

Carlee Joe-Wong

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Education

Ph.D. Applied and Computational Mathematics, Princeton University 2016
M.A. Applied and Computational Mathematics, Princeton University 2013
A.B. Mathematics, Princeton University (*magna cum laude*) 2011
Certificate in Applied and Computational Mathematics
Phi Beta Kappa Society

Professional Experience

Assistant Professor of Electrical and Computer Engineering 2016–present
Carnegie Mellon University
Co-Founder and Director of Research (2013–2014) 2012
DataMi, named a startup-to-watch by Forbes in 2014.

Honors and Awards

NSF CAREER Award 2018
Porter Ogden Jacobus Fellowship 2015–2016
The fellowship, awarded to four students each year, is the highest honor awarded by the Graduate School at Princeton.
INFORMS ISS Design Science Award 2014
For my research on smart data pricing.
Artiman B.E.T.A. member 2014
I was one of 12 students invited to join the B.E.T.A. (Biology, Economics, Technology, Arts) network, which recognizes student innovators who have the potential to become entrepreneurs and founders.
IEEE INFOCOM Best Paper Award 2012
Multi-Resource Allocation: Fairness-Efficiency Tradeoffs in a Unifying Framework
National Defense Science and Engineering Graduate Fellowship (NDSEG) 2011 – 2013
National Science Foundation Graduate Fellowship (declined to accept NDSEG) 2011
Princeton Graduate School Centennial Fellowship 2011-2016
George B. Wood Legacy Junior Prize for the Class of 2011 2010
The prize, awarded annually to two students at the beginning of their senior year, recognizes an exceptional academic record as a junior at Princeton University.

Teaching Experience

Mathematical Foundations of Electrical Engineering , CMU	Spring 2018
Sophomore-level required undergraduate course, co-taught with Soumya Kar.	
Wireless Networks and Mobile Systems: DARPA Spectrum Grand Challenge Edition and Foundations of Cloud and Machine Learning Infrastructure , CMU	Fall 2017
Guest lectures in both courses on my network economics and cloud pricing research.	
Network Economics and Resource Allocation , CMU	Fall 2016, 2017
Ph.D.-level seminar course that I taught and developed.	
Networks: Friends, Money, and Bytes , Princeton University	Fall 2014
Assistant in Instruction for Prof. Mung Chiang.	
Mathematical Neuroscience , Princeton University	Fall 2012
Assistant in Instruction for Prof. Phil Holmes.	
Numerical Methods , Princeton University	Fall 2012
Assistant in Instruction for Prof. Bart Vandereycken.	

Mentoring Experience

Postdoctoral Scholars

Xiaoxi Zhang CMU, 2017–

Ph.D. Students

Hsu-Chieh Hu (Thesis Committee Member)	CMU ECE, 2018
Rusheng Zhang (Thesis Committee Member)	CMU ECE, 2018
Nandi Zhang (Thesis Committee Member)	CMU EPP, 2018
Jinhang Zuo	CMU ECE, 2017–
Yichen (Ethan) Ruan	CMU ECE, 2018–
Yuxuan Jiang	CMU, visiting from HKUST, 2017–2018
Xiaoli Wang (Thesis Reader)	Princeton University, 2017

I have also worked with several other Ph.D. students at CMU, most notably Xinlei Chen, Madhumitha Harishankar, Abhinav Jauhri, Carlos Ruiz Dominguez, and Susu Xu.

M.S. Students

Serhan Oztekin (Independent Research)	CMU, Spring 2018
Chenxi Wang (Independent Research)	CMU, Fall 2017
Haoxiang Gao (Independent Research)	CMU, Spring/Fall 2017
Yao Cai (Independent Research)	CMU, Spring 2017
Jie Chen (Independent Research)	CMU, Spring 2017
Vaishnavi Ramesh Jayaraman (Independent Research)	CMU, Spring 2017
Takuma Oda (Independent Research)	CMU, Spring 2017
Nagarjun Srinivasan (Independent Research)	CMU, Spring 2017
Bingzhang Wu (Independent Research)	CMU, Spring 2017

Publications

Books and Book Chapters

Y. Ruan, L. Zheng, M. Gorlatova, M. Chiang and **C. Joe-Wong**, The Economics of Fog Computing: Pricing Tradeoffs for Data Analytics, to appear in *Fog and Fogonomics: Challenges and Practices of Fog Computing, Networking, Strategy and Economics*, Wiley, 2018.

J. Chung, **C. Joe-Wong** and S. 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, 2018.

C. Joe-Wong, L. Zheng and J. Chen, Oligopoly Pricing, to appear in the *Encyclopedia for Wireless Networks*, Springer, 2018.

