

Sangtae Ha

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Research Interests

My research focuses on building and deploying practical systems that span multiple disciplines, including networks and distributed systems, mobile systems, internet protocols and algorithms, LTE and 5G networks and security, video streaming, and storage systems. I co-founded DataMi, a startup on wireless networks, in 2012, and served as the founding CTO/VP Engineering. DataMi is disrupting the mobile advertisement industry and currently serving over 60 million smartphone users. I also co-founded Zoomi, which develops an artificial intelligence (AI) learning platform. Zoomi was recently named in the "Top 20 Learning Delivery Companies" by TrainingIndustry.com. I serve as the technical advisor for Myota Inc., a storage startup spun off from my recent research in secure and reliable storage. Previously, I co-authored CUBIC (RFC 8312), which is the default TCP congestion control algorithm for Linux, Android and Windows, and is currently being used by the majority of Internet servers around the world and by several billion Android and Linux 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 (Now the VP of IoT, Google)
- 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

- 08/2014 - Current **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 Dean of Engineering 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 Dean of Engineering at Purdue University)

Work Experience

- 10/2019 - Current Chief Architect Officer for Earable Inc.
<http://www.earable.ai>
- 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

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."

Teaching, Mentoring and Advising

Courses Taught

2019 Fall CSCI 4273 Network Systems
 (001): 55 Undergraduate Students: FCQ (Course: 5.03, Instructor: 5.44)

2019 Fall CYBR 5010 Data Communications
 (001): 21 Graduate Students: FCQ (Course: 4.94, Instructor: 5.17)

2018 Fall CSCI 4273/5273: Network Systems
 (001): 68 Graduate and Undergrad Students, FCQ (Course: 4.93, Instructor: 5.16)
 (001B): 17 Graduate Students, FCQ (Course: 5.5, Instructor: 5.58)

2018 Fall TLEN 5330: Data Communications 1
 (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 Postdoctoral Advisees

1. Dr. Jinsung Lee, Postdoctoral Associate, Computer Science, University of Colorado (18S - Present)
2. Dr. Jihoon Lee, Research Associate, Computer Science, University of Colorado(17F - Present)

Current PhD Dissertation Advisees

1. Ayad Ibrahim, 2015 Fall - Present. TCP, University of Colorado
2. Insoo Lee, 2017 Fall - Present. Computer Science, University of Colorado
3. Zhang Liu, 2015 Fall - Present. TCP, University of Colorado
4. Parisa Rahimzadeh, 2016 Spring - Present. Computer Science, University of Colorado
5. Prasanth Prahladan, 2017 Fall - Present. Computer Science, University of Colorado
6. Siqi Chen, 2018 Fall - Present. Computer Science, University of Colorado
7. Jaeyoung Oh, 2018 Fall - Present. Computer Science, University of Colorado
8. Hyoyoung Lim, 2018 Fall - Present. Computer Science, University of Colorado
9. Jason Schnitzer, 2019 Spring - Present. TCP, University of Colorado
10. Sandesh Dhawaskar Sathyanarayana, 2019 Fall - Present. Computer Science, University of Colorado
11. Taeho Kim, 2020 Spring - Present. Computer Science, University of Colorado

Current MS Thesis Advisees

1. Gyuhong Lee, 2018 Spring - Present. Computer Science, University of Colorado

Thesis and PhD Exam Committee

1. Andre Rosete, ITP PhD Comprehensive Exam Committee, 2019 Spring
2. Nadia Yoza-Mitsuishi, ITP PhD Comprehensive Exam Committee, 2019 Spring
3. Blake Caldwell, Computer Science PhD Thesis Defense Committee, 2019 Spring
4. Oliver Michel, Computer Science PhD Thesis Defense Committee, 2019 Spring
5. Eric Goodman, Computer Science PhD Thesis Defense Committee, 2019 Spring

