Balakrishnan Chandrasekaran

Contact

Max-Planck-Institut für Informatik
Saarland Informatics Campus
Campus E1 4, 517
Saarbrücken 66123, DE

+49 0681 93253513
balac@mpi-inf.mpg.de
https://balakrishnanc.github.io

Education

Duke University — Durham (NC), US
Ph.D., Department of Computer Science — August 2010 – November 2016
Dissertation Title: *Head into the Cloud: An Analysis of the Emerging Cloud Infrastructure*
Dissertation Advisor: Bruce MacDowell Maggs

Washington University in St. Louis — St. Louis (MO), US
Master of Science in Computer Science — August 2006 – May 2008

Anna University, S.R.M. Engineering College — Chennai (TN), IN
Bachelor of Technology in Information Technology — August 2001 – May 2005

Preprints

"*Dissecting Latency in the Internet's Fiber Infrastructure*," I. N. Bozkurt, W. Aqeel, D. Bhattacherjee, B. Chandrasekaran, P. B. Godfrey, G. Laughlin, B. M. Maggs, and A. Singla, arXiv:1811.10737; Computing Research Repository (CoRR), November 2018.

"*cISP: A Speed-of-Light Internet Service Provider*," D. Bhattacherjee, S. A. Jyothi, I. N. Bozkurt, M. Tirmazi, W. Aqeel, A. Aguirre, B. Chandrasekaran, P. Brighten Godfrey, G. Laughlin, B. Maggs, and A. Singla, arXiv:1809.10897; Computing Research Repository (CoRR), September 2018.

Refereed Publications

"*Untangling Header Bidding Lore: Some myths, some truths, and some hope*," W. Aqeel, D. Bhattacherjee, B. Chandrasekaran, P. Brighten Godfrey, G. Laughlin, B. Maggs, and A. Singla, In Proceedings of the Active and Passive Measurement Conference (PAM), March 2020.

"*P4-enabled Network-assisted Congestion Feedback: A Case for NACKs*," A. Feldmann, B. Chandrasekaran, S. Fathalli, and E. N. Weyulu, Stanford Workshop on Buffer Sizing (BS), December 2019.

"*On Mapping the Interconnections in Today's Internet*," R. Motamedi, B. Yeganeh, B. Chandrasekaran, R. Rejaie, B. M. Maggs, W. Willinger, In IEEE/ACM Transactions on Networking (TON), Volume 27, Issue 5, October 2019.

"*RPKI is Coming of Age: A Longitudinal Study of RPKI Deployment and Invalid Route Origins*," T. Chung, E. Aben, T. Bruijnzeels, B. Chandrasekaran, D. Choffnes, D. Levin and B. M. Maggs, A. Mislove, R. van Rijswik-Deij, J. Rula, and N. Sullivan, In Proceedings of the ACM Internet Measurement Conference (IMC), November 2019.

"*The QUIC Fix for Optimal Video Streaming*," M. Palmer, T. Krüger, B. Chandrasekaran, and A. Feldmann, In Proceedings of the ACM CoNEXT 2018 Workshop on the Evolution, Performance, and Interoperability of QUIC (EPIQ), December 2018.

"*Gearing up for the 21st century space race*," D. Bhattacherjee, W. Aqeel, I. N. Bozkurt; A. Aguirre, B. Chandrasekaran, P. Brighten Godfrey, G. Laughlin, B. Maggs, and A. Singla, In Proceedings of the Seventeenth ACM Workshop on Hot Topics in Networks (HotNets), November 2018.

"*Is the Web Ready for OCSP Must-Staple?*," T. Chung, J. Lok, B. Chandrasekaran, D. Choffnes, D. Levin and B. M. Maggs, A. Mislove, J. Rula, N. Sullivan, and C. Wilson, In Proceedings of the ACM Internet Measurement Conference (IMC), October 2018.

"*Sounding the Bell for Improving Internet Security*," T. Benson and B. Chandrasekaran, In Proceedings of the First Workshop on Internet of Things Security and Privacy (IoT S&P), November 2017.