C. Joe-Wong, L. Zheng, S. Ha, S. Sen, C. W. Tan and M. Chiang, Smart Data Pricing in 5G Systems, in *Key Technologies for 5G Wireless Systems*, Cambridge University Press, 2017.

C. Joe-Wong, S. Ha, Z. Liu, F. M. F. Wong and M. Chiang, Mind Your Own Bandwidth, in *Fog for 5G and IoT*, Wiley, 2017.

S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, Human Factors in Smart Data Pricing, in *Smart Data Pricing*, Wiley, 2014.

S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, eds., *Smart Data Pricing*, Wiley, 2014.

S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, Smart Data Pricing (SDP): Economic Solutions to Network Congestion, in *SIGCOMM eBook on Recent Advances in Networking*, Volume 1, 2013.

Journal Articles

C. Ruiz, S. Pan, A. Bannis, X. Chen, **C. Joe-Wong**, H. Y. Noh and P. Zhang, IDrone: Robust Drone Identification through Motion Actuation Feedback, accepted to *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)*, formerly *ACM UbiComp*, 2018.

C. Joe-Wong and S. Sen, Harnessing the Power of the Cloud: Revenue, Fairness, and Cloud Neutrality, accepted to the *Journal of Management and Information Systems*, March 2018.

C. Joe-Wong, S. Sen and S. Ha, Sponsoring Mobile Data: Analyzing the Impact on Internet Stakeholders, *IEEE/ACM Transactions on Networking*, May 2018.

L. Zheng, **C. Joe-Wong**, C. W. Tan, S. Ha and M. Chiang, Customized Data Plans for Mobile Users: Feasibility and Benefits of Data Trading, *IEEE Journal of Selected Areas in Communications*, May 2017.

K. Shin, **C. Joe-Wong**, S. Ha, Y. Yi, I. Rhee and D. Reeves, T-Chain: A General Incentive Scheme for Cooperative Computing, *IEEE/ACM Transactions on Networking*, April 2017.

T.-Y. Yang, C. G. Brinton, **C. Joe-Wong** and M. Chiang, Behavior-Based Grade Prediction for MOOCs via Time Series Neural Networks, accepted in *IEEE Journal of Special Topics in Signal Processing*, March 2017.

Y. Im, **C. Joe-Wong**, S. Ha, S. Sen, T. Kwon and M. Chiang, AMUSE: Empowering Users for Cost-Aware Offloading with Throughput-Delay Tradeoffs, *IEEE Transactions on Mobile Computing*, May 2016.

S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, Smart Data Pricing: Using Economics to Manage Network Congestion, *Communications of the ACM*, December 2015.

- C. Joe-Wong**, I. Kamitsos and S. Ha, Inter-Datacenter Job Routing and Scheduling with Variable Costs and Deadlines, *IEEE Transactions on Smart Grid*, November 2015.
- C. Joe-Wong**, T.-S. Ho and H. Rabitz, On Choosing the Form of the Objective Functional for Optimal Control of Molecules, *Journal of Mathematical Chemistry*, September 2015 (letter to the editor).
- C. Joe-Wong**, T.-S. Ho, H. Rabitz and R. Wu, Topology of Classical Molecular Optimal Control Landscapes for Multi-Target Objectives, *Journal of Chemical Physics*, April 2015.
- C. Joe-Wong**, S. Sen and S. Ha, Offering Supplementary Network Technologies: Adoption Behavior and Offloading Benefits, *IEEE/ACM Transactions on Networking*, April 2015.
- S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, Pricing Data: A Look at Past Proposals, Current Plans, and Future Trends, *ACM Computing Surveys*, February 2014.
- C. Joe-Wong**, S. Sen, T. Lan and M. Chiang, Multi-Resource Allocation: Fairness-Efficiency Tradeoffs in a Unifying Framework, *IEEE/ACM Transactions on Networking*, December 2013.
- C. Joe-Wong**, T.-S. Ho, R. Long, H. Rabitz and R. Wu, Topology of Classical Molecular Optimal Control Landscapes in Phase Space, *Journal of Chemical Physics*, March 2013.
- A. M. S. Palanca, S.-L. Lee, L. E. Yee, **C. Joe-Wong**, L. A. Trinh, E. Hiroyasu, M. Husain, S. E. Fraser, M. Pellegrini and A. Sagasti, New Transgenic Reporters Identify Somatosensory Neuron Subtypes in Larval Zebrafish, *Developmental Neurobiology*, February 2013.
- S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, Incentivizing Time-Shifting of Data: A Survey of Time-Dependent Pricing for Internet Access, *IEEE Communications Magazine*, November 2012.
- C. Joe-Wong**, S. Sen, S. Ha and M. Chiang, Optimized Day-Ahead Pricing for the Smart Grid with Device-Specific Scheduling Flexibility, *IEEE Journal on Selected Areas in Communications*, July 2012.