6. Oliver Michel, Computer Science PhD Proposal Exam Committee, 2018 Winter
7. Waleed Almarshedi, ITP PhD Preliminary Exam Committee, 2018 Spring
8. Eric Lobato, ITP PhD Preliminary Exam Committee, 2018 Spring
9. Nadia Yoza-Mitsuishi, ITP PhD Preliminary Exam Committee, 2018 Spring
10. Dewang Gedia, ITP PhD Preliminary Exam Committee, 2018 Spring
11. Jason Schnitzer, ITP PhD Preliminary Exam Committee, 2018 Spring
12. Parisa Rahimzadeh, Computer Science PhD Preliminary Exam Committee, 2018 Spring
13. Zaid Al-Ali, Computer Science PhD Preliminary Exam Committee, 2018 Spring
14. Michael Coughlin, Computer Science PhD Thesis Defense Committee, 2018 Spring
15. Xinyang Zhou, ITP PhD Thesis Defense Committee, 2018 Spring
16. Azzam Alsudais, Computer Science PhD Preliminary Exam Committee, 2018 Spring
17. Ehab Ababneh, Computer Science PhD Thesis Defense Committee, 2017 Summer
18. Murad Kablan, Computer Science PhD Thesis Defense Committee, 2017 Summer
19. Mark Lofquist, ITP PhD Preliminary Exam Committee, 2017 Spring
20. Syed F Shamim, ITP PhD Preliminary Exam Committee, 2017 Spring
21. Zhang Liu, ITP PhD Preliminary Exam Committee, 2017 Spring
22. Irena Stevens, ITP PhD Preliminary Exam Committee, 2017 Spring
23. Andre Rosete, ITP PhD Preliminary Exam Committee, 2017 Spring
24. Joe McManus, ITP PhD Preliminary Exam Committee, 2017 Spring
25. Blake Caldwell, Computer Science PhD Proposal Exam Committee, 2017 Spring
26. Oliver Michael, Computer Science PhD Preliminary Exam Committee, 2016 Fall
27. Ehab Ababneh, Computer Science PhD Proposal Exam Committee, 2016 Fall
28. Xinyang Zhou, ITP PhD Proposal Exam Committee, 2016 Fall
29. Andy Saylor, Computer Science PhD Thesis Defense Committee, 2016 Spring
30. Lei Tian, Computer Science PhD Thesis Defense Committee, 2016 Spring
31. Christopher G. Brinton, Thesis Reader, EE, PhD, Princeton University, 2016 Spring
32. Martin Saint, ITP PhD Preliminary Exam Committee, 2016 Spring
33. Eric Goodman, Computer Science PhD Proposal Exam Committee, 2015 Fall
34. Daniel Hembree, ITP PhD Preliminary Exam Committee, 2015 Summer

35. Blake Caldwell, Computer Science PhD Preliminary Exam Committee, 2015 Spring
36. Xinyang Zhou, ITP PhD Preliminary Exam Committee, 2015 Spring
37. Ibrahim Ayad, ITP PhD Preliminary Exam Committee, 2015 Spring
38. Andy Sayler, Computer Science PhD Proposal Exam Committee, 2015 Spring
39. Lei Tian, Computer Science PhD Proposal Exam Committee, 2015 Spring
40. Felix Ming Fai Wong, Thesis Reader, EE, PhD, Princeton University, 2015 Spring
41. Abhiram Yarlagadda, ITP MS Thesis Committee, ITP, MS, 2014 Fall

Independent Study

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

Alumni

1. Dr. Youngbin Im, Postdoctoral Associate, Computer Science, University of Colorado (2015 Spring - 2019 Summer). Now an Assistant Professor in the CS department at UNIST.

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. Sesa 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

Professional Service

Fog Computing/Networking

TPC	IEEE INFOCOM 2020, 2019, 2018, 2017, 2016
TPC	IEEE SECON 2020
Co-Chair	ACM CoNEXT'19 Student Workshop, 2019
TPC Co-Chair	Fog World Congress 2017
Organizing Committee	IEEE DSN 2017
Publicity Co-Chair	ACM SEC 2017
TPC	IEEE ICDCS 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

TPC	International Teletraffic Congress (ITC), 2016
Editorial Board	IEEE ComSoc Technology News (CTN) 2012 - 2014
Panelist	NSF NeTS Small and Medium Panel 2017, 2016, 2015
Reviewer	NSF CREST, 2018

TPC	IEEE GLOBECOM 2016, 2014, 2013
TPC	IEEE SECON 2015
TPC	MobileSoft ACM Student Research Competition, 2015
TPC	IEEE PIMRC 2014, 2013
TPC	WiOPT 2014, 2013, 2012, 2011
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 JSAC Networking Challenges in Cloud Computing Systems and Applications 2013, IEEE JSAC SI-NetEcon 2012, IEEE WCNC 2013, Mobile Computing and Communications Review 2013
Adhoc 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 Boulder
2018F – 2019S	Faculty Search Committee, Computer Science, University of Colorado Boulder
2016F – 2017S	Faculty Search Committee, Computer Science, University of Colorado Boulder
2014F – 2016S	Graduate Committee, Computer Science, University of Colorado Boulder
2014F –	Ph.D. Committee, Interdisciplinary Telecom Program (ITP), University of Colorado Boulder

