Soumya Sen

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Contact Information

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Education

University of Pennsylvania, PA

Ph.D. in Electrical & Systems Engineering

2011

Thesis: "On the Economic Viability of Network Systems & Architectures"

Advisors: Dr. Roch Guérin, EE, and Dr. Kartik Hosanagar, The Wharton School

M.S. in Electrical Engineering

2008

Birla Institute of Technology & Science, Pilani, India

B.E. (Hons.) in Electronics & Instrumentation Engineering

2005

Academic

Princeton University, NJ

Postdoctoral Research Associate, EE

2011-present

Mentor: Dr. Mung Chiang

Research Topics:

- Sustainability and economic viability of Internet infrastructure
- Resilient cloud computing, network security
- E-commerce and online social networks
- Human factors in networking, consumer behavior
- Technology adoption and competition

Research Areas

Network economics, E-commerce platforms, Cloud Computing, Social networks

Methods: Analytical models in Microeconomics, Optimization, Marketing, Empirical

studies and consumer trials

Relevant Coursework

Information System & Management: Enabling Technologies (Topics in OPIM, Wharton), Special Topics in Web Technologies, Graph Theory in networks, Game Theory & Applications, Microeconomic Theory, Corporate Finance (MBA course at Wharton).

Engineering: Networking Theory & Queuing Systems, Advanced Networking Protocols, Optimization Theory, Probability Theory and Random Processes, Linear Systems, Wireless Networking, Digital Communication Systems.

Academic Honors IEEE INFOCOM Best Paper Award	2012
BITSAA 30 Under 30 Award, India	2012
Media Coverage of Research in MIT Technology Review,	
The Wall Street Journal, Yahoo News, ACM Tech News, Politico	2012
Finalist, Vodafone Wireless Innovation Project, CA	2011
Intel Communication Technology Group's intern award, CA	2007

Work Experience Co-founder & Industry-Academia Liaison

2012

Datami (TUBE Inc.,), Princeton, NJ

• Offers pricing solutions, system implementation, data analysis, field trial opportunities to Internet service providers in US and India

- Collaborates with several ISPs including Reliance Communications, AT&T, MTA Alaska, Comcast, and vendors like Alcatel-Lucent, Microsoft, Qualcomm, Lock-heed Martin
- Released a commercial grade, free mobile app for personalized bandwidth management, DataWiz, for iOS and Android platforms. It had 80K+ downloads since its release and got wide-media coverage in CNet News, The Guardian, Mac World, Network World etc.

Intern, Communications Technology Group

Summer 2007

Intel Research, Intel Corporation HQ, Santa Clara, CA

- Developed and implemented membership management schemes in collaborative intrusion detection using network simulators (ns-2/C++).
- 'Mobile device of your dreams' proposal won Intel CTG's prize

Intern, Networking Research Laboratory

Summer 2006

Bell Labs, Holmdel, NJ

• Implemented new pattern matching and storage mechanisms to improve performance of SNORT, a widely-used network Intrusion Detection System

Intern, Mobile Handset Development Lab

Jan-June 2005

LG Soft India, Bangalore, India

- Development of graphical user interfaces (GUIs) for LG mobile applications
- Created a project proposal for Internet Key Exchange security protocol (IKEv6) which got funding from LG Electronics, Korea

Academic Services

- Editor, "Smart Data Pricing," John Wiley & Sons, December 2013 (expected release).
- Journals reviewed: INFORMS Operations Research, IEEE/ACM Transactions on Networking, IEEE Journal on Selected Areas in Communications, ACM SIG-COMM Computer Communication Review, Elsevier Computer Networks, IEEE Transactions on Automatic Control, IEEE Wireless Communications Magazine, Elsevier's Decisions Support Systems, Springer's Computational Management Science.
- Conference reviewed: IEEE INFOCOM 2012, CISS 2012, ISIT 2012, CDC 2012, MILCOM 2012, CoNEXT 2011, WiOpt 2011
- Technical Program Committee: SDP 2012, IEEE GLOBECOM 2013
- General Co-chair: SDP 2012 (Princeton, US), SDP 2013 (Turin, Italy)
- Panel Leader, NECA Expo 2012 in Seattle, IEEE GLOBECOM Industry Forum 2012 in Anaheim.
- Session Chair, CISS Track on Ad-hoc Networks, Princeton, NJ, March, 2012.
- Session Chair, NSF Student Panel on 'Internet Economics and Industry Structure' in 2008.

