

Aaron Gember-Jacobson

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EDUCATION

Ph.D. in Computer Science May 2016
University of Wisconsin–Madison, Madison, WI

Master of Science in Computer Science May 2011
University of Wisconsin–Madison, Madison, WI

Bachelor of Science in Computer Science May 2009
Marquette University, Milwaukee, WI

EMPLOYMENT

Assistant Professor, Colgate University July 2016 – Present

Lecturer, University of Wisconsin–Madison Spring 2015, Spring 2014

Research Assistant/Fellow, University of Wisconsin–Madison January 2010 – May 2016

Student Intern, AT&T Research May 2011 – July 2011

TEACHING

(† indicates course includes a weekly 2 hour laboratory in addition to lecture)

COLGATE UNIVERSITY — *undergraduate liberal arts institution with a 5 course teaching load*

- **Intro to Computing I (COSC 101)**: Fall 2021, Spring 2020†, Spring 2018†
- **Intro to Computer Systems (COSC 208)**†: Fall 2022 (2 sections), Spring 2022, Fall 2021, Spring 2021 (2 sections), Fall 2020
- **Operating Systems (COSC 301)**†: Spring 2019, Fall 2018, Fall 2017, Spring 2017, Fall 2016 (2 sections)
- **Computer Networks (COSC 465)**: Spring 2022†, Spring 2020†, Spring 2019†, Spring 2017
- **The Unreliable Internet (FSEM 136)**: Fall 2020, Fall 2018

UNIVERSITY OF WISCONSIN-MADISON — *courses taught as a lecturer during PhD program*

- **Introduction to Networks (CS 640)**: Spring 2015, Spring 2014

PUBLISHED WORKS

(* indicates Colgate student author)

REFEREED CONFERENCE PUBLICATIONS ¹

C17. Peng Zhang, Dan Wang, and Aaron Gember-Jacobson. Symbolic router execution. In *Proceedings of the ACM SIGCOMM 2022 Conference (SIGCOMM)*, pages 336–349. ACM, 2022

¹In computer science, conference publications are similar to journal publications. Well regarded conferences have a rigorous peer-review process and conference proceedings are archival. See the Computing Research Association’s “Best Practices Memo: Evaluating Computer Scientists and Engineers for Promotion and Tenure” for more information.

