

# Sangtae Ha

Associate Professor  
University of Colorado at Boulder  
1045 Regent Drive 430 UCB  
Boulder CO, 80309-0430 USA

Phone: (303) 492-7031  
Fax: (303) 492-1112  
sangtae.ha@colorado.edu  
<http://netstech.org/sangtaeha>

## Research Interests

---

My research focuses on building and deploying practical systems that span multiple disciplines, including machine learning and deep learning systems, networks and distributed systems, mobile systems, internet protocols and algorithms, LTE and 5G networks and security, video streaming, and storage systems. Previously, I developed CUBIC (RFC 9438), which serves as the default TCP congestion control algorithm on the Internet for Linux/Android, MacOSX, and Windows. It is currently employed by the majority of Internet servers worldwide and utilized by several billion internet devices.

## Education

---

- November, 2009 **Ph.D., Computer Science, North Carolina State University, USA**  
Thesis: Improving TCP Congestion Control for High Bandwidth and Long Distance Networks  
Advisor: Prof. Injong Rhee
- February, 2001 **M.S., Computer and Communication Engineering, POSTECH, Korea**  
Thesis: Design and Implementation of High-Speed Internet Gateway  
Advisor: Prof. James W. Hong
- February, 1999 **B.E., Computer Science and Engineering, Kyung Hee University, Korea**

## Academic Appointments

---

- 08/2021 - Current **Associate Professor** of Computer Science, University of Colorado Boulder
- 08/2014 - 07/2021 **Assistant Professor** of Computer Science, University of Colorado Boulder
- 11/2010 - 05/2013 **Associate Research Scholar**, Princeton University  
**Associate Director**, the Princeton EDGE Lab, Princeton University  
Mentor: Prof. Mung Chiang (Now the President at Purdue University)
- 11/2009 - 11/2010 **Postdoctoral Research Associate**, Princeton University  
**Associate Director**, the Princeton EDGE Lab, Princeton University  
Mentor: Prof. Mung Chiang (Now the President at Purdue University)

## Work Experience

---

- 1/2022 - Current Technical Advisor for Earable Inc.  
<http://www.earable.ai>.
- 10/2019 - 12/2021 Chief Architect Officer for Earable Inc.
- 08/2017 - Current Technical Advisory Board for Myota Inc.  
<http://www.myota.io>.
- 09/2012 - Current Co-Founder and Consulting IT architect for Zoomi Inc.  
<http://www.zoomi.ai/>
- 05/2013 - 07/2014 Co-Founder (Founding CTO) and VP of Advanced Technology, DataMi Inc.  
<http://www.datami.com>.

05/2008 - 08/2008 Summer Research Intern, Cisco Systems, San Jose, CA  
07/2002 - 07/2004 Senior Research Engineer, Telson I&C Research Center, Seoul, Korea  
03/2001 - 06/2002 (Part-time) Linux Consultant and Writer, Linux@Works, Seoul, Korea  
11/2000 - 03/2002 Senior Research Engineer (Linux Kernel), Netstech R&D Center, Seoul, Korea

## **Awards and Honors**

---

2021 Best Paper Award at ACM MobiSys 2021  
2019 Best Paper Award at ACM MobiSys 2019  
2018 AT&T Faculty Research Award (VURI)  
2017 Samsung 2017 GRO Award  
2017 AT&T Faculty Research Award (VURI)  
2017 IEEE INFOCOM'17 Distinguished TPC Member Award  
2014 INFORMS ISS Design Science Award  
2013 Princeton IP Accelerator Fund Winner, Princeton, NJ  
2011 Princeton Innovation Competition Finalist, Princeton University  
2011 Vodafone Wireless Innovation Competition Finalist, "TUBE-ing Over Digital Divide."

## **Professional Service**

---

### **Fog Computing/Networking**

TPC Co-Chair IEEE MASS 2024  
TPC ACM CoNEXT 2024  
TPC IEEE ICNP 2024  
TPC ACM MOBICOM 2022  
TPC IEEE INFOCOM 2024-2016  
TPC IEEE ICDCS 2023, 2022, 2017  
TPC IEEE MASS 2022, 2021  
TPC IEEE SECON 2021, 2020, 2015, 2014, 2013  
TPC IEEE PIMRC 2020  
TPC WiOPT 2017, 2014, 2013, 2012, 2011  
Reviewer CVPR 2023-2022, ACM MM 2024  
Co-Chair ACM CoNEXT'19 Student Workshop, 2019  
TPC Co-Chair Fog World Congress 2017  
Organizing Committee IEEE DSN 2017  
Organizing Committee IEEE MASS 2022, 2021

Publicity Co-Chair ACM SEC 2017  
 Co-Chair Software Infrastructure Working Group, OpenFog Consortium, 2016 - 2018  
 Guest Editor IEEE Comm. Magazine Feature Topic on Fog Computing and Networking, Sept 2016  
 Panelist NSF Edge Workshop, Oct, 2016  
 TPC Co-Chair Asia-US Forum on Fog Networking for 5G and IoT, 2015  
 General Co-Chair IEEE SECON Workshop on Fog Networking For 5G and IoT, 2015  
 Associate Editor IEEE Internet of Things Journal 2013 - 2018

### **Smart Data Pricing**

General Co-Chair IEEE INFOCOM Smart Data Pricing Workshop 2017, 2016, 2013  
 TPC IEEE INFOCOM Smart Data Pricing Workshop 2015, 2014  
 Guest Editor IEEE Network Magazine special issue on Smart Data Pricing, Aug 2015  
 Co-Editor Book "Smart Data Pricing", John Wiley & Sons, 2014

### **Miscellaneous**

Panelist NSF RINGS Review Panel, 2021  
 Panelist NSF MLWiNS Review Panel, 2019  
 Panelist NSF NeTS Small and Medium Panel 2017, 2016, 2015  
 Panelist NSF CREST Reviewer, 2018  
 TPC International Teletraffic Congress (ITC), 2016  
 Editorial Board IEEE ComSoc Technology News (CTN) 2012 - 2014  
 TPC IEEE GLOBECOM 2016, 2014, 2013  
 TPC MobileSoft ACM Student Research Competition, 2015  
 TPC IEEE VTC 2014  
 TPC IEEE IPCCC 2014, 2012  
 TPC The International Workshop on Smart Complex Engineered Networks (SCENE 2014)  
 TPC IEEE Workshop on Green Multimedia 2013  
 TPC IEEE NAS 2012  
 TPC PFLDNeT 2010  
 Session Chair CISS 2012, 2010  
 Panel List Smart Data Pricing Forum, Princeton, July, 2012  
 Judge Princeton Undergraduate Research Symposium, May, 2011  
 Membership IEEE Senior member, ACM Member

Reviewer IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, IEEE Transactions on Communications, IEEE Transactions on Multimedia, IEEE Journal on Selected Areas in Communications, Elsevier Computer Networks, Computer Communications, IEEE Communications Letters, ACM Multimedia, IEEE INFOCOM, IEEE ICDCS, IWQoS, PFLDNeT, CISS, WiOPT, IEEE SECON, IEEE Networking, ACC, CDC, ICCCN, IMSA, MILCOM, IJCAS

## **Campus Service**

---

### **Departmental Service**

2016F – Computing Co-Chair, Computer Science, University of Colorado  
2023 F Computer Science Research Professors Search Committee, University of Colorado  
2022 S Cybersecurity Instructor Search Committee, Computer Science, University of Colorado  
2021F – 2022S Security Faculty Search Chair, Computer Science, University of Colorado  
2018F – 2019S Faculty Search Committee, Computer Science, University of Colorado  
2016F – 2017S Faculty Search Committee, Computer Science, University of Colorado  
2014F – 2016S Graduate Committee, Computer Science, University of Colorado  
2014F – 2020S Ph.D. Committee, Interdisciplinary Telecom Program (ITP), University of Colorado

### **University Service**

2016F – 2018F Cloud Working Group, University of Colorado Boulder  
2014F Faculty Student Mentorship Program (FSMP), University of Colorado Boulder

### **Outreach**

2/23/-24/2019 Mentor, HackCU V

## **Publications**

---

(Google Scholar Citations: 7612, h-index: 33, i10-index: 63)  
<https://scholar.google.com/citations?user=GcMKuu8AAAAJ&hl=en>

### **Internet Drafts**

11 Lisong Xu, Sangtae Ha, Injong Rhee, Vidhi Goel, and Lars Eggert, “RFC 9438: CUBIC for Fast Long-Distance Networks,” DOI: <https://doi.org/10.17487/RFC9438>.

### **Books**

B1 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, Mung Chiang, eds., *Smart Data Pricing*, Wiley & Sons, 536 pages, Sept., 2014 (available at Amazon).

### **Book Chapters**

BC1 Jaeyoon Chung, Carlee Joe-Wong and Sangtae Ha, “Extending the Cloud to Fog: Highly Available Elastic Fog,” *Fog and Fogonomics*, Wiley & Sons, ch. 12, pp. 295–324, 2020.  
BC2 Carlee Joe-Wong, Liang Zheng, Sangtae Ha, Soumya Sen, Chee Wei Tan, and Mung Chiang, “Smart Data Pricing in 5G Systems,” *Key Technologies for 5G Wireless Systems*, Cambridge University Press, pp. 478–500, April, 2017.  
BC3 Carlee Joe-Wong, Sangtae Ha, Zhenming Liu, Felix Ming Fai Wong, and Mung Chiang, “Mind Your Own Bandwidth,” *Fog for 5G and IoT*, Wiley & Sons, ch. 2, pp. 24–51, April, 2017

- BC4 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "Human Factors in Smart Data Pricing," in *Smart Data Pricing*, Wiley & Sons, pp. 127-166, Sept., 2014.
- BC5 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "Smart Data Pricing (SDP): Economic Solutions to Network Congestion," in *SIGCOMM eBook on Recent Advances in Networking*, Volume I, ch. 5, pp. 221-274, Aug., 2013.