"*A Longitudinal, End-to-End View of the DNSSEC Ecosystem*," T. Chung, R. van Rijswik-Deij, B. Chandrasekaran, D. Choffnes, D. Levin, B. M. Maggs, A. Mislove, and C. Wilson, In Proceedings of the 26st USENIX Security Symposium, August 2017. *Winner of* ***"Distinguished Paper Award."***

[Poster] "*Delorean: Using Time Travel to Avoid Bugs and Failures in SDN Applications*," Z. Zhou, T. Benson, M. Canini, and B. Chandrasekaran, *In Proceedings of the ACM Symposium on SDN Research (SOSR)*, April 2017.

"*Why is the Internet so slow!?*," I. N. Bozkurt, A. Aguirre, B. Chandrasekaran, P. Brighten Godfrey, G. Laughlin, B. Maggs, and A. Singla, In Proceedings of the Active and Passive Measurement Conference (PAM), March 2017. *Winner of* ***"Best Data Set Award."***

"*Reducing Latency through Page-aware Management of Web Objects by Content Delivery Networks*," S. Narayanan, Y. Nam, A. Sivakumar, B. Chandrasekaran, B. Maggs, and S. Rao, In Proceedings of the ACM SIGMETRICS International Conference on Measurement and Modeling of Computer Science, June 2016.

"*Isolating and Tolerating SDN Application Failures with LegoSDN*," B. Chandrasekaran, B. Tschaen, and T. Benson, In Proceedings of the ACM Symposium on SDN Research (SOSR), March 2016.

"*A Server-to-Server View of the Internet*," B. Chandrasekaran, G. Smaragdakis, A. Berger, M. Luckie, and K.C. Ng, In Proceedings of the ACM Conference on emerging Networking EXperiments and Technologies (CoNEXT), December 2015.

"*Back-Office Web Traffic on the Internet*," E. Pujol, P. Richter, B. Chandrasekaran, G. Smaragdakis, A. Feldmann, B. M. Maggs, and K.C. Ng, In Proceedings of the ACM Internet Measurement Conference (IMC), November 2014.

"*The Internet at the Speed of Light*," A. Singla, B. Chandrasekaran, P. Brighten Godfrey, and B. Maggs, In Proceedings of the Thirteenth ACM Workshop on Hot Topics in Networks (HotNets), October 2014.

"*Tolerating SDN Application Failures with LegoSDN*," B. Chandrasekaran and T. Benson, In Proceedings of the Thirteenth ACM Workshop on Hot Topics in Networks (HotNets), October 2014.

[Poster] "*Tolerating SDN Application Failures with LegoSDN*," B. Chandrasekaran and T. Benson, *In Proceedings of the Third ACM Workshop on Hot Topics in Software Defined Networking (HotSDN)*, August 2014.

"*Curing Regular Expressions Matching Algorithms from Insomnia, Amnesia, and Acalculia*," S. Kumar, B. Chandrasekaran, J. Turner, and G. Varghese, In Proceedings of the 3rd ACM/IEEE Symposium on Architectures for Networking and Communications Systems (ANCS), November 2007.

Technical Reports

"*On the geography of X-Connects*," R. Motamedi, B. Chandrasekaran, B. Maggs, R. Rejaie, and W. Willinger, Oregon University, Technical Report CIS-TR-2014-1, May 2015.

"*Alidade: IP Geolocation without Active Probing*," B. Chandrasekaran, M. Bai, M. Schoenfield, A. Berger, N. Caruso, G. Economou, S. Gilliss, B. Maggs, K. Moses, D. Duff, K.C. Ng, E. G. Sirer, R. Weber, and B. Wong, Duke University, Technical Report CS-TR-2015-001, January 2015.

Other Publications

"*A Longitudinal, End-to-End View of the DNSSEC Ecosystem*," T. Chung, R. van Rijswik-Deij, B. Chandrasekaran, D. Choffnes, D. Levin, B. M. Maggs, A. Mislove, and C. Wilson, ;login: The USENIX Magazine, Winter 2017, Vol. 42, No. 4, 2017.