Leadership Activities

Co-Founder, DATAMI Inc., Princeton, NJ

Co-Founder, Smart Data Pricing (SDP) Forum

Secretary, Association for India's Development, Philadelphia, PA

Organizer & Session Chair, NSF Student Panel, Seattle, WA

August 2008

Book Chapters

- S. Sen, C. Joe-Wong, S. Ha, M. Chiang, "Smart Data Pricing (SDP): Economic Solutions to Network Congestion," Chapter 3, **ACM SIGCOMM** eBook on Recent Advances in Networking. editors: Olivier Bonaventure and Hamed Haddadi.
- S. Sen, C. Joe-Wong, "Human-Computer Interaction in Smart Data Pricing", Smart Data Pricing, John Wiley & Sons, forthcoming 2014.

Papers Under Review

- "Shared or Dedicated Infrastructures?: On the Impact of Reprovisioning," with R. Guérin, K. Hosanagar, X. Li (in preparation).
- "Pricing Cloud Services: Revenue, Fairness, and Resource Allocations," with C. Joe-Wong (in preparation).

Selected Journal Publications

- "A Survey of Broadband Data Pricing: Past Proposals, Current Plans, and Future Trends," with C. Joe-Wong, S. Ha, M. Chiang, **ACM Computing Survey** (ranked 1st impact factor among all Computer Science journals by ISI Journal Citations Report), vol. 46, issue 2, June 2014.
- "Multi-Resource Allocation: Fairness-Efficiency Tradeoffs in a Unifying Framework," with C. Joe-Wong, T. Lan, M. Chiang, accepted in **IEEE/ACM Transactions on Networking** (ranked **2nd** among all Computer Science journals by Times Higher Education).
- "Modeling the Dynamics of Network Technology Adoption and the Role of Converters," with Y. Jin, R. Guérin, K. Hosanagar, in **IEEE/ACM Transactions** on Networking (ranked 2nd among all Computer Science journals by Times Higher Education), Volume 18:(6), pp. 1793-1805, December 2010.
- "Optimized Day-Ahead Pricing for the Smart Grid with Device-Specific Scheduling Flexibility," with C. Joe-Wong, S. Ha, M. Chiang, in **IEEE Journal on Selected Areas in Communications** (ranked 1st among all Computer Science journals by Times Higher Education), July 2012 issue.
- "Incentivizing Time-Shifting of Data: A Survey of Time-Dependent Pricing for Internet Access", with C. Joe-Wong, S. Ha, M. Chiang, in **IEEE Communications Magazine** (ranked 3rd by impact factor among all Telecommunication journals by IEEE), pp. 91-99, November 2012.
- "Functionality-rich versus Minimalist Platforms: A Two-sided Market Analysis", with R. Guérin and K. Hosanagar, ACM SIGCOMM Computer Communication Review, Vol 41, Issue 5, pp. 36-43, September, 2011.

Selected Conference Publications

- "Pricing the Cloud: Resource Allocation, Fairness, and Revenues," with C. Joe-Wong (in preparation), Aug 2013.
- "When the Price is Right: Enabling Time-Dependent Pricing of Broadband Data," with C. Joe-Wong, S. Ha, J. Bawa, M. Chiang, accepted for publication in **ACM SIGCHI 2013** (the flagship international conference in Computer-Human Interaction; acceptance rate: 20% of 1963 submissions).
- "Offering Supplementary Wireless Technologies: Adoption Behavior and Offloading Benefits," with C. Joe-Wong and S. Ha, in **IEEE INFOCOM 2013** (flagship conference of IEEE in networks; *Acceptance rate: 17%*).
- "An Economic Analysis of Regulating Security Investments in the Internet," with M. H. R. Khouzani and N. Shroff, in **IEEE INFOCOM 2013** (Acceptance rate: 17%).