- C16. Peng Zhang, [Aaron Gember-Jacobson](#), Yueshang Zuo, Yuhao Huang, Xu Liu, and Hao Li. Differential network analysis. In *Proceedings of the 19th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, pages 601–615. USENIX, 2022
- C15. Anubhavnidhi Abhashkumar, [Aaron Gember-Jacobson](#), and Aditya Akella. AED: Incrementally synthesizing policy-compliant and manageable configurations. In *Proceedings of the 16th International Conference on Emerging Networking EXperiments and Technologies (CoNEXT)*, pages 482–495. ACM, 2020
- C14. Anubhavnidhi Abhashkumar, [Aaron Gember-Jacobson](#), and Aditya Akella. Tiramisu: Fast multilayer network verification. In *Proceedings of the 17th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, pages 201–219. USENIX Association, 2020
- C13. [Aaron Gember-Jacobson](#), Aditya Akella, Ratul Mahajan, and Hongqiang Harry Liu. Automatically repairing network control planes using an abstract representation. In *Proceedings of the 26th Symposium on Operating Systems Principles (SOSP)*, pages 359–373. ACM, 2017
- C12. [Aaron Gember-Jacobson](#), Raajay Viswanathan, Aditya Akella, and Ratul Mahajan. Fast control plane analysis using an abstract representation. In *Proceedings of the ACM SIGCOMM 2016 Conference (SIGCOMM)*, pages 300–313. ACM, 2016
- C11. Junaid Khalid, [Aaron Gember-Jacobson](#), Roney Michael, Anubhavnidhi Abhashkumar, and Aditya Akella. Paving the way for NFV: Simplifying middlebox modifications using StateAlyzr. In *Proceedings of the 13th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, pages 239–253. USENIX Association, 2016
- C10. [Aaron Gember-Jacobson](#), Wenfei Wu, Xiujun Li, Aditya Akella, and Ratul Mahajan. Management plane analytics. In *Proceedings of the 2015 ACM Internet Measurement Conference (IMC)*, pages 395–408. ACM, 2015
- C9. Keqiang He, Junaid Khalid, [Aaron Gember-Jacobson](#), Sourav Das, Chaithan Prakash, Aditya Akella, Li Erran Li, and Marina Thottan. Measuring control plane latency in SDN-enabled switches. In *Proceedings of the 1st ACM SIGCOMM Symposium on Software Defined Networking Research (SOSR)*, pages 25:1–25:6. ACM, 2015
- C8. Ashok Anand, [Aaron Gember-Jacobson](#), Collin Engstrom, and Aditya Akella. Design patterns for tunable and efficient SSD-based indexes. In *Proceedings of the tenth ACM/IEEE symposium on Architectures for networking and communications systems (ANCS)*, pages 149–160. ACM, 2014
- C7. [Aaron Gember-Jacobson](#), Raajay Viswanathan, Chaithan Prakash, Robert Grandl, Junaid Khalid, Sourav Das, and Aditya Akella. OpenNF: enabling innovation in network function control. In *Proceedings of the ACM SIGCOMM 2014 Conference (SIGCOMM)*, pages 163–174. ACM, 2014
- C6. Thomas Ball, Nikolaj Bjørner, [Aaron Gember](#), Shachar Itzhaky, Aleksandr Karbyshev, Mooly Sagiv, Michael Schapira, and Asaf Valadarsky. VeriCon: towards verifying controller programs in software-defined networks. In *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*, pages 282–293. ACM, 2014
- C5. Keqiang He, Alexis Fisher, Liang Wang, [Aaron Gember](#), Aditya Akella, and Thomas Ristenpart. Next stop, the cloud: understanding modern web service deployment in EC2 and Azure. In *Proceedings of the 2013 Internet Measurement Conference (IMC)*, pages 177–190. ACM, 2013
- C4. [Aaron Gember](#), Aditya Akella, Jeffrey Pang, Alexander Varshavsky, and Ramón Cáceres. Obtaining in-context measurements of cellular network performance. In *Proceedings of the 12th ACM SIGCOMM Internet Measurement Conference (IMC)*, pages 287–300. ACM, 2012

- C3. [Aaron Gember](#), Christopher Dragga, and Aditya Akella. ECOS: leveraging software-defined networks to support mobile application offloading. In *Proceedings of the Symposium on Architecture for Networking and Communications Systems (ANCS)*, pages 199–210. ACM, 2012
- C2. Shan-Hsiang Shen, [Aaron Gember](#), Ashok Anand, and Aditya Akella. Refactor-ing content overhearing to improve wireless performance. In *Proceedings of the 17th Annual International Conference on Mobile Computing and Networking (MobiCom)*, pages 217–228. ACM, 2011
- C1. [Aaron Gember](#), Ashok Anand, and Aditya Akella. A comparative study of handheld and non-handheld traffic in campus Wi-Fi networks. In *Proceedings of the 12th International Passive and Active Measurement Conference (PAM)*, pages 173–183. Springer, 2011