#### Peer-Reviewed Journals Published/Accepted

- J1 Anh Nguyen, Galen Pogoncheff, Ban Xuan Dong, Nam Bui, Hoang Truong, Nhat Pham, Linh Nguyen, Hoang Nguyen-Huu, Khue Bui-Diem, Quan Vu-Tran-Thien, Sy Duong-Guy, Sangtae Ha, and Tam Vu, "A Comprehensive Study on the Efficacy of a Wearable Sleep Aid Device Featuring Closed-loop Real-time Acoustic Stimulation," *Scientific Report*, 13, 17515 (2023).
- J2 Beom-Su Kim and Byung Hyun Lim, Beomkyu Suh, Sangtae Ha, Ting He, Babar Shah and Ki-Il Kim, "Enabling Grant-Free URLLC for AoI Minimization in RAN-Coordinated 5G Health Monitoring System," *IEEE Internet of Things Journal*, 2023.
- J3 Hyoyoung Lim, Jinsung Lee, Jongyun Lee, Sandesh Dhawaskar Sathyanarayana, Junseon Kim, Anh Nguyen, Kwang Taik Kim, Youngbin Im, Mung Chiang, Dirk Grunwald, Kyunghan Lee, and Sangtae Ha, "An Empirical Study of 5G: Effect of Edge on Transport Protocol and Application Performance," *IEEE Transactions on Mobile Computing*, 2023.
- J4 Taejin Kim, Sandesh Dhawaskar Sathyanarayana, Siqi Chen, Youngbin Im, Xiaoxi Zhang, Sangtae Ha, and Carlee Joe-Wong, "MODEMS: Optimizing Edge Computing Migrations For User Mobility," *IEEE Journal on Selected Areas in Communications*, 2023.
- J5 Xiaoxi Zhang, Siqi Chen, Youngbin Im, Maria Gorlatova, Sangtae Ha, and Carlee Joe-Wong, "Optimal Network Protocol Selection for Competing Flows via Online Learning," *IEEE Transactions on Mobile Computing*, 2022.
- J6 Seyeon Kim, Kyungmin Bin, Sangtae Ha, Kyunghan Lee and Song Chong, "zTT: Learning-based DVFS with Zero Thermal Throttling for Mobile Devices," *ACM GetMobile*, vol. 25, no. 4, pp. 30-34, Mar. 2022.
- J7 Raza Qazi, Kyle E. Parker, Choong Yeon Kim, Ruediger Rill, Makenzie R. Norris, Jaeyoon Chung, John Bilbily, Jenny R. Kim, Marie C. Walicki, Graydon B. Gereau, Hyoyoung Lee, Yanyu Xiong, Jenna R. Lee, Melissa A. Tapia, Alexxai V. Kravitz, Matthew J. Will, Sangtae Ha, Jordan G. McCall, and Jae-Woong Jeong, "Scalable and modular wireless-network infrastructure for large-scale behavioral neuroscience," *Nature Biomedical Engineering*, 2021.
- J8 Jihoon Lee, Gyuhong Lee, Jinsung Lee, Youngbin Im, Max Hollingsworth, Eric Wustrow, Dirk Grunwald, and Sangtae Ha, "Securing the Wireless Emergency Alerts System", *Communications of the ACM*, vol. 64, no. 10, pp. 85-93, Oct. 2021.
- J9 Sandesh Dhawaskar Sathyanarayana, Jinsung Lee, Jihoon Lee, Dirk Grunwald, and Sangtae Ha, "Exploiting Client Inference in Multipath TCP over Multiple Cellular Networks", *IEEE Communications Magazine*, vol. 59, no. 4, pp. 58-64, Apr. 2021.
- J10 Jason Schnitzer, Prasanth Prahladan, Parisa Rahimzadeh, Chad Humble, Jinsung Lee, Jihoon Lee, Kyunghan Lee, and Sangtae Ha, "Toward Programmable DOCSIS 4.0 Networks: Adaptive Modulation in OFDM Channels," *IEEE Transactions on Network and Service Management (TNSM)*, pp. 441-455, Mar. 2021.

- J11 Taeho Kim, Phuc Nguyen, Nhat Pham, Nam Bui, Hoang Truong, Sangtae Ha, and Tam Vu, "Epileptic Seizure Detection and Experimental Treatment: A Review," *Frontiers in Neurology*, vol. 11, pp. 701 (24 pages), 2020.
- J12 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "Time-Dependent Pricing for Multimedia Data Traffic: Analysis, Systems, and Trials," *IEEE Journal on Selected Areas in Communications*, vol. 37, no. 7, pp. 1504–1517, July 2019.
- J13 Won Seok Jang, Yonggwon Lee, Jason C. Neff, Youngbin Im, Sangtae Ha, and Luca Doro, "Development of an EPIC parallel computing framework to facilitate regional/global gridded crop modeling with multiple scenarios: A case study of the United States," *Computers and Electronics in Agriculture*, vol. 158, pp. 189–200, 2019.
- J14 Christopher Brinton, Swapna Buccapatnam, Liang Zheng, Da Cao, Andrew Lan, Felix Wong, Sangtae Ha, Mung Chiang, and Vince Poor, "On the Efficiency of Online Social Learning Networks," *IEEE/ACM Transactions on Networking*, vol. 25, issue 5, pp. 2076–2089, Oct. 2018.
- J15 Carlee Joe-Wong, Soumya Sen, and Sangtae Ha, "Sponsoring Mobile Data: Analyzing the Impact on Internet Stakeholders," *IEEE/ACM Transactions on Networking*, vol. 26, no. 3, pp. 1179–1192, June 2018.
- J16 Ibrahim Ayad, Youngbin Im, Eric Keller, and Sangtae Ha, "A Practical Evaluation of Rate Adaptation Algorithms in HTTP-based Adaptive Streaming," *Computer Networks*, vol. 133, pp. 90–103, 2018.
- J17 Kyuyong Shin, Carlee Joe-Wong, Sangtae Ha, Yung Yi, Injong Rhee and Douglas Reeves, "T-Chain: A General Incentive Scheme for Cooperative Computing," *IEEE/ACM Transactions on Networking*, vol. 25, no. 4, pp. 2122–2137, Aug. 2017.
- J18 Liang Zheng, Carlee Joe-Wong, Chee-Wei Tan, Sangtae Ha, and Mung Chiang, "Customized Data Plans for Mobile Users: Feasibility and Benefits of Data Trading," *IEEE Journal on Selected Areas in Communications*, vol. 35, no. 4, pp. 949–963, Apr. 2017.
- J19 Ioannis Kamitsos, Sangtae Ha, Lachlan Andrew, Jasika Bawa, Dana Butnariu, Hongseok Kim, and Mung Chiang "Optimal Sleeping: Models and Experiments for Energy-Delay Tradeoff," *International Journal of Systems Science: Operations & Logistics*, vol. 5, no. 4, pp. 356–371, 2017.
- J20 Youngbin Im, Carlee Joe-Wong, Sangtae Ha, Soumya Sen, Taekyoung Kwon and Mung Chiang, "AMUSE: Empowering Users for Cost-Aware Offloading with Throughput-Delay Tradeoffs," *IEEE Transactions on Mobile Computing*, vol. 15, no. 5, pp. 1062–1076, May 2016.
- J21 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "Smart Data Pricing: Using Economics to Manage Network Congestion," *Communications of the ACM*, vol. 58, no. 12, pp. 86–93, Dec. 2015.
- J22 Ioannis Kamitsos, Paschalis Tsiaflakis, Sangtae Ha, and Mung Chiang, "Stable Sleep Mode Optimization for Energy Efficient DSL Broadband Access," *IEEE Transactions on Communications*, vol. 63, no. 12, pp. 5116–5127, Dec. 2015.
- J23 Jaeyoon Chung, Sangtae Ha and James Won-Ki Hong, "A Management Architecture for Client-Defined Cloud Storage Services," *International Journal of Network Management*, vol. 25, no. 6, pp. 435–453, July 2015.
- J24 Carlee Joe-Wong, Ioannis Kamitsos, and Sangtae Ha, "Inter-Datacenter Job Routing and Scheduling with Variable Costs and Deadlines," *IEEE Transactions on Smart Grid*, vol. 6, no. 6, pp. 2669–2680, Nov. 2015.
- J25 Christopher Brinton, Ruediger Rill, Sangtae Ha, Mung Chiang, Robert Smith and William Ju, "Indi-

vidualization for Education at Scale: MIIC Design and Preliminary Evaluation," *IEEE Transactions on Learning Technologies*, vol. 8, no. 1, pp. 136–148, Jan. 2015.

- J26 Carlee Joe-Wong, Soumya Sen, and Sangtae Ha, "Offering Supplementary Network Technologies: Adoption Behavior and Offloading Benefits," *IEEE/ACM Transactions on Networking*, vol. 23, no. 2, pp. 355–368, Apr. 2015.
- J27 Amitabha Ghosh, Sangtae Ha, Edward Crabbe and Jennifer Rexford, "Scalable Multi-Class Traffic Management in Data Center Backbone Networks," *IEEE Journal on Selected Areas in Communications*, vol. 31, no. 12, pp. 2673–2684, Dec. 2013.
- J28 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "A Survey of Smart Data Pricing: Past Proposals, Current Plans, and Future Trends," *ACM Computing Survey*, vol. 46, no. 2, pp. 15:1–15:37, Nov. 2013.
- J29 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "Incentivizing Time-Shifting of Data: A Survey of Time-Dependent Pricing for Internet Access," *IEEE Communications Magazine*, vol. 50, no. 11, pp. 91–99, Nov. 2012.
- J30 Carlee Joe-Wong, Soumya Sen, Sangtae Ha, and Mung Chiang, "Optimized Day-Ahead Pricing for the Smart Grid with Device-Specific Scheduling Flexibility," *IEEE Journal on Selected Areas in Communications*, vol. 30, no. 6, pp. 1075–1085, July 2012.
- J31 Hongseok Kim, Sangtae Ha, Mung Chiang, Dae Kyung Kang, and Jin Hee Kim, "Iterative Resource Pooling for Bandwidth Allocation in TDM-PON: Convergence Results and Experimental Evaluation," *IEEE Photonic Network Communications*, vol. 24, no. 2, pp. 138–150, Oct. 2012.
- J32 Sangtae Ha and Injong Rhee, "Taming the Elephants: New TCP Slow Start," *Elsevier Computer Networks*, vol. 55, no. 9, pp. 2092–2110, 2011.
- J33 Han Cai, Do Young Eun, Sangtae Ha, Injong Rhee, and Lisong Xu, "Stochastic Convex Ordering for Multiplicative Decrease Internet Congestion Control," *Elsevier Computer Networks*, vol. 53, no. 3, pp. 365–381, 2009.
- J34 Sangtae Ha, Injong Rhee, and Lisong Xu, "CUBIC: A New TCP-Friendly High-Speed TCP Variant," *ACM SIGOPS Operating Systems Review*, vol. 42, no. 5, pp. 64–74, 2008.
- J35 Sangtae Ha, Long Le, Injong Rhee, and Lisong Xu, "Impact of Background Traffic on Performance of High-Speed TCP Variant Protocols," *Elsevier Computer Networks*, vol. 15, no. 4, pp. 852–865, 2007.