- "TUBE: Time Dependent Pricing of Mobile Data", with S. Ha, C. Joe-Wong, Y. Im, M. Chiang, Proc. of **ACM SIGCOMM 2012** (flagship conference of ACM in networks; *Acceptance rate:* 13%), August 2012.
- "Incentive Analysis of Bidirectional Filtering in the Internet," M. H. R. Khouzani,
 S. Sen, N. Shroff, Workshop on the Economics of Information Security (WEIS),
 June 2013.
- "Self-adaptive, Deadline-aware Resource Control in Cloud Computing," with Y. Xiang, B. Balasubramanian, M. Wang, T. Lan, S. Sen, M. Chiang, under submission at AHANS, workshop of SASO, July 2013.
- "The Economics of Shared Data Plans", with C. Joe-Wong and S. Ha, in Proc. of the Workshop of Information Technologies and Systems, **WITS 2012**.
- "Quantifying Political Leanings from Tweets and Retweets," with F. M. F. Wong,
 C. W. Tan, and M. Chiang, Proc. of International AAAI Conference on Weblogs and Social Media (ICWSM) (Acceptance rate: 20%), July 2013.
- "Why Watching Movie Tweets Won't Tell the Whole Story?", with F. M. F.Wong and M. Chiang, **ACM SIGCOMM Workshop on Online Social Networks** (WOSN) (Acceptance rate: 20%), August 2012.
- "Multi-Resource Allocation: Fairness-Efficiency Tradeoffs in a Unifying Framework," with C. Joe-Wong, T. Lan, M. Chiang, **IEEE INFOCOM 2012** (Acceptance rate: 17%) (Won the **Best Paper Award**).
- "On the Volatility of Online Ratings: An Empirical Study," with C. S. Leberknight and Mung Chiang, Proc. of the Workshop on e-Business, **WEB 2011**, Lecture Notes in Business Information Processing, Springer-Verlag, December 2011.
- "The Impact of Re-provisioning on the Choice of Network Infrastructures," with K. Yamauchi, R. Guérin, K. Hosanagar, Proc. of the Workshop on e-Business, WEB 2010, St. Louis, Missouri, December 11, 2010.
- "Dynamics of competition between incumbent and emerging network technologies," with Y. Jin, R. Guérin, K. Hosanagar, Z.-L. Zhang, Proc. of **NetEcon 2008** in ACM SIGCOMM, August, 2008.

Demo Papers

- "Demo: A System for Time-Dependent Pricing" with S. Ha, C. Joe-Wong, R. Rill, M. Chiang, IEEE MobiSys 2012, June, UK.
- "Aperator: A new Twitter command tool for enabling application-specific actions", with P. Zakin and M. Chiang, WebApps 2012, USENIX, Boston, MA.

Patents Filed

- "Systems and Methods for Time-dependent Internet Pricing", Invention #11-2687-1, U.S. Provisional Patent (#61/447, 896) filed on March, 2011, co-inventors: Mung Chiang, Sangtae Ha, Carlee Joe-Wong.
- "User Interface Design for Time-dependent Pricing Applications", Invention #11-2710-1, U.S. Provisional Patent (#61/496, 731) filed in June, 2011, co-inventors: Mung Chiang, Sangtae Ha, Carlee Joe-Wong.
- "A Middleware for Supporting Pricing Solutions for Broadband Networks", Invention #11-2711-1, U.S. Provisional Patent (#61/496, 611) filed in June, 2011, co-inventors: Mung Chiang, Sangtae Ha, Carlee Joe-Wong.
- "A System For Offering Intelligent Flat Rate (IFR) Data Plans", Invention #12-2726-1, U.S. Provisional Patent (#61/523,835) filed on August, 2011, co-inventors: Mung Chiang, Sangtae Ha, Carlee Joe-Wong.