REFEREED WORKSHOP PUBLICATIONS

- W9. Emily Huff* and [Aaron Gember-Jacobson](#). Divesting in socially (ir)responsible internet service providers. In *Proceedings of the ACM SIGCOMM 2021 Workshop on Technologies, Applications, and Uses of a Responsible Internet (TAURIN)*, pages 21–28. ACM, 2021
- W8. Peng Zhang, Yhao Huang, [Aaron Gember-Jacobson](#), Wenbo Shi, Xu Liu, Hongkun Yang, and Zhiqiang Zuo. Incremental network configuration verification. In *Proceedings of the 19th ACM Workshop on Hot Topics in Networks (HotNets)*, pages 81–87. ACM, 2020
- W7. [Aaron Gember-Jacobson](#), Costin Raiciu, and Laurent Vanbever. Integrating verification and repair into the control plane. In *Proceedings of the 16th ACM Workshop on Hot Topics in Networks (HotNets)*, pages 129–135. ACM, 2017
- W6. Junaid Khalid, Mark Coatsworth, [Aaron Gember-Jacobson](#), and Aditya Akella. A standardized southbound API for VNF management. In *Proceedings of the ACM SIGCOMM Workshop on Hot topics in Middleboxes and Network Function Virtualization (HotMiddlebox)*, pages 38–43. ACM, 2016
- W5. [Aaron Gember-Jacobson](#) and Aditya Akella. Improving the safety, scalability, and efficiency of network function state transfers. In *Proceedings of the 2015 ACM SIGCOMM Workshop on Hot Topics in Middleboxes and Network Function Virtualization (HotMiddlebox)*, pages 43–48. ACM, 2015
- W4. Anand Krishnamurthy, Shoban P. Chandrabose, and [Aaron Gember-Jacobson](#). Pratyastha: an efficient elastic distributed SDN control plane. In *Proceedings of the 3rd workshop on Hot topics in software defined networking (HotSDN)*, pages 133–138. ACM, 2014
- W3. [Aaron Gember](#), Prathmesh Prabhu, Zainab Ghadiyali, and Aditya Akella. Toward software-defined middlebox networking. In *Proceedings of the 11th ACM Workshop on Hot Topics in Networks (HotNets)*, pages 7–12. ACM, 2012
- W2. [Aaron Gember](#), Chris Dragga, and Aditya Akella. ECOS: practical mobile application offloading for enterprises. In *Proceedings of the 2nd USENIX Workshop on Hot Topics in Management of Internet, Cloud, and Enterprise Networks and Services (Hot-ICE)*. USENIX Association, 2012
- W1. Ashok Anand, [Aaron Gember](#), Aditya Akella, and Vyas Sekar. Tracking semantic relationships for effective data management in home networks. In *Proceedings of the 2010 ACM SIGCOMM Workshop on Home Networks (HomeNets)*, pages 49–54. ACM, 2010

REFEREED POSTERS (EXTENDED ABSTRACTS)

([†] indicates conference did not include the extended abstracts in the published proceedings)

- P7. Omshi Samal* and Aaron Gember-Jacobson. Testing router command line interfaces. In *ACM SIGCOMM 2022 Networking Networking Women Professional Development Workshop (N2Women)*. ACM, 2022[†]
- P6. Xi Jiang* and Aaron Gember-Jacobson. Non-interoperability detection for routing protocol implementations. In *ACM SIGCOMM 2021 Conference (SIGCOMM), Poster and Demo Sessions*, pages 4–5. ACM, 2021. (Awarded 1st place in the Undergraduate Student Research Competition)
- P5. Ruchit Shrestha*, Xiaolin Sun*, and Aaron Gember-Jacobson. Localizing router configuration errors using unsatisfiable cores. In *16th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*. USENIX, 2019[†]
- P4. Ahsan Mahmood* and Aaron Gember-Jacobson. Auto-completion for network configurations. In *15th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*. USENIX, 2018[†]
- P3. Keqiang He, Junaid Khalid, Sourav Das, Aaron Gember-Jacobson, Chaithan Prakash, Aditya Akella, Li Erran Li, and Marina Thottan. Latency in software defined networks: Measurements and mitigation techniques. In *Proceedings of the 2015 ACM SIGMETRICS International Conference on Measurement and Modeling of Computer Systems (SIGMETRICS)*, pages 435–436. ACM, 2015
- P2. Aaron Gember, Robert Grandl, Junaid Khalid, and Aditya Akella. Design and implementation of a framework for software-defined middlebox networking. In *Proceedings of the ACM SIGCOMM 2013 Conference (SIGCOMM)*, pages 467–468. ACM, 2013
- P1. Aaron Gember and Dennis Brylow. Real-Time TCP for Embedded Devices. *ACM Student Research Competition Poster Session, 40th ACM Technical Symposium on Computer Science Education (SIGCSE)*, 2009.