University Service

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

Outreach

Publications

Internet Drafts

- 11 Injong Rhee, Lisong Xu, **Sangtae Ha**, Alexander Zimmermann, Lars Eggert and Richard Scheffenegger, “[RFC8312] CUBIC for Fast Long-Distance Networks,” DOI: 10.17487/RFC8312, Feb., 2018.

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,” to appear in *Fog and Fogonomics: Challenges and Practices of Fog Computing, Networking, Strategy and Economics*, Wiley, 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, Chapter 5 (54 pages), Aug., 2013.

Journals Published/Accepted

- J1 Soumya Sen, Carlee Joe-Wong, **Sangtae Ha**, and Mung Chiang, “Time-Dependent Pricing for Multimedia Data Traffic: Analysis, Systems, and Trials,” *IEEE JSAC Special Issue on Multimedia Economics for Future Networks: Theory, Methods and Applications*, 2019.
- J2 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.
- J3 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.
- J4 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.
- J5 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.
- J6 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, Aug. 2017.
- J7 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.
- J8 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.

- J9 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.
- J10 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 JSAC Special Issue on Human-In-The-Loop Mobile Networks*, vol. 35, no. 4, pp. 949-963, Apr. 2017.
- J11 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*, pp. 1-16, May, 2016.
- J12 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.
- J13 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.
- J14 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.
- J15 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.
- J16 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.
- J17 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.
- J18 Christopher Brinton, Ruediger Rill, **Sangtae Ha**, Mung Chiang, Robert Smith and William Ju, "Individualization for Education at Scale: MIIC Design and Preliminary Evaluation," *IEEE Transactions on Learning Technologies*, vol. 8, no. 1, pp. 136-148, Jan. 2015.
- J19 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.
- J20 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.
- J21 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.
- J22 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.
- J23 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: Smart Grid Communications Series*, vol. 30, no. 6, pp. 1075-1085, July 2012.
- J24 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.
- J25 **Sangtae Ha** and Injong Rhee, "Taming the Elephants: New TCP Slow Start," *Elsevier Computer Networks*, vol. 55, no. 9, pp. 2092-2110, 2011.

- J26 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.
- J27 **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.
- J28 **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.

Conferences Published/Accepted

- C1 Xiaoxi Zhang, Siqi Chen, Youngbin Im, Maria Gorlatova, **Sangtae Ha**, and Carlee Joe-Wong, "Towards Automated Network Management: Learning the Optimal Protocol Selection," *IEEE ICNP 2019* (short paper – 19.3% acceptance rate).
- C2 Parisa Rahimzadeh, Youngbin Im, Gueyoung Jung, Carlee Joe-Wong and **Sangtae Ha**, "ECHO: Efficiently Overbooking Applications to Create a Highly Available Cloud," *IEEE ICDCS 2019* (19.6% acceptance rate).
- C3 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," *ACM MobiSys 2019* (23.2% acceptance rate).
- C4 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," *ACM MobiSys 2019* (23.2% acceptance rate).
- C5 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?," *EuroSys 2019* (21.7% acceptance rate).
- C6 Shinik Park, Jinsung Lee, Junseon Kim, Jihoon Lee, **Sangtae Ha**, and Kyunghan Lee, "ExLL: An Extremely Low-Latency Congestion Control for Mobile Cellular Networks," *ACM CoNEXT*, Heraklion/Crete, Greece, 2018 (17.3% acceptance rate).
- C7 Youngbin Im, Prasanth Prahladan, Tae Hwan Kim, Yong Geun Hong, and **Sangtae Ha**, "SNN-Cache: A Practical Machine Learning-based Caching System Utilizing the Inter-relationships of Requests," *CISS 2018*, Princeton, NJ, 2018.
- C8 Gueyoung Jung, Parisa Rahimzadeh, Zhang Liu, **Sangtae Ha**, Kaustubh Joshi, and Matti Hiltunen, "Virtual Redundancy for Active-Standby Cloud Applications," *IEEE INFOCOM 2018* (19.2% acceptance rate).
- C9 Taeyeol Jeong, Jaeyoon Chung, James Won-Ki Hong, and **Sangtae Ha**, "Towards a distributed computing model for fog," *Fog World Congress*, Santa Clara, CA, Oct 30 - Nov 1, 2017.
- C10 Jinciao Zhu, Youngbin Im, Shivakant Mishra, and **Sangtae Ha**, "Calibrating Time-variant, Device-specific Phase Noise for COTS WiFi Devices," *ACM Sensys*, 2017 (17.4% acceptance rate).
- C11 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," in *IEEE ICDCS*, pp. 298–307, June 2017 (16.94% acceptance rate).
- C12 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 (20.93% acceptance rate).
- C13 Carlee Joe-Wong, Youngbin Im, Kyuyong Shin, and **Sangtae Ha**, "A Performance Analysis of Incentive Mechanisms for Cooperative Computing," in *IEEE ICDCS*, pp. 108-117, June 2016 (17.6% acceptance rate).
- C14 Liang Zheng, Carlee Joe-Wong, Christopher Brinton, Cheewei Tan, **Sangtae Ha**, and Mung Chiang, "Viability of Virtual Cloud Providers," in *Proceedings of the ACM SIGMETRICS*, pp. 235–248, 2016 (13.46% acceptance rate).