#### **Non-Peer Reviewed Journals Published**

- J1 Mung Chiang, Sangtae Ha, Chih-Lin I, Fulvio Rizzo, and Tao Zhang, "Fog Computing and Networking: Part 2 [Guest editorial]," *IEEE Communications Magazine*, vol. 55, no. 8, pp. 13–13, Aug. 2017.
- J2 Mung Chiang, Sangtae Ha, Chih-Lin I, Fulvio Rizzo, and Tao Zhang, "Clarifying Fog Computing and Networking: 10 Questions and Answers," *IEEE Communications Magazine*, vol. 55, no. 4, pp. 18–20, Apr. 2017.
- J3 Mung Chiang, Sangtae Ha, Chih-Lin I, Fulvio Rizzo, and Tao Zhang, "Fog Computing and Networking: Part 1 [Guest editorial]," *IEEE Communications Magazine*, vol. 55, no. 4, pp. 16–17, Apr. 2017.
- J4 Matthew Andrews, Mung Chiang, Sangtae Ha, Jianwei Huang, and Soumya Sen, "Innovation in Network Pricing [guest editorial]," *IEEE Network*, vol. 30, no. 2, pp. 4–5, Mar. 2016.

#### **Conferences Published/Accepted**

- C1 Jongseok Park, Kyungmin Bin, Gibum Park, Sangtae Ha and Kyunghan Lee, "ASPEN: Breaking Operator Barriers for Efficient Parallelization of Deep Neural Networks," 37th Conference on Neural Information Processing Systems (*NeurIPS*), 2023 (acceptance ratio: 26.1%)
- C2 Beom-Su Kim, Byung Hyun Lim, BeomKyu Suh, Ki-Il Kim, and Sangtae Ha, "Modeling of AoI Minimization for (m,k)-firm Streams in 5G Networks," 31st International Symposium on the Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (*MASCOTS*), 2023 (acceptance ratio: 30%)
- C3 Seyeon Kim, Kyungmin Bin, Donggyu Yang, Sangtae Ha, Song Chong, and Kyunghan Lee, "ENTRO: Tackling the Encoding and Networking Trade-off in Offloaded Video Analytics," Proceedings of the 31th ACM International Conference on Multimedia (*ACM Multimedia*), 2023. (902 out of 3072 submissions, acceptance ratio: 29.3%)
- C4 Sungyong Lee, Wooseung Nam, Jinsung Lee, Sangtae Ha, and Kyunghan Lee, "N-epitomizer: Enabling Semantic Offloading for Neural Network Inferences," *IEEE MASS*, 2023.
- C5 Sandesh Dhawaskar Sathyanarayana, Kyunghan Lee, Dirk Grunwald, and Sangtae Ha, "Converge: QoE-driven Multipath Video Conferencing over WebRTC," In Proceedings of the ACM SIGCOMM 2023 Conference (*ACM SIGCOMM '23*). Association for Computing Machinery, New York, NY, USA, 637–653 (71 out of 323 submissions, acceptance ratio: 21.98%).
- C6 Zhang Liu, Dirk Grunwald, Joseph Izralewitz, Gaukas Wang, and Sangtae Ha, "MRTOM: Mostly Reliable Totally Ordered Multicast, a Network Primitive to Offload Distributed Systems," 2023 43th IEEE Conference on Distributed Computing Systems (*IEEE ICDCS*), 2023 (83 out of 439 submissions, acceptance ratio: 18.9%)
- C7 Weipeng Zhuo, Ka Ho Chiu, Jierun Chen, Ziqi Zhao, S.-H. Gary Chan, Sangtae Ha, and Chul-Ho Lee, "FIS-ONE: Floor Identification System with One Label for Crowdsourced RF Signals," 2023 43th IEEE Conference on Distributed Computing Systems (*IEEE ICDCS*), 2023 (83 out of 439 submissions, acceptance ratio: 18.9%)
- C8 Weipeng Zhuo, Ka Ho Chiu, Jierun Chen, Jiajie Tan, Edmund Sumpena, S.-H. Gary Chan, Sangtae Ha, and Chul-Ho Lee, "Semi-supervised Learning with Network Embedding on Ambient RF Signals for Geofencing Services," *IEEE ICDE 2023 - IEEE International Conference on Data Engineering*, 2023.
- C9 Tu Van Nguyen, Kyungchan Ko, Sangwoo Ryu, Sangtae Ha, and James W. Hong, "Improve Video Conferencing Quality with Deep Reinforcement Learning," *NOMS 2023 - IEEE/IFIP Network Operations and Management Symposium*, 2023.
- C10 Taejin Kim, Sandesh Dhawaskar Sathyanarayana, Siqi Chen, Youngbin Im, Xiaoxi Zhang, Sangtae Ha, and Carlee Joe-Wong, "MoDEMS: Optimizing Edge Computing Migrations for User Mobility," *IEEE INFOCOM 2022 - IEEE Conference on Computer Communications*, 2022 (255 out of 1129 submissions, acceptance ratio: 22.6%)
- C11 Weipeng Zhuo, Ziqi Zhao, Ka Ho Chiu, Shiju Li, Sangtae Ha, Chul-Ho Lee, and S.-H. Gary Chan, "GRAFICS: Graph Embedding-based Floor Identification Using Crowdsourced RF Signals," 2022 42th IEEE Conference on Distributed Computing Systems (*IEEE ICDCS*), pp. 11 pages, 2022 (114 out of 573 submissions, acceptance ratio: 19.9%)
- C12 Jierun Chen, Tianlang He, Weipeng Zhuo, Li Ma, Sangtae Ha and S.-H. Gary Chan, "TVConv: Efficient Translation Variant Convolution," *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, New Orleans, LA, USA, 2022 pp. 12538-12548 (2067 out of 8161 submissions,

acceptance ratio: 25.33%)

- C13 Insoo Lee, Seyeon Kim, Sandesh Sathyanarayana, Kyungmin Bin, Song Chong, Kyunghan Lee, Dirk Grunwald and Sangtae Ha, “R-FEC: RL-Based FEC Adjustment for Better QoE in WebRTC,” Proceedings of the 30th ACM International Conference on Multimedia (*ACM Multimedia*), pp. 2948–2956, 2022. (690 out of 2473 submissions, acceptance ratio: 27.9%)
- C14 Taeho Kim, Yongin Kwon, Jemin Lee, Taeho Kim and Sangtae Ha, “CPrune: Compiler-Informed Model Pruning for Efficient Target-Aware DNN Execution,” European Conference on Computer Vision (*ECCV*), 2022. (1650 out of 5803 submissions, acceptance ratio: 28%)
- C15 Insoo Lee, Jinsung Lee, Kyunghan Lee, Dirk Grunwald and Sangtae Ha, “Demystifying Commercial Video Conferencing Applications,” Proceedings of the 29th ACM International Conference on Multimedia (*ACM Multimedia*), pp. 3583–3591, 2021. (542 out of 1942 submissions, acceptance ratio: 27.9%)
- C16 Seyeon Kim, Kyungmin Bin, Sangtae Ha, Kyunghan Lee, and Song Chong, “zTT: Learning-based DVFS with Zero Thermal Throttling for Mobile Devices,” In Proceedings of the 19th Annual International Conference on Mobile Systems, Applications, and Services (*MobiSys '21*), pp. 41–53, 2021. (**Best Paper Award**, acceptance ratio: 21.7%)
- C17 Zhang Liu, Hee Won Lee, Yu Xiang, Dirk Grunwald, and Sangtae Ha, “eMRC: Efficient Miss Ratio Approximation for Multi-Tier Caching,” Proceedings of the 19th USENIX Conference on File and Storage Technologies (*FAST '21*), pp. 293–306, 2021. (28 out of 130 submissions, acceptance ratio: 21.5%)
- C18 Jinsung Lee, Sungyong Lee, Jongyun Lee, Sandesh Dhawaskar Sathyanarayana, Hyoyoung Lim, Jihoon Lee, Xiaoqing Zhu, Sangeeta Ramakrishnan, Dirk Grunwald, Kyunghan Lee, and Sangtae Ha, “PERCEIVE: Deep Learning-based Cellular Uplink Prediction Using Real-time Scheduling Patterns,” In Proceedings of the 18th International Conference on Mobile Systems, Applications, and Services (*MobiSys '20*), pp. 377–390, 2020. (34 out of 175 submissions, acceptance ratio: 19.4%)
- C19 Parisa Rahimzadeh, Jinsung Lee, Youngbin Im, Siun-Chuon Mau, Eric C. Lee, Bradford O. Smith, Fatemah Al-Duoli, Carlee Joe-Wong, and Sangtae Ha, “SPARCLE: Stream Processing Applications over Dispersed Computing Networks,” 2020 40th IEEE Conference on Distributed Computing Systems (*IEEE ICDCS*), pp. 11 pages, 2020. (105 out of 584 submissions, acceptance ratio: 18%)
- C20 Blake Caldwell, Youngbin Im, Sepideh Goodarzy, Sangtae Ha, Richard Han, Eric Keller, and Eric Rozner, “FluidMem: Full Flexible and Fast Memory Disaggregation for the Cloud,” 2020 40th IEEE Conference on Distributed Computing Systems (*IEEE ICDCS*), pp. 11 pages, 2020. (105 out of 584 submissions, acceptance ratio: 18%)
- C21 Xiaoxi Zhang, Siqi Chen, Youngbin Im, Maria Gorlatova, Sangtae Ha, and Carlee Joe-Wong, “Towards Automated Network Management: Learning the Optimal Protocol Selection,” the IEEE 27th International Conference on Network Protocols (*ICNP*), pp. 1–4, 2019. (Acceptance ratio: 19.3%)
- C22 Parisa Rahimzadeh, Youngbin Im, Gueyoung Jung, Carlee Joe-Wong and Sangtae Ha, “ECHO: Efficiently Overbooking Applications to Create a Highly Available Cloud,” 2019 39th IEEE Conference on Distributed Computing Systems (*IEEE ICDCS*), pp. 1–11, 2019. (Acceptance ratio: 19.6%)
- C23 Gyuhong Lee, Jihoon Lee, Jinsung Lee, Youngbin Im, Max Hollingsworth, Eric Wustrow, Dirk Grunwald and Sangtae Ha, “This is Your President Speaking: Spoofing Alerts in 4G LTE Networks,” In Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and