TECHNICAL REPORTS (NON-REFEREED)

- R8. Aaron Gember-Jacobson, Ruchit Shrestha*, and Xiaolin Sun*. Localizing router configuration errors using minimal correction sets. *arXiv Computing Research Repository (CoRR)*, abs/2204.10785, 2022. (15 pages)
- R7. Anubhavnidhi Abhashkumar, Aaron Gember-Jacobson, Aditya Akella, and Yibo Zhu. Tiramisu: Fast and general network verification. *arXiv Computing Research Repository (CoRR)*, abs/1906.02043, 2019. (17 pages)
- R6. Eric Campbell, Aaron Gember-Jacobson, Alex Horn, and Nate Foster. A two-stage network anomaly detection method using formal analysis. Technical Report 2482, Fujitsu Laboratories of America, 2018. (10 pages)
- R5. Aaron Gember, Robert Grandl, Junaid Khalid, Shan-Hsiang Shen, and Aditya Akella. Design and implementation of a framework for software-defined middlebox networking. Technical Report TR1794, University of Wisconsin-Madison, 2012. (14 pages)
- R4. Aaron Gember, Anand Krishnamurthy, Saul St. John, Robert Grandl, Xiaoyang Gao, Ashok Anand, Theophilus Benson, Aditya Akella, and Vyas Sekar. Stratos: A network-aware orchestration layer for middleboxes in the cloud. *arXiv Computing Research Repository (CoRR)*, abs/1305.0209, 2013. (14 pages)

- R3. Ashok Anand, [Aaron Gember](#), and Aditya Akella. Generic design patterns for tunable and high-performance ssd-based index. Technical Report TR1778, University of Wisconsin-Madison, 2012. (13 pages)
- R2. [Aaron Gember](#) Robert Grandl, Ashok Anand, Theophilus Benson, and Aditya Akella. Stratos: Virtual middleboxes as first-class entities. Technical Report TR1771, University of Wisconsin-Madison, 2012. (15 pages)
- R1. [Aaron Gember](#) Ashok Anand and Aditya Akella. Handheld vs. non-handheld traffic: Implications for campus wifi networks. Technical Report TR1679, University of Wisconsin-Madison, 2010. (12 pages)

INVITED BLOG POSTS (NON-REFEREED)

- B2. [Aaron Gember-Jacobson](#) and Aditya Akella. The verification-synthesis spectrum. *Netverify*, August 2020. <https://netverify.fun/the-verification-synthesis-spectrum>
- B1. Aditya Akella and [Aaron Gember-Jacobson](#). Talk to a network operator today! *Netverify*, July 2020. <https://netverify.fun/talk-to-a-network-operator-today>

PRESENTATIONS

CONFERENCE/WORKSHOP PRESENTATIONS

- Refereed Conference Publications: C17, C16, C13, C8, C7, C5, C4, C2, C1
- Refereed Workshop Publications: W9, W5, W3, W2

INVITED TALKS

- T2. Detecting Configuration Errors Via Pattern Mining. *Network Verification Workshop (NetVerify)*, November 2021. (with Jyotirmay Chauhan*, Devon Lee*, and Emily Yu*)
- T1. Localizing router configuration errors using correction sets. *ACM SIGCOMM 2019 Workshop on Networking and Programming Languages (NetPL)*, August 2019

PANELS

- N1. Advances, Opportunities, and "Non-Traditional" Software-Defined Networking Control. *ACM SIGCOMM Symposium on SDN Research (SOSR) 2021*, October 2021.

COLLOQUIUMS

- Q3. The Verification-Synthesis Spectrum. *Colgate University Natural Sciences and Mathematics Colloquium Series 2020-2021*, April 2021.
- Q2. Verifying and repairing network control planes using an abstract representation. *Cornell University Systems Lunch*, September 2019.
- Q1. Providing automatic insights into network requirements. *Hamilton College Computer Science Colloquium*, March 2019.

