

Balakrishnan Chandrasekaran

CONTACT

Max-Planck-Institut für Informatik
Forschungsgruppe Internet Architecture (INET),
Campus E1 4, 507
Saarbrücken 66123, DE

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+49 174 2640506
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RESEARCH INTERESTS

Network measurements & mapping, network design and security, and software-defined networking.

EDUCATION

Duke University

Ph.D., Department of Computer Science

Dissertation Title: *Head into the Cloud: An Analysis of the Emerging Cloud Infrastructure*

Dissertation Advisor: Bruce MacDowell Maggs

Durham (NC), US
August 2010 – November 2016

Washington University in St. Louis

Master of Science in Computer Science

St. Louis (MO), US
August 2006 – May 2008

Anna University, S.R.M. Engineering College

Bachelor of Technology in Information Technology

Chennai (TN), IN
August 2001 – May 2005

PREPRINTS

The QUIC Fix for Optimal Video Streaming

M. Palmer, T. Krüger, B. Chandrasekaran, A. Feldmann

arXiv:1809.10270; Computing Research Repository (CoRR), September 2018

cISP: A Speed-of-Light Internet Service Provider

D. Bhattacharjee, S. A. Jyothi, I. N. Bozkurt, M. Tirmazi, W. Aqeel, A. Aguirre, B. Chandrasekaran, P. Brighten Godfrey, G. P. Laughlin, B. M. Maggs, A. Singla

arXiv:1809.10897; Computing Research Repository (CoRR), September 2018

Towards a Speed of Light Internet

A. Singla, B. Chandrasekaran, P. Brighten Godfrey, B. Maggs

arXiv:1505.03449v1; Computing Research Repository (CoRR), May 2015

REFEREED PUBLICATIONS

The QUIC Fix for Optimal Video Streaming

M. Palmer, T. Krüger, B. Chandrasekaran, 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. Bhattacharjee, W. Aqeel and I. N. Bozkurt; A. Aguirre, B. Chandrasekaran, P. Brighten Godfrey, G. P. Laughlin, B. M. Maggs, 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, C. Wilson
In Proceedings of the ACM Internet Measurement Conference (IMC), October 2018

Sounding the Bell for Improving Internet Security

T. Benson, 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 Rijswijk-Deij, B. Chandrasekaran, D. Choffnes, D. Levin, B. M. Maggs, A. Mislove, C. Wilson

Distinguished Paper Award

In Proceedings of the 26st USENIX Security Symposium, August 2017

Delorean: Using Time Travel to Avoid Bugs and Failures in SDN Applications

Z. Zhou, T. Benson, M. Canini, B. Chandrasekaran

[Poster] 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, A. Singla

Best Data Set Award

In Proceedings of the Active and Passive Measurement Conference (PAM), March 2017

Reducing Latency through Page-aware Management of Web Objects by Content Delivery Networks

S. Narayanan, Y. Nam, A. Sivakumar, B. Chandrasekaran, B. Maggs, 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. Maggs, 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, 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, T. Benson

In Proceedings of the Thirteenth ACM Workshop on Hot Topics in Networks (HotNets), October 2014

Tolerating SDN Application Failures with LegoSDN

B. Chandrasekaran, T. Benson

[Poster] 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

On the geography of X-Connects

R. Motamedi, B. Chandrasekaran, B. Maggs, R. Rejaie, W. Willinger

Oregon University, Technical Report CIS-TR-2014-1, May 2015

Alidade: IP Geolocation without Active Probing

B. Chandrasekaran, M. Bai, M. Schoenfeld, 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 Rijswijk-Deij, B. Chandrasekaran, D. Choffnes, D. Levin, B. M. Maggs, A. Mislove, C. Wilson
;login: The USENIX Magazine, Winter 2017, Vol. 42, No. 4, 2017

A Universal Approach to Data Center Design

A. Akella, T. Benson, B. Chandrasekaran, C. Huang, B. Maggs and D. Maltz
[Invited paper] In Proceedings of the 16th International Conference on Distributed Computing and Networking (ICDCN), January 2015

TALKS

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

Postdoctoral Scholar, Max-Planck-Institut für Informatik

Saarbrücken, DE

Mentor: Anja Feldmann

March 2018 – *

Working on projects in the areas of network measurements and mapping, software-defined networking, and network design and security.

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.

Mentor: Anja Feldmann

Berlin, DE

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.

Mentors: Arthur Berger, Keung-Chi Ng, David Duff

Cambridge (MA), US

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.

Mentors: He Yan, Nicholas Duffield

Florham Park (NJ), US

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.

Mentors: Arthur Berger, Keung-Chi Ng, David Duff

Cambridge (MA), US

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.

Mentors: Arthur Berger, Keung-Chi Ng, David Duff

Cambridge (MA), US

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.

Supervisor: George Hunter

Denver (CO), US

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.

Mentor: Brian Costlow

Earth City (MO), US

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.

Supervisors: Meenakshi Sharma, Srivathsa Vijay

Bangalore (KA), India

June 2005 - June 2006

Developed tools to diagnose faults in middleware applications.

**COMMUNITY
SERVICE**

Program Committee Member, ACM Symposium on SDN Research (SOSR), 2019.

IN THE NEWS

The *Internet at the Speed of Light* project was featured on the front page of [San Jose Mercury News](#), and [IT World](#), and subsequently republished in a few other news outlets: [Contra Costa Times](#), [The Bulletin](#), [Valley News](#), and [Star Tribune](#).

TEACHING

Data Networks

With Anja Feldmann

Universität des Saarlandes

Saarbrücken, DE

Graduate-level course, Winter Semester	2018-19
<i>Guest lecture on Sketches and Sampling, Network Algorithms</i>	
<i>Instructor: Georgios Smaragdakis</i>	
Technische Universität Berlin	Berlin, DE
Graduate-level course, Winter Semester	2017-18
Internet Measurements	
<i>With Anja Feldmann</i>	
Technische Universität Berlin	Berlin, DE
Graduate-level course, Summer Semester	2017
<i>Guest lecture on Web/HTTP, DNS & DNS, Network Protocol Architecture</i>	
<i>Instructor: Anja Feldmann</i>	
Technische Universität Berlin	Berlin, DE
Graduate-level course, Winter Semester	2016-17
<i>Guest lecture on Hadoop, Distributed Systems (CPS 512.01)</i>	
<i>Instructor: Bruce MacDowell Maggs</i>	
Duke University	Durham (NC), US
Graduate-level course, Spring Semester	2015, 2014
<i>Teaching Assistant, Operating Systems (CPS 310)</i>	
<i>Instructor: Jeffrey S. Chase</i>	
Duke University	Durham (NC), US
Undergraduate-level course, Fall Semester	2013
<i>Teaching Assistant, Discrete Mathematics (CPS 102.1)</i>	
<i>Instructor: Bruce MacDowell Maggs</i>	
Duke University	Durham (NC), US
Undergraduate-level course, Fall Semester	2011
<i>Teaching Assistant, Programming Design and Analysis II (CPS 100E.2)</i>	
<i>Instructor: Susan Rodger</i>	
Duke University	Durham (NC), US
Undergraduate-level course, Spring Semester	2011