- Services (*MobiSys '19*), pp. 404–416, 2019. (**Best Paper Award**, acceptance ratio: 23.2%)
- C24 Jihoon Lee, Jinsung Lee, Youngbin Im, Sandesh Sathyanarayana, Parisa Rahimzadeh, Xiaoxi Zhang, Max Hollingworth, Carlee Joe-Wong, Dirk Grunwald and Sangtae Ha, “CASTLE over the Air: Distributed Scheduling for Cellular Data Transmissions,” In Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and Services (*MobiSys '19*), pp. 417–429, 2019. (Acceptance ratio: 23.2%)
- C25 Youngbin Im, Parisa Rahimzadeh, Brett Shouse, Shinik Park, Carlee Joe-Wong, Kyunghan Lee and Sangtae Ha, “I Sent It: Where Does Slow Data Go to Wait?,” In Proceedings of the Fourteenth EuroSys Conference (*EuroSys '19*), Article 22, pp. 1–15, 2019. (Acceptance ratio: 21.7%)
- C26 Shinik Park, Jinsung Lee, Junseon Kim, Jihoon Lee, Sangtae Ha, and Kyunghan Lee, “ExLL: An Extremely Low-Latency Congestion Control for Mobile Cellular Networks,” In Proceedings of the 14th International Conference on emerging Networking EXperiments and Technologies (*CoNEXT '18*), pp. 307–319, 2018. (Acceptance ratio: 17.3%)
- C27 Youngbin Im, Prasanth Prahlanan, Tae Hwan Kim, Yong Geun Hong, and Sangtae Ha, “SNN-Cache: A Practical Machine Learning-based Caching System Utilizing the Inter-relationships of Requests,” 2018 52nd Annual Conference on information Science and Systems (*CISS*), pp. 1–6, 2018.
- C28 Gueyoung Jung, Parisa Rahimzadeh, Zhang Liu, Sangtae Ha, Kaustubh Joshi, and Matti Hiltunen, “Virtual Redundancy for Active-Standby Cloud Applications,” *IEEE INFOCOM 2018 - IEEE Conference on Computer Communications*, Honolulu, HI, 2018, pp. 1916–1924. (Acceptance ratio: 19.2%).
- C29 Taeyeol Jeong, Jaeyoon Chung, James Won-Ki Hong, and Sangtae Ha, “Towards a distributed computing model for fog,” 2017 IEEE Fog World Congress (*FWC*), Santa Clara, CA, 2017, pp. 1–6.
- C30 Jincao Zhu, Youngbin Im, Shivakant Mishra, and Sangtae Ha, “Calibrating Time-variant, Device-specific Phase Noise for COTS WiFi Devices,” In Proceedings of the 15th ACM Conference on Embedded Network Sensor Systems (*SenSys '17*), Article 15, pp. 1–12. (Acceptance ratio: 17.4%)
- C31 Youngbin Im, Ji Hoon Lee, Jinyoung Han, Yoon Kwon, Carlee Joe-Wong, Ted “Taekyoung” Kwon, and Sangtae Ha, “FLARE: Coordinated Rate Adaptation for HTTP Adaptive Streaming in Cellular Networks,” 2017 IEEE 37th International Conference on Distributed Computing Systems (*ICDCS*), Atlanta, GA, 2017, pp. 298–307. (Acceptance ratio: 16.94%).
- C32 Parisa Rahimzadeh, Carlee Joe-Wong, Kyuyong Shin, Youngbin Im, Jongdeog Lee and Sangtae Ha, “SVC-TChain: Incentivizing Good Behavior in Layered P2P Video Streaming,” *IEEE INFOCOM 2017 - IEEE Conference on Computer Communications*, Atlanta, GA, 2017, pp. 1–9. (Acceptance ratio: 20.93%).
- C33 Carlee Joe-Wong, Youngbin Im, Kyuyong Shin, and Sangtae Ha, “A Performance Analysis of Incentive Mechanisms for Cooperative Computing,” 2016 IEEE 36th International Conference on Distributed Computing Systems (*ICDCS*), Nara, 2016, pp. 108–117. (Acceptance ratio: 17.6%)
- C34 Liang Zheng, Carlee Joe-Wong, Christopher Brinton, Cheewei Tan, Sangtae Ha, and Mung Chiang, “Viability of Virtual Cloud Providers,” In Proceedings of the 2016 ACM SIGMETRICS International Conference on Measurement and Modeling of Computer Science (*SIGMETRICS '16*), pp. 235–248, 2016. (Acceptance ratio: 13.46%).

- C35 Felix Ming Fai Wong, Carlee Joe-Wong, Sangtae Ha, Zhenming Liu, and Mung Chiang, "Improving User QoE for Residential Broadband: Adaptive Traffic Management at the Network Edge," 2015 IEEE 23rd International Symposium on Quality of Service (IWQoS), Portland, OR, 2015, pp. 105–114. (Acceptance ratio: 22.5%).
- C36 Kyuyong Shin, Carlee Joe-Wong, Sangtae Ha, Yung Yi, Injong Rhee and Douglas Reeves, "T-Chain: A General Incentive Scheme for Cooperative Computing," 2015 IEEE 35th International Conference on Distributed Computing Systems, Columbus, OH, 2015, pp. 163–174. (Acceptance ratio: 12.89%).
- C37 Jaeyoon Chung, Carlee Joe-Wong, Sangtae Ha, James Won-Ki Hong, and Mung Chiang, "CYRUS: Towards Client-Defined Cloud Storage," In Proceedings of the Tenth European Conference on Computer Systems (*EuroSys '15*). Article 17, 1–16. (Acceptance ratio: 21.33%)
- C38 Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, "Sponsoring Mobile Data: An Economic Analysis of the Impact on Users and Content Providers," 2015 IEEE Conference on Computer Communications (INFOCOM), Kowloon, 2015, pp. 1499–1507. (Acceptance ratio: 19%).
- C39 Liang Zheng, Carlee Joe-Wong, Chee-Wei Tan, Sangtae Ha, and Mung Chiang, "Secondary Markets for Mobile Data: Feasibility and Benefits of Traded Data Plans," 2015 IEEE Conference on Computer Communications (INFOCOM), Kowloon, 2015, pp. 1580–1588. (Acceptance ratio: 19%).
- C40 Carlee Joe-Wong, Soumya Sen, and Sangtae Ha, "Do Mobile Data Plans Affect Usage? Results from a Pricing Trial with ISP Customers," *Passive and Active Measurement Conference*, pp. 96–108, 2015 (Acceptance ratio: 27%).
- C41 Carlee Joe-Wong, Soumya Sen, and Sangtae Ha, "Offering Supplementary Wireless Technologies: Adoption Behavior and Offloading Benefits," in *Proceedings of the IEEE INFOCOM*, pp. 1061–1069, Apr. 2013 (17.4% acceptance rate).
- C42 Youngbin Im, Carlee Joe-Wong, Sangtae Ha, Soumya Sen, Ted "Taekyoung" Kwon and Mung Chiang, "AMUSE: Empowering Users for Cost-Aware Offloading with Throughput-Delay Tradeoffs," 2013 Proceedings IEEE INFOCOM, Turin, 2013, pp. 435–439. (Acceptance ratio: 17.4%).
- C43 Soumya Sen, Carlee Joe-Wong, Sangtae Ha, Jasika Bawa and Mung Chiang, "When the Price is Right: Enabling Time-Dependent Pricing of Broadband Data," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 2477–2486, 2013 (Acceptance ratio: 20%).
- C44 Sangtae Ha, Soumya Sen, Carlee Joe-Wong, Youngbin Im and Mung Chiang, "TUBE: Time-Dependent Pricing for Mobile Data," in *Proceedings of the ACM SIGCOMM*, pp. 247–258, Helsinki, Finland, 2012. (Acceptance ratio: 13%).
- C45 Sangtae Ha, Carlee Joe-Wong, Soumya Sen, and Mung Chiang, "Pricing by Timing: Innovating Broadband Data Plans", *Broadband Access Communications Technologies VI (SPIE OPTO)*, vol. 8282, pp. 67 – 79, 2012.
- C46 Ioannis Kamitsos, Paschalis Tsiaflakis, Ken Kerpez, Sangtae Ha, and Mung Chiang, "Energy Efficient DSL via Heterogeneous Sleeping States: Optimization Structures and Operation Guidelines," 2012 IEEE Global Communications Conference (GLOBECOM), Anaheim, CA, 2012, pp. 3128–3134. (Acceptance ratio: 37.7%).
- C47 Joe Wenjie Jiang, Tian Lan, Sangtae Ha, Minghua Chen, and Mung Chiang "Joint VM Placement and Routing for Data Center Traffic Engineering," 2012 Proceedings *IEEE INFOCOM*, Orlando, FL, 2012, pp. 2876-2880. (Acceptance ratio: 18%).
- C48 Ioannis Kamitsos, Lachlan Andrew, Hongseok Kim, Sangtae Ha, and Mung Chiang "Better Energy-

Delay Tradeoff via Server Resource Pooling,” 2012 International Conference on Computing, Networking and Communications (ICNC), Maui, HI, 2012, pp. 611-616.