[Invited paper] "*A Universal Approach to Data Center Design*," A. Akella, T. Benson, B. Chandrasekaran, C. Huang, B.

Maggs and D. Maltz, *In Proceedings of the 16th International Conference on Distributed Computing and Networking (ICDCN)*, January 2015.

Press coverage

The *MyAdPrice* extension was identified as one of the best browser extensions to obtain insights into header bidding at headerbidding.co (on Jan. 3, 2020) and bannertag.com (on Jun. 25, 2019).

The *Internet at the Speed of Light* project was featured on the front page of San Jose Mercury News (on Nov. 30, 2014), and IT World (on May 9, 2015), and subsequently republished in a few other news outlets: Contra Costa Times (on Mar. 17, 2015), The Bulletin (on Dec. 6, 2014), Valley News (On Aug. 12, 2014), and Star Tribune (on Dec. 13, 2014).

Talks

A Two-Part Tale on Network Congestion — March 6, 2020
Aalto University
Espoo, FI

The Server-to-Server Landscape: insights, opportunities, and challenges — October 22, 2019
Chalmers University
Göteburg, SE

The Server-to-Server Landscape: insights, opportunities, and challenges — March 14, 2019
The University of Edinburgh
Edinburgh, UK

Solving the Internet Latency Problem: One Piece at a Time — December 6, 2017
KTH Royal Institute of Technology
Stockholm, SE

Fail without fear: On a Novel Fault-Tolerant SDN Controller Architecture — April 14, 2016
IBM T.J. Watson Research Center
Yorktown Heights (NY), US

Isolating and Tolerating SDN Application Failures with LegoSDN — March 14, 2016
ACM Symposium on SDN Research (SOSR)
Santa Clara (CA), US

A Server-to-Server View of the Internet — December 3, 2015
ACM Conference on emerging Networking EXperiments and Technologies (CoNEXT)
Heidelberg, DE

Tolerating SDN Application Failures with LegoSDN — October 28, 2014
Thirteenth ACM Workshop on Hot Topics in Networks (HotNets)
Los Angeles (CA), US

Peeling through the Structural Layers of the Internet — June 13, 2011
Internet MRA Reunion Conference II, IPAM, UCLA
Lake Arrowhead (CA), US

Employment

Senior Researcher, *Max-Planck-Institut für Informatik* — Saarbrücken, DE
Group: Networked Systems — August 2019 – ∗

Working broadly on networked systems and projects include analyzing the Web PKI, cross-layer optimization for video streaming, congestion control, network routing and traffic dynamics, and blockchains.

Postdoctoral Scholar, *Max-Planck-Institut für Informatik* — Saarbrücken, DE
Mentor: Anja Feldmann — March 2018 – July 2019

Working on projects in the areas of network measurements and mapping, software-defined networking, video streaming, and the Web PKI.

Postdoctoral Scholar, *Technische Universität Berlin* Berlin, DE
Mentor: Anja Feldmann December 2016 – February 2018

Worked on projects in the areas of IoT security, video streaming, fault-tolerant designs for software-defined networking, and inferring congestion in the Internet.

Graduate Research Assistant, *Duke University* Durham (NC), US
Advisor: Bruce MacDowell Maggs August 2010 - December 2016

Worked on various projects related to network measurements and mapping, software-defined networks, datacenter networks, future Internet architectures, and IP geolocation.

Visiting Researcher, *Technische Universität Berlin.* Berlin, DE
Mentor: Anja Feldmann June 2015 - September 2015

Designed a measurement study to analyze factors contributing to page-load times of Web pages and identify where significant improvements can be made.

Intern, Custom Engineering, *Akamai Technologies, Inc.* Cambridge (MA), US
Mentors: Arthur Berger, Keung-Chi Ng, David Duff June 2014 - August 2014

Analyzed traceroute data gathered over a time frame of 16 months between dual-stacked Akamai servers over both IPv4 and IPv6 protocols to provide insights into the state of the Internet's core. We showed that *consistent congestion* (daily oscillations in RTTs) is not the norm in the Internet's core and that routing changes at the AS-level typically do not increase latencies.