GRANTS

EXTERNAL

- E2. *NeTS: Medium: Collaborative Research: Automatic Network Repair*. National Science Foundation (NSF), 2018-2022, \$170K (plus \$1,030K awarded to the University of Wisconsin-Madison).
Role: Principal Investigator
- E1. *AitF: Collaborative Research: Foundations of Intent-based Networking*. National Science Foundation (NSF), 2016-2019, \$60K (plus \$356K awarded to the University of Wisconsin-Madison).
Role: Principal Investigator

INTERNAL

- I10. *Learning from network history*. Colgate University, Faculty-Initiated Summer Student Fellowship, Summer 2022, \$4200.
- I9. *Improving network management with machine learning*. Colgate University, Faculty-Initiated Summer Student Fellowship, Summer 2021, \$4725.
- I8. *Practical bug detection in software implementations of routing protocols*. Colgate University, Faculty-Initiated Summer Student Fellowship, Summer 2020, \$3800.
- I7. *Analyzing network configurations and inferring/verifying networking behavior*. Colgate University, Student Wage Grant, Fall Summer 2019, \$1882.
- I6. *Updating computer networks one step at a time*. Colgate University, Faculty-Initiated Summer Student Fellowship, Summer 2019, \$4050.
- I5. *Leveraging WiFi signals to identify smartphone proximity*. Colgate University, Student Wage Grant, Fall 2018, \$590.
- I4. *Quickly and clearly repairing computer networks*. Colgate University, Faculty-Initiated Summer Student Fellowship, Summer 2018, \$7200.
- I3. *Efficiently monitoring and analyzing events in a live network to accurately detect errors*. Colgate University, Student Wage Grant, Spring 2018, \$1672.
- I2. *Automatically fixing common causes of network problems*. Colgate University, Student Wage Grant, Summer 2017, \$2233.
- I1. *Improving auto-generated repairs for computer networks*. Colgate University, Faculty-Initiated Summer Student Fellowship, Summer 2017, \$9000.

HONORS AND AWARDS

- Internet Engineering Task Force (IETF) Applied Networking Research Prize (2015)
- Department of Computer Sciences Graduate Student Instructor Award (2014)
- IBM Ph.D. Fellowship (2013-2015)
- Wisconsin Alumni Research Foundation (WARF) Innovation Award Finalist (2012)
- National Science Foundation Graduate Research Fellowship Honorable Mention (2011)
- University of Wisconsin—Madison, Computer Science Summer Graduate Fellowship (2010)
- Third Place in the ACM Student Research Competition at SIGCSE 2009

RESEARCH COMMUNITY

- *Steering committee chair*, ACM Symposium on SDN Research (SOSR): 2019–present
- *Program co-chair*, ACM Symposium on SDN Research (SOSR): 2019
- *Program committee member*, ACM Symposium on SDN Research (SOSR): 2021, 2020
- *External reviewer*, International Conference on Computer Aided Verification (CAV): 2022
- *Artifact evaluation committee co-chair*, ACM SIGCOMM Conference (SIGCOMM): 2021
- *Program committee member*, International Conference on emerging Networking EXperiments and Technologies (CoNEXT): 2021, 2018
- *Reviewer*, IEEE/ACM Transactions on Networking (TON): 2021, 2016, 2014
- *Moderator*, SIGCOMM Slack Workspace: 2020
- *Panelist*, National Science Foundation (NSF): 2020, 2019, 2018
- *Poster committee member*, ACM SIGCOMM Conference (SIGCOMM): 2020, 2019
- *Program committee member*, ACM SIGMETRICS International Conference on Measurement and Modeling of Computer Systems: 2018
- *Poster and Demo committee member*, ACM Symposium on SDN Research (SOSR): 2018
- *Program committee member*, Asia-Pacific Workshop on Networking (APNet): 2017
- *Program committee member*, IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN): 2017
- *Reviewer*, ACM New York Celebration of Women in Computing (NYCWIC): 2017
- *External reviewer*, International Journal of Network Measurement (IJNM): 2016, 2014
- *External reviewer*, Symposium on Principles of Programming Languages (POPL): 2016
- *External reviewer*, Computer Communications Review (CCR): 2016, 2015
- *External reviewer*, IEEE Transactions on Wireless Communications (TWC): 2015
- *Poster committee member*, ACM/IEEE Symposium on Architectures for Networking and Communications Systems (ANCS): 2014