- C15 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," in *IEEE/ACM IWQoS*, pp. 105–114, June 2015 (22.5% acceptance rate).
- C16 Kyuyong Shin, Carlee Joe-Wong, **Sangtae Ha**, Yung Yi, Injong Rhee and Douglas Reeves, "T-Chain: A General Incentive Scheme for Cooperative Computing," in *IEEE ICDCS*, pp. 163–174, June 2015 (12.89% acceptance rate).
- C17 Jaeyoon Chung, Carlee Joe-Wong, **Sangtae Ha**, James Won-Ki Hong, and Mung Chiang, "CYRUS: Towards Client-Defined Cloud Storage," in *Proceedings of the ACM EuroSys*, pp. 17:1–17:16, 2015 (21.33% acceptance rate)
- C18 Carlee Joe-Wong, **Sangtae Ha**, and Mung Chiang, "Sponsoring Mobile Data: An Economic Analysis of the Impact on Users and Content Providers," in *Proceedings of the IEEE INFOCOM*, pp. 1499-1507, Apr. 2015 (19% acceptance rate).
- C19 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," in *Proceedings of the IEEE INFOCOM*, pp. 1580–1588, 2015 (19% acceptance rate).
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- C21 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).
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- C24 **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 (13% acceptance rate).
- C25 **Sangtae Ha**, Carlee Joe-Wong, Soumya Sen, and Mung Chiang, "Pricing by Timing: Innovating Broadband Data Plans", *SPIE OPTO*, San Francisco, CA, 2012.
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- C27 Joe Wenjie Jiang, Tian Lan, **Sangtae Ha**, Minghua Chen, and Mung Chiang "Joint VM Placement and Routing for Data Center Traffic Engineering," in *Proceedings of the IEEE INFOCOM (mini conference)*, pp. 2876–2880, Orlando, Florida, 2012 (18% acceptance rate).
- C28 Ioannis Kamitsos, Lachlan Andrew, Hongseok Kim, **Sangtae Ha**, and Mung Chiang "Better Energy-Delay Tradeoff via Server Resource Pooling," in *ICNC GCNC (invited)*, pp. 611-616, Jan. 2012.
- C29 Ioannis Kamitsos, Paschalis Tsiaflakis, **Sangtae Ha**, and Mung Chiang, "Stable Sleeping in DSL Broadband Access: Feasibility and Tradeoffs," in *IEEE GLOBECOM*, Dec. 2011 (36.6% acceptance rate).
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- C31 Mung Chiang, Prashanth Hande, Hongseok Kim, **Sangtae Ha**, and Robert Calderbank, "Pricing Broadband: Survey and Open Problems," in *International Conference on Ubiquitous and Future Networks*, pp. 303–308, June 2010.

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- C33 Han Cai, Do Young Eun, **Sangtae Ha**, Injong Rhee, and Lisong Xu, "Stochastic Ordering for Internet Congestion Control and its Applications," in *Proceedings of the IEEE INFOCOM*, pp. 910–918, Anchorage, Alaska, May 2007 (18% acceptance rate).