- C49 Ioannis Kamitsos, Paschalis Tsiaflakis, Sangtae Ha, and Mung Chiang, “Stable Sleeping in DSL Broadband Access: Feasibility and Tradeoffs,” 2011 IEEE Global Telecommunications Conference - GLOBECOM 2011, Houston, TX, USA, 2011, pp. 1-6. (Acceptance ratio: 36.6%).
- C50 Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, “Time-Dependent Broadband Pricing: Feasibility and Benefits”, 2011 31st International Conference on Distributed Computing Systems (ICDCS), Minneapolis, MN, 2011, pp. 288-298. (Acceptance ratio: 15.4%).
- C51 Mung Chiang, Prashanth Hande, Hongseok Kim, Sangtae Ha, and Robert Calderbank, “Pricing Broadband: Survey and Open Problems,” 2010 Second International Conference on Ubiquitous and Future Networks (ICUFN), Jeju, 2010, pp. 303–308.
- C52 Ajit Warrier, Sankar Janakiraman, Sangtae Ha, and Injong Rhee, “DiffQ: Practical Differential Backlog Congestion Control for Wireless Networks,” in Proceedings of the *IEEE INFOCOM*, pp. 262–270, Rio de Janeiro, Brazil, Apr. 2009. (Acceptance ratio: 19.65%).
- C53 Han Cai, Do Young Eun, Sangtae Ha, Injong Rhee, and Lisong Xu, “Stochastic Ordering for Internet Congestion Control and its Applications,” *IEEE INFOCOM 2007 - 26th IEEE International Conference on Computer Communications*, Barcelona, 2007, pp. 910–918. (Acceptance ratio: 18%).

### Workshops

- WS1 Xiaoxi Zhang, Siqi Chen, Youngbin Im, Maria Gorlatova, Sangtae Ha, and Carlee Joe-Wong, “Optimal Learning-Based Network Protocol Selection,” *IEEE/ACM ISCA Workshop on Machine Learning for Systems*, 2019.
- WS2 Zaid Al-Ali, Sepideh Goodarzy, Ethan Hunter, Sangtae Ha, Richard Han, Eric Keller and Eric Rozner, “Making Serverless Computing More Serverless,” 2018 IEEE 11th International Conference on Cloud Computing (CLOUD), San Francisco, CA, 2018, pp. 456-459. (Acceptance ratio: 20%).
- WS3 Soumya Sen, Carlee Joe-Wong, Sangtae Ha and Mung Chiang, “Time-Dependent Pricing in Mobile Data Plans: Results from a Field Deployment in Alaska,” *Workshop on Information Technology and Systems*, 2016.
- WS4 Seungwon Kim, Gun Lee, Sangtae Ha, Nobuchika Sakata and Mark Billinghurst, “Automatically Freezing Live Video for Annotation during Video Conferencing,” In Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '15), pp. 1669–1674.
- WS5 Ming-Jye Sheng, Carlee Joe-Wong, Sangtae Ha, Felix Ming Fai Wong and Soumya Sen, “Smart Data Pricing: Lesson from Trial Planning,” 2013 *IEEE INFOCOM Workshop - Smart Data Pricing (in conjunction with IEEE INFOCOM)*, pp. 3327-3332.
- WS6 Soumya Sen, Carlee Joe-Wong and Sangtae Ha, “The Economics of Shared Data Plans,” *Workshop on Information Technology and Systems (in conjunction with ICIS)*, pp. 6 pages, 2012.
- WS7 Yaogong Wang, Injong Rhee, and Sangtae Ha, “Augment SCTP Multi-Streaming with Pluggable Scheduling,” 2011 IEEE Conference on Computer Communications Workshops (*INFOCOM WK-SHPS*), Shanghai, 2011, pp. 810–815.
- WS8 Carlee Joe-Wong, Sangtae Ha, and Mung Chiang, “Time-Dependent Internet Pricing,” *Information Theory and Applications Workshop*, UCSD, Feb., 2011.

- WS9 Sangtae Ha and Injong Rhee, "Hybrid Slow Start for High-Bandwidth and Long-Distance Networks," *PFLDNeT*, Manchester, UK, 2008, pp. 6 pages.
- WS10 Lachlan Andrew, Cesar Marcondes, Sally Floyd, Lawrence Dunn, Romaric Guillier, Wang Gang, Lars Eggert, Sangtae Ha and Injong Rhee, "Towards a Common TCP Evaluation Suite," *PFLDNeT*, Manchester, UK, 2008. pp. 5 pages.
- WS11 Han Cai, Do Young Eun, Sangtae Ha, Injong Rhee, and Lisong Xu, "Stochastic Ordering for Internet Congestion Control," *PFLDNeT*, ISI, Marina Del Rey, CA, 2007.
- WS12 Sangtae Ha, Yusung Kim, Injong Rhee, and Lisong Xu, "A Step toward Realistic Performance Evaluation of High-Speed TCP Variants," *PFLDNeT*, Japan, Feb., 2006, pp. 8 pages.

### Demo and Posters

- D1 Taejin Kim, Siqi Chen, Youngbin Im, Xiaoxi Zhang, Sangtae Ha, and Carlee Joe-Wong, "MoDEMS: Optimizing Edge Computing for User Mobility," 2021 IEEE/ACM 29th International Symposium on Quality of Service (IWQOS) (poster), pp. 1–2, 2021.
- D2 Max Hollingsworth, Gyuhong Lee, Jihoon Lee, Jinsung Lee, Youngbin Im, Eric Wustrow, Dirk Grunwald, and Sangtae Ha, "This is Your President Speaking: Spoofing Alerts in 4G LTE Networks (demo)," In Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and Services (*MobiSys '19*), pp. 663–664, 2019.
- D3 Sandesh Dhawaskar Sathyanarayana, Jihoon Lee, Jinsung Lee, Youngbin Im, Parisa Rahimzadeh, Xiaoxi Zhang, Max Hollingsworth, Carlee Joe-Wong, Dirk Grunwald, and Sangtae Ha, "CASTLE over the Air – Distributed Scheduling for Cellular Data Transmissions (demo)," In Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and Services (*MobiSys '19*), pp. 673–674, 2019.
- D4 Zhang Liu, Eric Keller, and Sangtae Ha, "Mitigating Network Resource Abuses and DDoS attacks with Client Puzzle based Software-Defined Networks," *USENIX Network Systems Design and Implementation (NSDI)*, Poster Session, Santa Clara, CA, Mar., 2016.
- D5 Sangtae Ha, Soumya Sen, Carlee Joe-Wong, and Mung Chiang, "DataMi," *NYC Media Lab Research Summit*, Sept., 2012.
- D6 Sangtae Ha, Soumya Sen, Carlee Joe-Wong, Rudiger Rill and Mung Chiang, "Demo: A System for Time-Dependent Pricing," *ACM Mobisys*, Low Wood Bay, UK, 2012.
- D7 Sangtae Ha, Soumya Sen, Carlee Joe-Wong, Justin Mifkovich, Rudiger Rill, Youngbin Im, Dana Butnariu, Jasika Bawa and Mung Chiang, "Demo: Pricing by Timing of Mobile Data," *IEEE INFOCOM 2012*.
- D8 Sangtae Ha, Carlee Joe-Wong, Soumya Sen and Mung Chiang, "TUBE: Pricing by Timing," *Poster, Celebrate Princeton Invention*, Chancellor Green, Princeton, Dec., 2011.
- D9 Sangtae Ha and Soumya Sen, "Princeton TUBE trials: Discussions with US ISPs," *Demo and Poster, NECA (National Exchange Carrier Association) EXPO*, Chicago, Sept., 2011.
- D10 Carlee Joe-Wong, Sangtae Ha, Soumya Sen, and Mung Chiang, "TUBE: Pricing by Timing," *Poster, 4th Computer Sciences & Economics Day*, New York Academy of Sciences, Sept., 2011.
- D11 Ajit Warriar, Sangtae Ha, Prashant Wason, and Injong Rhee, "DiffQ: Differential Backlog Congestion Control for Multi-hop Wireless Networks," *Demo, SECON*, 2008.

D12 Sangtae Ha, Ajit Warriar, and Injong Rhee, "TCP problem under high bandwidth delay product networks - Demo III (B)," *The Future of TCP: Train-wreck or Evolution?*, Stanford University, Stanford, CA, 2008.

### Technical Reports

TR1 Ehab Ababneh, Zaid Al-Ali, Sangtae Ha, Richard Han and Eric Keller, "Elasticizing Linux via Joint Disaggregation of Memory and Computation," *arXiv 1806.00885*, June 2018.

TR2 Blake Caldwell, Youngbin Im, Sangtae Ha, Richard Han and Eric Keller, "FluidMem: Memory as a Service for the Datacenter," *arXiv 1707.07780*, July 2017.

TR3 Murad Kablan, Carlee Joe-Wong, Sangtae Ha, Hani Jamjoom and Eric Keller, "The Cloud Needs a Reputation System," *arXiv 1509.09057*, Sept 2015, pp. 14 pages.

TR4 Carlee Joe-Wong, Sangtae Ha and Mung Chiang, "Time-dependent broadband pricing: Feasibility and Benefits," *Princeton University Technical Report*, 2011.

TR5 Victor Glass and Princeton EDGE Lab, "United States' Broadband Goals: Managing "Spillover Effects" to Increase Availability, Adoption, and Investment – A Discussion," *Joint Whitepaper with NECA on Broadband Plan*, June 2010.

TR6 Sangtae Ha and Injong Rhee, "Taming the Elephants: New TCP Slow Start," *NCSU Technical Report*, 2008.

TR7 Ajit Warriar, Sangtae Ha, and Injong Rhee, "DiffQ: Differential Backlog Congestion Control for Multi-hop Wireless Networks," *NCSU Technical Report*, 2008.

TR8 Sangtae Ha, Yusung Kim, Injong Rhee, and Lisong Xu, "A Step toward Realistic Performance Evaluation of High-Speed TCP Variants," *NCSU Technical Report*, 2006.

### Patents (granted)

P1 Jin-Sung Lee, Young-Bin Im, Sangtae Ha, Sang-Jun Moon, Jung-Shin Park, Ji-Cheol Lee, and Joo-Hyung Lee, Method and Apparatus for Controlling Send Buffer of Transmission Control Protocol in Communication System, *United State Publication#*: US 10560389, Feb. 11, 2020.

