ARM9 and Tensilica Xtensa.

INDUSTRY EXPERIENCE

Nihon Communications Pvt. Ltd, Bengaluru

May-July 2010

Area of Work : Networks, Simulator Design

- Developed C++ source code to simulate the behaviour of *Sliding Window Protocol*, a data-link layer protocol using the Discrete-Event Simulator paradigm.
- Integrated the simulator into an existing network layer simulator called "QualNet".

SCHOLASTIC ACHIEVEMENTS

- Recipient of *DAAD WISE Scholarship* 2011 to pursue research in a German university.
- Secured an *All India Rank 805* in IIT JEE 2008 out of 330,000 students
- *Top 1%* among approximately 40,000 candidates in National Level *Physics Olympiad* and National Level *Chemistry Olympiad*, 2007.

RELEVANT COURSES

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|--|------------------------------|
| • Probability & Stochastic Process (<i>Graduate</i>) | • Coding Theory |
| • Information Theory | • Queuing Networks |
| • Advanced Networks (Stochastic Geometry) | • Randomized Algorithms |
| • Image Signal Processing | • Graph Theory |
| • Data Structures and Algorithms | • Non-Linear Control Systems |
| • Theory of Computation | • Digital Communications |
| • Mathematical Logic | • Wireless Communications |
| • Calculus - I and II | • Communication Systems |

SKILLS

- Programming: C, C++, Python
- Scientific: MATLAB, Scilab

EXTRA- CURRICULAR ACTIVITIES

- Winner of Industry Defined Problem, a techno-business event at Shaastra 2011 (annual technical festival of IIT Madras).
Proposed a technique to incorporate *social relevance* into Mobile Recommendations.
The solution model was judged by a panel from the telecom company *Ericsson*.
- Selected to represent IIT Madras and was ranked 15th in India at the national level finals of **ACM Inter Collegiate Programming Contest**, Amritapuri, December 2010.
- Winner of *Circuit Design Challenge*, Shaastra 2010.
- Built an *autonomous maze navigating robot* for the image processing based autonomous robotics competition at Shaastra 2009 and was placed 3rd out of 50 teams.
- **National Social Service volunteer** - Performed weekly teaching activities in an under privileged school in Chennai. (*Aug 2008 - May 2009*)
- Hostel Water Polo and aquatics team, 2008-2012.
- Regular participant of all long distance marathons on campus.