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- 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," *International Workshop on Serverless Computing (WoSC)*, San Francisco, CA, 2018 (20% acceptance rate).
- 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 Billingham, "Automatically Freezing Live Video for Annotation during Video Conferencing," *Work In Progress, ACM CHI*, 2015.
- WS5 Ming-Jye Sheng, Carlee Joe-Wong, **Sangtae Ha**, Felix Ming Fai Wong and Soumya Sen, "Smart Data Pricing: Lesson from Trial Planning," *IEEE INFOCOM Workshop - Smart Data Pricing (in conjunction with IEEE INFOCOM)*, 2013.
- 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)*, 2012.
- WS7 Yaogong Wang, Injong Rhee, and **Sangtae Ha**, "Augment SCTP Multi-Streaming with Pluggable Scheduling," *INFOCOM Workshops (Global Internet)*, 2011.
- 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.
- 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.
- 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.

Demo and Posters

- D1 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.
- D2 **Sangtae Ha**, Soumya Sen, Carlee Joe-Wong, and Mung Chiang, "DataMi," *NYC Media Lab Research Summit*, Sept., 2012.
- D3 **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.
- D4 **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*

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- D6 **Sangtae Ha** and Soumya Sen, "Princeton TUBE trials: Discussions with US ISPs," *Demo and Poster, NECA (National Exchange Carrier Association) EXPO*, Chicago, Sept., 2011.
- D7 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.
- D8 Ajit Warriar, **Sangtae Ha**, Prashant Wason, and Injong Rhee, "DiffQ: Differential Backlog Congestion Control for Multi-hop Wireless Networks," *Demo, SECON*, 2008.
- D9 **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.

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- 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.
- 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.
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- P1 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 (granted).
- P2 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 (granted)
- P3 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 (granted).
- P4 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 (granted).
- P5 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 (granted).
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- P7 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 (granted).

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- PP1 Jin-Sung Lee, Young-Bin Im, **Sangtae Ha**, Sang-Joon Moon, Jung-Shin Park, Ji-Chul Lee, and Ju-Hyung Lee, Method and Apparatus for Controlling Send Buffer of Transport Control Protocol in Communication System, filed, 2017.
- PP2 **Sangtae Ha**, Youngbin Im, and Samsung Electronics, Low-Latency TCP through Send Buffer Control, Patent filed, South Korea, 2016.
- PP3 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.
- PP4 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.
- PP5 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.
- PP6 Mung Chiang, **Sangtae Ha**, Carlee Joe-Wong, Jagan Shantigram and Wim Sweldens, System and Method for Scheduling Mobile Data during a Spectrum Valley, U.S. Patent Application #14/575550, filed Dec. 2014.
- PP7 Mung Chiang, **Sangtae Ha**, Soumya Sen and Carlee Joe-Wong, System and Method for Variable Pricing of Data Usage, U.S. Patent Application #13/916525, filed June 2013.
- PP8 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.
- PP9 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.

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- 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.
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- 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 Research Challenges in Fog Networking, *NSF WiFiUS Meeting*, Helsinki, Finland, Aug., 2016.
- PT2 T-Chain: A General Incentive Scheme for Cooperative Computing, *IEEE ICDCS*, Columbus, Ohio, Jun., 2015.
- PT3 TUBE: Time Dependent Pricing for Mobile Data, *ACM SIGCOMM*, Helsinki, Finland, Aug., 2012.
- PT4 Pricing Broadband Access, *ICUFN*, Jeju, Korea, June, 2010.
- PT5 Hybrid Slow Start for High-Bandwidth and Long-Distance Networks, *PFLDNeT*, UK, Mar., 2008
- PT6 Stochastic Ordering for Internet Congestion Control, *PFLDNeT*, ISI, Marina Del Rey, Feb., 2007