UNIVERSITY

- *Computer Science co-representative*, Benton Center Users Group: Fall 2021–present
- *Executive advisory committee member*, Picker Interdisciplinary Science Institute: Fall 2021–present
- *Group member*, DEI in STEM: Fall 2020–present
- *Co-facilitator*, Dart Colgrove Commons Wellness Discussion Group: Fall 2020
- *Ex officio representative*, Committee on Information Technology (CIT): 2018-19
- *Appointed member*, Fellowships Committee: Fall 2021, Fall 2018, Fall 2017
- *Search committee member*, Information Technology Services (ITS): Spring 2019, Spring 2017

DEPARTMENT

- *Organizer*, Task Force on Diversity, Equity, and Inclusion (DEI) in Computer Science: Fall 2020–present
- *Organizer*, weekly department symposium: Spring 2020, Spring 2017–Spring 2019
- *Search committee member*: Spring 2022, Fall 2021, Spring 2021, Fall 2019, Spring 2019, Fall 2018, Spring 2018, Spring 2017, Fall 2017

RESEARCH MENTORING

BACHELOR'S THESES

- Xi (Chase) Jiang '21: “Non-interoperability Detection for Routing Protocol Implementations”
- Emily Huff '20: “Socially Responsible Internet Routing”
- Xiaolin (Owen) Sun '20: “Energy-Aware Network Routing”
- Alex Thomas '19: “Examinations of Stock Trading Algorithms and Applications of Twitter Sentiment for Trading Strategies”
- Ahsan Mahmood '18: “Autocompletion for Network Configurations”

UNDERGRADUATE RESEARCH STUDENTS

- Omshi Samal '24 (Spring 2021, Fall 2021–present)
- Sara Alam '23 (Spring 2022–present)
- Jyotirmay Chauhan '23 (Summer 2020, Summer 2021–present)
- Zhaoyang Liu '23 (Summer 2022–present)
- Emily Yu '23 (Summer 2021–Fall 2021)
- Devon Lee '22 (Summer 2021–Spring 2022)
- Megan Imperato '21 (Spring 2019)
- Xi (Chase) Jiang '21 (Summer 2020–Spring 2021)
- Yasoob Khalid '21 (Summer 2018–Spring 2019, Fall 2020)
- Tyler Potter '21 (Summer 2020)
- Mary Festa '20 (Summer 2019–Fall 2019)
- Emily Huff '20 (Fall 2019–Spring 2020)
- Ruchit Shrestha '20 (Summer 2017–Summer 2019)
- Xiaolin (Owen) Sun '20 (Summer 2018–Summer 2020)
- Eliza Lucas '20 (Fall 2019–Spring 2020, Spring 2018–Fall 2018)
- Alex Thomas '19 (Spring 2018)
- Lindsey Derbyshire '18 (Summer 2017)
- Ahsan Mahmood '18 (Summer 2017–Spring 2018)
- Amanda Milberg '18 (Spring 2018)
- Franklin van Nes '18 (Summer 2017)
- Danielle Zegelstein '18 (Spring 2018)

- Francisco Flores '17 (Spring 2017)
- Alec Glassman '17 (Spring 2017)
- Saw Lin '17 (Spring 2017)
- Pam Needle '17 (Spring 2017)

PHD THESIS COMMITTEE

- Hongyi Huang (Tsinghua University, May 2022)
- Rüdiger Birkner (ETH Zurich, September 2021)