Grant Proposals

- "Autonomous Collaborative Control for Resilient Cyber Defense (ACCORD)", funded by DARPA, co-written with M. Chaing, Telcordia (Stuart S. Wagner et al.), DOLL Inc., and GWU, 2011.
- "Dynamic and Multi-Scale Inference of Complex Meaning in Online Social Media", submitted in response to DoD 2012 A12a-T009 with Intelligent Automation, Inc., 2012.
- "TUBE-ing over Digital Divide", Vodafone Wireless Innovations Project 2011 Finalist, San Francisco, CA, with M. Chaing, S. Ha, C. Joe-Wong, 2011.
- "Pricing Innovations Forum" (whitepaper), an initiative to form a consortium of service providers, vendors, academics, and Government agencies for Pricing for Sustainable Broadband, with M. Chiang. (Subsequently became "Smart Data Pricing (SDP) Forum" in 2012, http://scenic.princeton.edu/SDP2012/).

Selected Talks

- "Directions in Smart Data Pricing: Lessons from Theory & Practice", invited talk at Alcatel-Lucent Bell Labs, Murray Hill, January 2013.
- "Smart Data Pricing for Broadband Networks", invited talk at Workshop on Internet Technology & Economics (WITE), November, 2012.
- "Shared Data Plans & Sponsored Access", invited talk at the National Exchange Carrier Association (NECA) Expo, Seattle, October, 2012. Also presented at WITS 2012.
- "Why Watching Movie Tweets Won't Tell the Whole Story?", Workshop on Online Social Networks (WOSN), Helsinki, August, 2012.
- "Time Dependent Pricing for Mobile Data", Bell Labs, Crawford Hill, May, 2012.
- "The Impact of Re-provisioning on the Choice of Shared versus Dedicated Networks", presented at the Ninth Workshop on E-business (WEB), St. Louis, Missouri, December, 2010.
- "Exploring the Trade-offs between Functionality-rich and Minimalist Design: A
 Two-sided Market Analysis", presented at the University of Minnesota, Minneapolis, December, 2010.
- "On the Adoption and Deployment of New Network Technologies: An Economic Perspective", presented at the Georgia Institute of Technology, Atlanta, November, 2010.

Teaching

TA for Advanced Networking Protocols (50 Graduate students) – Spring 2007 (UPenn) TA for Introduction to Networks and Protocols (20 Undergraduates, 55 Graduates) – Fall 2006 (UPenn)

Guest lecturer in Network, Friends, Money, and Bytes (Undergraduates) – Fall 2012 (Princeton)

Mentored 4 PhD students and 4 Undergraduates at Princeton, 2 Undergraduate students at UPenn.

Industrial & Academic Collaborations

My collaborations allow me to have access to unique and large-scale data sets which I use in my research.

Intelligent Automation, Inc., MD

2012-present

Large-scale online social network data analysis and synthesis for anomaly detection, OSN language evolution, collaborative filtering AT&T, MTA (Alaska), Reliance Communications (India)

Theoretical & systems foundation for consumer trials of congestion-dependent pricing in mobile networks

2011-present

Telcordia Technologies, NJ

Mission-aware Resilient Cloud (MRC), funded by DARPA

2011-present

2011-present

2011-present

Lockheed Martin Advanced Technologies Laboratories, NJ

Information analysis and management of high-density low-power sensor networks

Microsoft Research & George Washington University

Fairness-efficiency tradeoffs in datacenter multi-resource allocation, funded by National Science Foundation

The Wharton School, UPenn, PA

2005-present

Interdisciplinary research on the economics of Internet architecture

University of Minnesota, MN

2006-2011

Interdisciplinary research on network economics, network neutrality issues

References

Prof. Kartik Hosanagar, The Wharton School University of Pennsylvania, PA (kartikh@wharton.upenn.edu)

Prof. Roch Guérin, Dept. of ESE University of Pennsylvania, PA (guerin@seas.upenn.edu)

Prof. Mung Chiang, Dept. of EE Princeton University, NJ (chiangm@princeton.edu)

Prof. Andrew Odlyzko, Dept. of Mathematics University of Minnesota, MN (odlyzko@umn.edu)