P2 Mung Chiang, Carlee Joe-Wong, Sangtae Ha and Soumya Sen, System and Methods for Time Deferred Transmission of Mobile Data, *United State Publication#*: US 10536584, Jan. 14, 2020.

P3 Gueyoung Jung, Kaustubh Joshi, and Sangtae Ha, Virtual redundancy for active-standby cloud applications, *United State Publication#*: US 10417035, Sept. 17, 2019.

P4 Christopher Greg Brinton, Weiyu Chen, Mung Chiang, Sangtae Ha, and Stefan Ruediger Rill, Systems and Methods for Automated Course Individualization via Learning Behaviors and Natural Language Processing, *United States Publication#*: US 10339822, July., 2019.

P5 Mung Chiang, Sangtae Ha, Soumya Sen, and Carlee Joe-Wong, System and Method for Variable Pricing of Data Usage, *United States Publication#*: US 9865009, Jan. 9, 2018.

P6 Mung Chiang, Sangtae Ha, Carlee Joe-Wong, Shantigram Jagannath and Wim Sweldens, System and Method for Scheduling Mobile Data During a Spectrum Valley, *United States Publications#*: US 9820291, Nov. 14, 2017.

P7 Jagan Shantigram, Minyan Shi, Carlee Joe-Wong, and Sangtae Ha, System and Method for Coordinating Client-Side Inference of Mobile Network Loading and Capacity, *United States Publication#*: US 9794155, Oct. 17, 2017.

- P8 Mung Chiang, Sangtae Ha, Carlee Joe-Wong, Harjot Saluja, Jagan Shantigram and Wim Sweldens, Client-Side Inference of Wireless Network States, *United States Publication#*: US 9407508, Aug. 2, 2016.
- P9 Nandita Dukkipati, Sangtae Ha, Vijay Subramanian, and Flavio Bonomi, "Increasing Transmission Rate to a Remote Device In Response to Attributing Information Loss at Not Being a Result of Network Congestion," *United States Publication#*: US 8625622, June 30, 2011, *European Patent#*: US 2010060517, Dec. 15, 2010.

#### **Patents (pending)**

- PP1 Chris Brinton, Ruediger Rill, Mung Chiang, Sangtae Ha, William Ju, James Walker, Da Cao, and Weiyu Chen, Systems and Methods for Integrating an eLearning Course Delivery Platform with an Enterprise Social Network, U.S. Patent Application #14/876239, filed Oct. 2015.
- PP2 Chris Brinton, Mung Chiang, Sangtae Ha, William Ju, Ruediger Rill, and James Walker, Systems and Methods for Authoring an Integrated and Individualized Course or Textbook, U.S. Patent #14/829202, filed Aug. 2015.
- PP3 Chris Brinton, Mung Chiang, Sangtae Ha, William Ju, Ruediger Rill, and James Walker, Systems and Methods to Assist an Instructor of a Course, U.S. Patent #14/712108, filed May 2015.
- PP4 Mung Chiang, Carlee Joe-Wong, Sangtae Ha and Soumya Sen, System and Methods for Time Dependent Internet Pricing, U.S. Patent Application #13/780941, filed Feb. 2013.
- PP5 Mung Chiang, Sangtae Ha, Ruediger Rill, Christopher Brinton and William Ju, "Methods and Systems for Creating, Delivering, Using, and Leveraging Integrated Teaching and Learning," *U.S. Patent Application # 14,063,289 and International Application # PCT/US13/67010*, Oct. 2013.

#### **Made Contributions to Internet Standards Related to Digital Subscriber Line (DSL).**

- ST1 Ioannis Kamitsos, Paschalis Tsiaflakis, Ken Kerpez, Sangtae Ha, and Mung Chiang, "G.adsl: Stable Sleep Mode Optimization for Energy Efficient DSL," *ATIS COAST-NAI contribution COAST-NAI-2012-019*, Aug. 22, 2012.
- ST2 Ken Kerpez, Ioannis Kamitsos, Paschalis Tsiaflakis, Sangtae Ha, and Mung Chiang, "G.adsl: Proposal to Enable Optimal Sleeping," *ATIS COAST-NAI contribution COAST-NAI-2012-020R1*, Aug. 22, 2012.
- ST3 Ioannis Kamitsos, Paschalis Tsiaflakis, K. Kerpez, Sangtae Ha, and Mung Chiang, "G.adsl: Stable Sleep Mode Optimization for Energy Efficient DSL," *US Study Group B contribution B12-08-40*, Aug. 24, 2012.
- ST4 Ken Kerpez, Ioannis Kamitsos, Paschalis Tsiaflakis, Sangtae Ha, and Mung Chiang, "G.adsl: Proposal to Enable Optimal Sleeping," *US Study Group B contribution B12-08-41*, Aug. 24, 2012.
- ST5 Ioannis Kamitsos, Paschalis Tsiaflakis, Ken Kerpez, Sangtae Ha, and Mung Chiang, "G.adsl: Stable Sleep Mode Optimization for Energy Efficient DSL," *ITU-T contribution T09-SG15-C-2066*, 10-21 Sept., 2012.
- ST6 Ken Kerpez, Ioannis Kamitsos, Paschalis Tsiaflakis, Sangtae Ha, and Mung Chiang, "G.adsl Stable Sleep Mode Optimization for Energy Efficient DSL: Proposal," *ITU-T contribution T09-SG15-C-2057*, 10-21 Sept., 2012.

#### **Professional Magazine Articles**

- M1 Sangtae Ha and Hyunjoon Cha, "Design and Implementation of Embedded Linux," *Programmer's World*, issue 3-1, April, 2001.
- M2 Sangtae Ha and Hyunjoon Cha, "Embedded Linux for Network Devices," *Linux@Works*, Nov., 2001.

M3 Sangtae Ha and Hyunjoon Cha, "Compare Embedded Linux with Other Real-Time Operating Systems," *Linux@Works*, Oct., 2001.

### **Presentations**

PT1 MRTOM: Most Reliable Totally Ordered Multicast, a Network Primitive to Offload Distributed Systems, *IEEE ICDCS*, Hong Kong, P.R. China, July., 2023.

PT2 Research Challenges in Fog Networking, *NSF WiFiUS Meeting*, Helsinki, Finland, Aug., 2016.

PT3 T-Chain: A General Incentive Scheme for Cooperative Computing, *IEEE ICDCS*, Columbus, Ohio, Jun., 2015.

PT4 TUBE: Time Dependent Pricing for Mobile Data, *ACM SIGCOMM*, Helsinki, Finland, Aug., 2012.

PT5 Pricing Broadband Access, *ICUFN*, Jeju, Korea, June, 2010.

PT6 Hybrid Slow Start for High-Bandwidth and Long-Distance Networks, *PFLDNeT*, UK, Mar., 2008

PT7 Stochastic Ordering for Internet Congestion Control, *PFLDNeT*, ISI, Marina Del Rey, Feb., 2007

### **Invited Seminars/Lectures**

T1 Accelerating Distributed Systems with Network and Software Programmability, *Invited Talk*, ETRI, Korea, Dec. 8, 2022.

T2 Towards AI-Driven Mobile Systems, *Invited Talk*, *Computer Science*, Chungnam University, Korea, Dec. 8, 2022.

T3 Enabling Closed-loop Personalized Sleep Care Through High-fidelity Brain Tracking and Just-in-time Brain Stimulation Wearables, *Invited Talk*, ETRI, Dec. 7, 2022.

T4 Towards Enhancing Rate Adaptation Behaviors in Video Conferencing using Reinforcement Learning, *Invited Talk*, UNIST, Korea, Dec. 6, 2022.

T5 Towards Enhancing Rate Adaptation Behaviors in Video Conferencing using Reinforcement Learning, *Invited Talk*, Hanyang University, Korea, Dec. 2, 2022.

T6 This is Your President Speaking: Spoofing Alerts in 4G LTE Networks, *Invited Talk*, Yonsei University, Korea, Nov. 30, 2022.

T7 Towards Enhancing Rate Adaptation Behaviors in Video Conferencing using Reinforcement Learning, *Invited Talk*, *2nd SNU-BK Workshop on Next-generation Wireless Communication and Networking*, Aug. 31, 2022.

T8 Towards AI-Driven Mobile Systems, *Invited Talk*, *Graduate School of Artificial Intelligence*, Pohang University of Science and Technology (POSTECH), Korea, Dec. 17, 2021.

T9 AI, Wireless and Security Threats, *Invited Talk*, *The Workshop on AI Applications Trends in Health & Agriculture*, HCMC University of Technology and Education, Vietnam, Dec. 17, 2019.

T10 LTE Networks: Performance and Security, *Invited Talk*, *Yonsei University*, South Korea, June 18, 2019.

T11 LTE Networks: Performance and Security, *Invited Talk*, *The 9th International Workshop on Cyber-Physical Systems (IWCPs 2019)*, DGIST, South Korea, June 13, 2019.

T12 LTE Networks: Performance and Security, *Invited Talk*, *Kyung Hee University*, South Korea, June 13, 2019.

T13 LTE Networks: Performance and Security, *Invited Talk*, *UNIST*, South Korea, June 14, 2019.