Intern, Service Quality Management, *AT&T Research Labs.* Florham Park (NJ), US
Mentors: He Yan, Nicholas Duffield June 2013 - August 2013

Developed tools to detect *holes* in network service coverage during service outages, and assist in network-infrastructure-recovery efforts.

Intern, Custom Engineering, *Akamai Technologies, Inc.* Cambridge (MA), US
Mentors: Arthur Berger, Keung-Chi Ng, David Duff May 2012 - August 2012

Worked on improving the geolocation accuracy of *Alidade*, a passive IP geolocation system, and developed tools to query and verify geolocation predictions.

Intern, Custom Engineering, *Akamai Technologies, Inc.* Cambridge (MA), US
Mentors: Arthur Berger, Keung-Chi Ng, David Duff May 2011 - August 2011

Collaborated on the design and development of *Alidade*, a constraint-based passive IP geolocation system; designed an aggregator to summarize the geolocation predictions of IPs contained in a prefix.

Sr. Technical Consultant, *Perficient, Inc.* Denver (CO), US
Supervisor: George Hunter June 2008 - July 2010

Designed tools to analyze and tune the performance of application servers running on the HotSpot JVM that routinely buckled under high load. I won an *Extra Mile Award* in the 1st Quarter of 2009 for outstanding performance and contributions.

Intern, Premedia Group, *Vertis Communications, Inc.* Earth City (MO), US
Mentor: Brian Costlow May 2007 - August 2007

Designed a multi-threaded asynchronous dispatcher framework for handling queries in an in-house RPC environment.

Associate Software Engineer, *Torry Harris Business Solutions, Pvt. Ltd.* Bangalore (KA), India
Supervisors: Meenakshi Sharma, Srivathsa Vijay June 2005 - June 2006

Developed tools to diagnose faults in middleware applications.

Community Service

Program Committee Member
Active and Passive Measurement Conference (PAM), 2020
ACM Symposium on SDN Research (SOSR), 2019
ACM Conference on emerging Networking EXperiments and Technologies (CoNEXT), 2019

External Reviewer
In IEEE/ACM Transactions on Networking (TON), 2019
International Federation for Information Processing (IFIP) Networking Conference, 2017

Teaching

Data Networks
With Anja Feldmann
Universität des Saarlandes, Saarbrücken, DE
Graduate-level course, Winter Semester 2018-19

Guest lecture on Sketches and Sampling, **Network Algorithms**
Instructor: Georgios Smaragdakis
Technische Universität Berlin, Berlin, DE
Graduate-level course, Winter Semester 2017-18

Internet Measurements
With Anja Feldmann
Technische Universität Berlin, Berlin, DE
Graduate-level course, Summer Semester 2017

Guest lecture on Web/HTTP & DNS, **Network Protocol Architecture**
Instructor: Anja Feldmann
Technische Universität Berlin, Berlin, DE
Graduate-level course, Winter Semester 2016-17

Guest lecture on Hadoop, **Distributed Systems (CPS 512.01)**
Instructor: Bruce MacDowell Maggs
Duke University, Durham (NC), US
Graduate-level course, Spring Semester 2015, 2014

Teaching Assistant, **Operating Systems (CPS 310)**
Instructor: Jeffrey S. Chase
Duke University, Durham (NC), US
Undergraduate-level course, Fall Semester 2013

Teaching Assistant, **Discrete Mathematics (CPS 102.1)**
Instructor: Bruce MacDowell Maggs
Duke University, Durham (NC), US
Undergraduate-level course, Fall Semester 2011

Teaching Assistant, **Programming Design and Analysis II (CPS 100E.2)**
Instructor: Susan Rodger
Duke University, Durham (NC), US
Undergraduate-level course, Spring Semester 2011