Invited Seminars/Lectures

- T1 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.
- T2 LTE Networks: Performance and Security, *Invited Talk, Yonsei University*, South Korea, June 18, 2019.
- T3 LTE Networks: Performance and Security, *Invited Talk, The 9th International Workshop on Cyber-Physical Systems (IWCPS 2019)*, DGIST, South Korea, June 13, 2019.
- T4 LTE Networks: Performance and Security, *Invited Talk, Kyung Hee University*, South Korea, June 13, 2019.
- T5 LTE Networks: Performance and Security, *Invited Talk, UNIST*, South Korea, June 14, 2019.
- T6 Combating Internet Latency in the Age of Fog and Cloud Computing, *Invited Talk, UNIST*, Ulsan, Korea, Dec. 14, 2018.
- T7 Bridging Theory and Practice: Towards More Accurate Wireless Sensing for Neural Devices, *Invited Talk, KAIST*, Daejeon, Korea, Aug. 6, 2018.
- T8 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Computer Science Colloquium, Colorado School of Mines*, Golden, Colorado, Nov. 16, 2017.
- T9 Linux CUBIC: From Idea to Actual Deployment, *Invited Speaker, Samsung Research America*, Richardson, Texas, Nov. 3, 2017.
- T10 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Computer Science Colloquium, POSTECH*, Pohang, Korea, Oct. 20, 2017.
- T11 Calibrating Time-variant, Device-specific Phase Noise for COTS WiFi Devices, *Invited Speaker, The 8th International Conference on ICT Convergence (ICTC)*, Oct. 19, 2017.
- T12 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Invited Speaker, ETRI Seminar*, Oct. 17, 2017.
- T13 Combating Internet Latency in the Age of Fog and Cloud Computing, *Invited Speaker, Samsung Electronics*, Suwon, Korea, Oct. 16, 2017.
- T14 Bridging Theory and Practice: Towards More Accurate Wireless Sensing, *Invited Speaker, Hanyang University (ERICA)*, Korea, Oct. 16, 2017.
- T15 Combating Internet Latency in the Age of Fog and Cloud Computing, *Computer Science Colloquium, University of Colorado Boulder*, Sep. 28, 2017.
- T16 Fog Networking for IoT: Empowering End-User Devices, *Distinguished Speaker, ETRI Seminar*, Daejeon, Korea, Feb., 2016.
- T17 T-Chain: A General Incentive Scheme for Cooperative Computing, *Distinguished Speaker, ETRI Semi-*

nar, Daejeon, Korea, Feb., 2016.

- T18 Fog Networking for IoT: Empowering End-User Devices, *Distinguished Speaker, IoT World Forum Research and Innovation Forum, Hosted by Cisco, Dubai, Dec., 2015.*
- T19 Fog Networking: Architecture, Algorithms, and Applications, *Invited Speaker, Asia-US Forum on Fog Networking for 5G and IoT 2015, Taipei, Taiwan, Sep., 2015.*
- T20 Challenges in Internet of Things, *IEEE SECON Workshop on Fog Networking for 5G and IoT, Seattle, Washington, Jun., 2015.*
- T21 CYRUS: Towards Client-Defined Cloud Storage, *ETRI Invited Seminar, Daejeon, Korea, Apr., 2015.*
- T22 Improving TCP Congestion Control for High Bandwidth and Long Distance Networks, *ITP Seminar, University of Colorado Boulder, Nov., 2014.*
- T23 Smart Data Pricing: From Theory to Practical Deployment, *Computer Science Seminar Talk, University of Colorado Boulder, May, 2014.*
- T24 CUBIC: Algorithm to Practical Deployment, *IT Convergence Division, POSTECH, Korea, Dec., 2012.*
- T25 CUBIC: Algorithm to Practical Deployment, *Guest Lecturer, ELE 381, Princeton University, Nov., 2012.*
- T26 TUBE: Time Dependent Pricing for Mobile Data - From Economic Theory to Trial Deployment, *Invited Speaker, Industry (Samsung, ETRI, Korea Telecom), Korea, Dec., 2012.*
- T27 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.*
- T28 Better Energy-Delay Tradeoff via Server Resource Pooling, *Invited Speaker, ICNC, Hawaii, Feb., 2012.*
- T29 TUBE – Pricing (Mobile Data) by Timing, *CTIF/Aalborg University Meeting, Princeton Univ., April, 2011*
- T30 TUBE – Pricing (Mobile Data) by Timing, *Princeton EDGE Lab Open House, Princeton Univ., April, 2011*
- T31 TUBE – Pricing (Mobile Data) by Timing, *Guest Lecture, Princeton University, March, 2011*
- T32 TUBE – Pricing (Mobile Data) by Timing, *Vodafone Wireless Innovation Competition, March, 2011*
- T33 Research Vision on Video-Aware Wireless Networks, *Intel VAWN Workshop, CA, Apr., 2010.*
- T34 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.*