- T14 Combating Internet Latency in the Age of Fog and Cloud Computing, *Invited Talk, UNIST, Ulsan, Korea, Dec. 14, 2018.*
- T15 Bridging Theory and Practice: Towards More Accurate Wireless Sensing for Neural Devices, *Invited Talk, KAIST, Daejeon, Korea, Aug. 6, 2018.*
- T16 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Computer Science Colloquium, Colorado School of Mines, Golden, Colorado, Nov. 16, 2017.*
- T17 Linux CUBIC: From Idea to Actual Deployment, *Invited Speaker, Samsung Research America, Richardson, Texas, Nov. 3, 2017.*
- T18 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Computer Science Colloquium, POSTECH, Pohang, Korea, Oct. 20, 2017.*
- T19 Calibrating Time-variant, Device-specific Phase Noise for COTS WiFi Devices, *Invited Speaker, The 8th International Conference on ICT Convergence (ICTC), Oct. 19, 2017.*
- T20 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Invited Speaker, ETRI Seminar, Oct. 17, 2017.*
- T21 Combating Internet Latency in the Age of Fog and Cloud Computing, *Invited Speaker, Samsung Electronics, Suwon, Korea, Oct. 16, 2017.*
- T22 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Invited Speaker, Hanyang University (ERICA), Korea, Oct. 16, 2017.*
- T23 Combating Internet Latency in the Age of Fog and Cloud Computing, *Computer Science Colloquium, University of Colorado Boulder, Sep. 28, 2017.*
- T24 Fog Networking for IoT: Empowering End-User Devices, *Distinguished Speaker, ETRI Seminar, Daejeon, Korea, Feb., 2016.*
- T25 T-Chain: A General Incentive Scheme for Cooperative Computing, *Distinguished Speaker, ETRI Seminar, Daejeon, Korea, Feb., 2016.*
- T26 Fog Networking for IoT: Empowering End-User Devices, *Distinguished Speaker, IoT World Forum Research and Innovation Forum, Hosted by Cisco, Dubai, Dec., 2015.*
- T27 Fog Networking: Architecture, Algorithms, and Applications, *Invited Speaker, Asia-US Forum on Fog Networking for 5G and IoT 2015, Taipei, Taiwan, Sep., 2015.*
- T28 Challenges in Internet of Things, *IEEE SECON Workshop on Fog Networking for 5G and IoT, Seattle, Washington, Jun., 2015.*
- T29 CYRUS: Towards Client-Defined Cloud Storage, *ETRI Invited Seminar, Daejeon, Korea, Apr., 2015.*
- T30 Improving TCP Congestion Control for High Bandwidth and Long Distance Networks, *ITP Seminar, University of Colorado Boulder, Nov., 2014.*
- T31 Smart Data Pricing: From Theory to Practical Deployment, *Computer Science Seminar Talk, University of Colorado Boulder, May, 2014.*
- T32 CUBIC: Algorithm to Practical Deployment, *IT Convergence Division, POSTECH, Korea, Dec., 2012.*
- T33 CUBIC: Algorithm to Practical Deployment, *Guest Lecturer, ELE 381, Princeton University, Nov., 2012.*
- T34 TUBE: Time Dependent Pricing for Mobile Data - From Economic Theory to Trial Deployment, *Invited Speaker, Industry (Samsung, ETRI, Korea Telecom), Korea, Dec., 2012.*

- T35 TUBE: Time Dependent Pricing for Mobile Data - From Economic Theory to Trial Deployment, *Department Seminar, Academia (SNU, KAIST, POSTECH, UNIST, Sogang, KHU), Korea, Dec., 2012.*
- T36 Better Energy-Delay Tradeoff via Server Resource Pooling, *Invited Speaker, ICNC, Hawaii, Feb., 2012.*
- T37 TUBE – Pricing (Mobile Data) by Timing, *CTIF/Aalborg University Meeting, Princeton Univ., April, 2011*
- T38 TUBE – Pricing (Mobile Data) by Timing, *Princeton EDGE Lab Open House, Princeton Univ., April, 2011*
- T39 TUBE – Pricing (Mobile Data) by Timing, *Guest Lecture, Princeton University, March, 2011*
- T40 TUBE – Pricing (Mobile Data) by Timing, *Vodafone Wireless Innovation Competition, March, 2011*
- T41 Research Vision on Video-Aware Wireless Networks, *Intel VAWN Workshop, CA, Apr., 2010.*
- T42 Improving TCP Congestion Control for High Bandwidth and Long Distance Networks, *Invited Talk, Electrical Engineering, Princeton University, Oct., 2009*

### **Outreach Seminars/Lectures**

- O1 Computer Science As Your Career, *Korean Presbyterian Church of Denver (KPCD), Arvada, Colorado, Oct. 29, 2017.*

## **Teaching, Mentoring and Advising**

---

### **Courses Taught**

- |             |   |
|-------------|---|
| 2023 Fall   | CSCI/ECEN 5273 Network Systems<br>(001): 17 Graduate Students   |
| 2022 Spring | CSCI/ECEN 5273 Network Systems<br>(001): 25 Graduate Students   |
| 2022 Spring | CSCI/ECEN 5273 Network Systems<br>(001): 25 Graduate Students   |
| 2021 Fall   | CSCI 4273 Network Systems<br>(001): 26 Undergraduate Students   |
| 2021 Spring | CSCI/ECEN 5273 Network Systems<br>(001): 15 Graduate Students   |
| 2020 Fall   | CSCI 4273 Network Systems<br>(001): 47 Undergraduate Students   |
| 2019 Fall   | CSCI 4273 Network Systems<br>(001): 55 Undergraduate Students: FCQ (Course: 5.03, Instructor: 5.44)   |
| 2019 Fall   | CYBR 5010 Data Communications<br>(001): 21 Graduate Students: FCQ (Course: 4.94, Instructor: 5.17)  |
| 2018 Fall   | CSCI 4273/5273: Network Systems<br>(001): 68 Graduate and Undergrad Students, FCQ (Course: 4.93, Instructor: 5.16)<br>(001B): 17 Graduate Students, FCQ (Course: 5.5, Instructor: 5.58) |
| 2018 Fall   | TLEN 5330: Data Communications 1<br>(001): 33 Graduate Students (Course: 4.93, Instructor: 4.83)  |

2017 Fall	CSCI 4273/5273: Network Systems (001): 85 Graduate and Undergrad Students, FCQ (Course: 4.69, Instructor: 5.04) (001B): 29 Graduate Students, FCQ (Course: 4.82, Instructor: 4.88)
2017 Fall	TLEN 5330: Data Communications 1 48 Graduate Students, FCQ (Course: 4.49, Instructor: 4.11)
2016 Fall	CSCI 4273/5273: Network Systems, 92 Undergraduate Students, FCQ (Course: 4.7, Instructor: 4.7) 22 Graduate Students, FCQ (Course: 4.6, Instructor: 4.6)
2016 Fall	TLEN 5330: Data Communications 1, 47 Graduate Students, FCQ (Course: 5.4, Instructor: 5.1)
2016 Spring	CSCI 7000-010: Advanced Internet Protocols, 9 Graduate Students, FCQ (Course: 5.2, Instructor: 5.7)
2015 Fall	CSCI 4273/5273: Network Systems, 89 Undergraduate Students, FCQ: (Course: 4.1, Instructor: 4.1) 19 Graduate Students, FCQ: (Course: 5.5, Instructor: 5.2)
2015 Fall	TLEN 5330: Data Communications 1, 87 Graduate Students, FCQ (Course: 4.9, Instructor: 4.5)
2014 Fall	TLEN 5330: Data Communications 1, 48 Graduate Students, FCQ: (Course: 3.8, Instructor: 3.7 )

#### **Current PhD Dissertation Advisees**

1. Prasanth Prahladan, 2017 Fall - Present. Computer Science, University of Colorado
2. Jaeyoung Oh, 2018 Fall - Present. Computer Science, University of Colorado
3. Taeho Kim, 2020 Spring - Present. Computer Science, University of Colorado
4. Tuan Tran, 2023 Spring - Present. Computer Science, University of Colorado

#### **Alumni**

1. Sandesh Dhawaskar Sathyanarayana, Ph.D. student in CS, University of Colorado (2019 Fall - 2023 Fall). Thesis Title: "Multipath Transport Protocols for Real Time Communication Systems."
2. Dr. Hyoyoung Lim, Ph.D. student in CS, University of Colorado (2018 Fall - 2023 Summer). Thesis Title: "Understanding the Impact of Congestion Control Algorithms on Emerging Networks and Applications."
3. Dr. Anh Nguyen, Postdoctoral Associate, Computer Science, University of Colorado (2022 Summer). Now an Assistant Professor in the CS department, University of Montana.
4. Insoo Lee, Ph.D. student in Computer Science, University of Colorado (2017 Fall - 2022 Summer). Thesis Title: "Toward Enhancing Rate Adaptation Behaviors in Video Conferencing using Reinforcement Learning."
5. Jason Schnitzer, Ph.D. student in TCP, University of Colorado (2019 Spring - 2022 Spring). Thesis Title: "Autonomic DOCSIS Networking."

6. Dr. Zhang Liu, Ph.D. student in TCP, University of Colorado (2015 Fall - 2021 Summer). Now a Software Engineer at Google (co-advised with Prof. Dirk Grunwald).  
Thesis Title: "Accelerating Distributed System Design with Programmable Network Devices and Reusable Network Primitives."
7. Dr. Ayad Ibrahim, Ph.D. student in TCP, University of Colorado (2015 Fall - 2020 Spring). Now a Senior Systems Architect Lead at Cisco Systems.  
Thesis Title: "Demystifying the Rate Adaptation Algorithms in Internet Video Applications."
8. Dr. Parisa Rahimzadeh, Ph.D. student in Computer Science, University of Colorado (2016 Spring - 2020 Spring). Now a research scientist at Intelligent Automation, Inc.  
Thesis Title: "Network-Aware Resource Provisioning for Heterogeneous Applications."
9. Dr. Jinsung Lee, Postdoctoral Associate, Computer Science, University of Colorado (2018 Spring - 2021 Summer). Now a Senior Staff Engineer at Qualcomm.
10. Dr. Jihoon Lee, Research Associate, Computer Science, University of Colorado (2017 Fall - 2020 Summer). Now a Principal Software Engineer at View.
11. Dr. Youngbin Im, Postdoctoral Associate, Computer Science, University of Colorado (2015 Spring - 2019 Summer). Now an Assistant Professor in the CS department at UNIST in South Korea.
12. Gyuhong Lee, M.S. student (with thesis) in Computer Science, University of Colorado (2017 Fall - 2019 Spring). Now a Lecturer at Korea Military Academy.  
Thesis Title: "Experimental Study of Spoofing Alerts in 4G LTE Networks."

#### **Thesis and PhD Exam Committee**

1. Sandesh Dhawaskar Sathyanarayana, CS PhD Thesis Defense Chair, 2023 Fall
2. Jack Wampler, CS PhD Thesis Defense Committee, 2023 Fall
3. Jackson Sippe, CS PhD Preliminary Exam Committee, 2023 Fall
4. Hyoyoung Lim, CS PhD Thesis Defense Chair, 2023 Summer
5. Seonwoo Kim, CS MS Thesis Chair, 2023 Summer
6. Sandesh Dhawaskar Sathyanarayana, CS PhD Comprehensive Exam Committee, 2023 Spring
7. Hyoyoung Lim, CS PhD Comprehensive Exam Committee, 2023 Spring
8. Gaukas Wang, CS PhD Preliminary Exam Committee, 2023 Spring
9. Jaeyoung Oh, CS PhD Preliminary Exam Committee, 2023 Spring
10. Prasanth Prahladan, CS PhD Preliminary Exam Committee, 2023 Spring
11. Max Hollingsworth, CS PhD Comprehensive Exam Committee, 2022 Fall
12. Jack Wampler, CS PhD Comprehensive Exam Committee, 2022 Fall
13. Shazal Irshad, CS PhD Comprehensive Exam Committee, 2022 Fall
14. Nam Bui, CS PhD Thesis Defense Committee, 2022 Fall

15. Insoo Lee, CS PhD Thesis Defense Chair, 2022 Summer
16. Fei Hu, CS PhD Preliminary Exam Committee, 2022 Spring
17. Manan Khasgiwale, CS MS Thesis Committee, 2022 Spring
18. William Mortl, CS PhD Comprehensive Exam Committee, 2022 Spring
19. Anh Nguyen, CS PhD Thesis Defense Committee, 2022 Spring
20. Ian Martiny CS PhD Thesis Defense Committee, 2022 Spring
21. Jason Schnitzer, TCP PhD Thesis Defense Chair, 2022 Spring
22. Zaid Alali, CS PhD Comprehensive Exam Committee, 2021 Fall
23. Nam Bui, CS PhD Comprehensive Exam Committee, 2021 Fall
24. Ian Martiny CS PhD Comprehensive Exam Committee, 2021 Fall
25. Taeho Kim, CS PhD Preliminary Exam Committee, 2021 Fall
26. Sandesh Dhawaskar Sathyanarayana, CS PhD Preliminary Exam Committee, 2021 Fall
27. Zhang Liu, TCP PhD Thesis Defense Chair, 2021 Summer
28. Hoang Truong, CS PhD Preliminary Exam Committee, 2021 Summer
29. Nam Bui, CS PhD Preliminary Exam Committee, 2021 Summer
30. Jason Schnitzer, TCP PhD Comprehensive Exam Committee, 2021 Spring
31. Max Hollingsworth, CS PhD Preliminary Exam Committee, 2021 Spring
32. Anh Nguyen, CS PhD Comprehensive Exam Committee, 2021 Spring
33. Zhang Liu, TCP PhD Comprehensive Exam Committee, 2021 Spring
34. Joon Il Kwon, CS MS Thesis Chair, 2021 Spring
35. Youngjin Ko, CS MS Thesis Chair, 2021 Spring
36. Dwight Browne, CS PhD Preliminary Exam Committee, 2021 Spring
37. Abdulrahman Alaraj, CS PhD Preliminary Exam Committee, 2021 Spring
38. Hyoyoung Lim, CS PhD Preliminary Exam Committee, 2021 Spring
39. Insoo Lee, CS PhD Preliminary Exam Committee, 2021 Spring
40. Nadia Yoza-Mitsuishi, TCP PhD Defense Committee, 2021 Spring
41. Shazal Irshad, CS PhD Preliminary Exam Committee, 2020 Fall
42. Azzam Alsudais, CS PhD Defense Committee, 2020 Fall
43. William Mortl, CS PhD Preliminary Exam Committee, 2020 Summer

44. Sergey Frolov, CS PhD Thesis Defense Committee, 2020 Summer
45. Azzam Alsudais, CS PhD Proposal Exam Committee, 2020 Summer
46. Parisa Rahimzadeh, CS PhD Thesis Defense Chair, 2020 Spring
47. Ibrahim Ayad, TCP PhD Thesis Defense Chair, 2020 Spring
48. Andre Rosete, TCP PhD Thesis Defense Committee, 2020 Spring
49. Ethan Hunter, CS Undergraduate Thesis Defense Committee, Spring 2020
50. Sergey Frolov, CS PhD Comprehensive Exam Committee, 2020 Spring
51. Gyuhong Lee, CS MS Thesis Defense Chair, 2019 Spring
52. Andre Rosete, TCP PhD Comprehensive Exam Committee, 2019 Spring
53. Nadia Yoza-Mitsuishi, TCP PhD Comprehensive Exam Committee, 2019 Spring
54. Blake Caldwell, CS PhD Thesis Defense Committee, 2019 Spring
55. Oliver Michel, CS PhD Thesis Defense Committee, 2019 Spring
56. Eric Goodman, CS PhD Thesis Defense Committee, 2019 Spring
57. Oliver Michel, CS PhD Proposal Exam Committee, 2018 Winter
58. Waleed Almarshedi, ITP PhD Preliminary Exam Committee, 2018 Spring
59. Eric Lobato, ITP PhD Preliminary Exam Committee, 2018 Spring
60. Nadia Yoza-Mitsuishi, ITP PhD Preliminary Exam Committee, 2018 Spring
61. Dewang Gedia, ITP PhD Preliminary Exam Committee, 2018 Spring
62. Jason Schnitzer, ITP PhD Preliminary Exam Committee, 2018 Spring
63. Parisa Rahimzadeh, CS PhD Preliminary Exam Committee, 2018 Spring
64. Zaid Al-Ali, CS PhD Preliminary Exam Committee, 2018 Spring
65. Michael Coughlin, CS PhD Thesis Defense Committee, 2018 Spring
66. Xinyang Zhou, ITP PhD Thesis Defense Committee, 2018 Spring
67. Azzam Alsudais, CS PhD Preliminary Exam Committee, 2018 Spring
68. Ehab Ababneh, CS PhD Thesis Defense Committee, 2017 Summer
69. Murad Kablan, CS PhD Thesis Defense Committee, 2017 Summer
70. Mark Lofquist, ITP PhD Preliminary Exam Committee, 2017 Spring
71. Syed F Shamim, ITP PhD Preliminary Exam Committee, 2017 Spring
72. Zhang Liu, ITP PhD Preliminary Exam Committee, 2017 Spring

73. Irena Stevens, ITP PhD Preliminary Exam Committee, 2017 Spring
74. Andre Rosete, ITP PhD Preliminary Exam Committee, 2017 Spring
75. Joe McManus, ITP PhD Preliminary Exam Committee, 2017 Spring
76. Blake Caldwell, CS PhD Proposal Exam Committee, 2017 Spring
77. Oliver Michael, CS PhD Preliminary Exam Committee, 2016 Fall
78. Ehab Ababneh, CS PhD Proposal Exam Committee, 2016 Fall
79. Xinyang Zhou, ITP PhD Proposal Exam Committee, 2016 Fall
80. Andy Sayler, CS PhD Thesis Defense Committee, 2016 Spring
81. Lei Tian, CS PhD Thesis Defense Committee, 2016 Spring
82. Christopher G. Brinton, Thesis Reader, EE, PhD, Princeton University, 2016 Spring
83. Martin Saint, ITP PhD Preliminary Exam Committee, 2016 Spring
84. Eric Goodman, CS PhD Proposal Exam Committee, 2015 Fall
85. Daniel Hembree, ITP PhD Preliminary Exam Committee, 2015 Summer
86. Blake Caldwell, CS PhD Preliminary Exam Committee, 2015 Spring
87. Xinyang Zhou, ITP PhD Preliminary Exam Committee, 2015 Spring
88. Ibrahim Ayad, ITP PhD Preliminary Exam Committee, 2015 Spring
89. Andy Sayler, CS PhD Proposal Exam Committee, 2015 Spring
90. Lei Tian, CS PhD Proposal Exam Committee, 2015 Spring
91. Felix Ming Fai Wong, Thesis Reader, EE, PhD, Princeton University, 2015 Spring
92. Abhiram Yarlagadda, ITP MS Thesis Committee, ITP, MS, 2014 Fall

### **Independent Study**

1. Vishwanath Kulkarni, Computer Science M.S. Student, 2020 Fall
2. Jaeyoung Oh, Computer Science Ph.D. Student, 2019 Fall
3. Hyun Sub Kim, Computer Science M.S. Student, 2018 Spring
4. Sandesh Dhawaskar Sathyanarayana, Computer Science M.S. Student, 2018 Spring and 2019 Spring
5. Sumeet Khule, ECEE M.S. Student, 2017 Summer
6. Won Cheol Song, Computer Science M.S. Student, 2017 Spring
7. Tae-Gu Kim, Computer Science M.S. Student, 2017 Spring
8. Shyam Ramamoorthy, Computer Science M.S. Student, 2015 Fall
9. Prithvi Manikonda, ITP M.S. Student, 2015 Spring

10. Sessa Chetlur, Computer Science M.S. Student, 2015 Spring

### **Visitors**

1. Stefan Ruediger Rill, now an Engineering Manager at Google, 2016 Fall - 2017 Fall
2. Trung Hieu Nguyen, Aalto University, Finland, 2015 Fall - 2016 Spring
3. Dr. Seung Eun Hong, ETRI, South Korea, 2015 Fall - 2016 Spring
4. Dr. Kyuyong Shin, Korea Military Academy, South Korea, 2014 Fall - 2015 Summer

### **Mentoring**

1. Hayeong Song, Computer Science M.S. Student, 2016 Fall - 2018 Spring. Now at Georgia Tech.
2. Hyunsub Kim, Computer Science M.S. Student, 2016 Fall - 2018 Spring
3. Brett Shouse, Computer Science M.S. Student, 2015 Fall - 2018 Spring
4. Won Cheol Song, Computer Science M.S. Student, 2015 Fall - 2017 Spring
5. Tae-Gu Kim, Computer Science M.S. Student, 2015 Fall - 2017 Spring
6. Varun Kaundinya, ITP M.S. Student, 2014 Fall - 2015 Spring
7. Prithvi Manikonda, ITP M.S. Student, 2015 Spring
8. Sessa Chetlur, Computer Science M.S. Student, CS, 2015 Spring

### **Guest Lectures**

2014 Spring	Optimization of Communication Systems (Graduate), Princeton University
2012 Fall	Networks: Friends, Money, and Bytes (Undergrad.), Princeton University
2011 Spring	Optimization in Communication Systems (Graduate), Princeton University