Conference Papers

- W. Chen, **C. Joe-Wong**, C. G. Brinton, L. Zheng and D. Cao, Principles of Assessing Adaptive Online Courses, accepted to *Educational Data Mining 2018*.
- M. Harishankar*, N. Srinivasan*, **C. Joe-Wong** and P. Tague, To Accept or Not to Accept: The Question of Supplemental Discount Offers in Mobile Data Plans, *IEEE INFOCOM 2018*.
- *These authors contributed equally to the paper.
- M. Khodak, L. Zheng, A. S. Lan, **C. Joe-Wong** and M. Chiang, Learning Cloud Dynamics to Optimize Spot Instance Bidding Strategies, *IEEE INFOCOM 2018*.
- T. Oda and **C. Joe-Wong**, MOVI: A Model-Free Approach to Dynamic Fleet Management, *IEEE INFOCOM 2018*.
- T.-Y. Yang, C. G. Brinton and **C. Joe-Wong**, Predicting Learner Interactions in Social Learning Networks, *IEEE INFOCOM 2018*.
- L. Zheng, **C. Joe-Wong**, M. Andrews and M. Chiang, Optimizing Data Plans: Usage Dynamics in Mobile Data Networks, *IEEE INFOCOM 2018*.
- L. Zheng, J. Chen, **C. Joe-Wong**, C. W. Tan and M. Chiang, An Economic Analysis of Wireless Network Infrastructure Sharing, *WiOpt 2017*.
- E. Aryafar, A. Keshavarz-Haddad, **C. Joe-Wong** and M. Chiang, Max-Min Fair Resource Allocation in HetNets: Distributed Algorithms and Hybrid Architecture, *IEEE ICDCS 2017*.

- Y. Im, J. Han, J. H. Lee, Y. Kwon, **C. Joe-Wong**, T. Kwon and S. Ha, FLARE: Coordinated Rate Adaptation for HTTP Adaptive Streaming in Cellular Networks, *IEEE ICDCS 2017*.
- Z. Huang, M. Weinberg, L. Zheng, **C. Joe-Wong** and M. Chiang, Discovering Valuations and Enforcing Truthfulness in a Deadline-Aware Scheduler, *IEEE INFOCOM 2017*.
- P. Rahimzadeh, **C. Joe-Wong**, K. Shin, Y. Im, J. Lee and S. Ha, SVC-TChain: Incentivizing Good Behavior in Layered P2P Video Streaming, *IEEE INFOCOM 2017*.
- L. Zheng, **C. Joe-Wong**, J. Chen, C. G. Brinton, C. W. Tan and M. Chiang, Economic Viability of a Virtual ISP, *IEEE INFOCOM 2017*.
- C. Joe-Wong**, Y. Im, K. Shin and S. Ha, A Performance Analysis of Incentive Mechanisms for Cooperative Computing, *IEEE ICDCS 2016*.
- L. Zheng, **C. Joe-Wong**, C. Brinton, C. W. Tan, S. Ha and M. Chiang, On the Viability of a Cloud Virtual Service Provider, *ACM SIGMETRICS 2016*.
- L. Zheng, **C. Joe-Wong**, C. W. Tan, M. Chiang and X. Wang, How to Bid the Cloud, *ACM SIGCOMM 2015*.
- K. Shin, **C. Joe-Wong**, S. Ha, Y. Yi, I. Rhee and D. Reeves, T-Chain: A General Incentive Scheme for Cooperative Computing, *IEEE ICDCS 2015*.
- F. M. F. Wong, **C. Joe-Wong**, S. Ha, Z. Liu and M. Chiang, Improving User QoE for Residential Broadband: Adaptive Traffic Management at the Network Edge, *IEEE/ACM IWQoS 2015*.
- C. Joe-Wong**, S. Ha and M. Chiang, Sponsoring Mobile Data: An Economic Analysis of the Impact on Users and Content Providers, *IEEE INFOCOM 2015*.
- L. Zheng, **C. Joe-Wong**, C. W. Tan, S. Ha and M. Chiang, Secondary Markets for Mobile Data: Feasibility and Benefits of Traded Data Plans, *IEEE INFOCOM 2015*.
- J. Chung, **C. Joe-Wong**, S. Ha, J. W.-K. Hong and M. Chiang, CYRUS: Towards Client-Defined Cloud Storage, *EuroSys 2015*.
- C. Joe-Wong**, S. Sen, S. Ha and M. Chiang, Do Mobile Data Plans Affect Usage? Results from a Pricing Trial with ISP Customers, *PAM 2015*.
- S. Sen, **C. Joe-Wong**, S. Ha, J. Bawa and M. Chiang, When the Price Is Right: Enabling Time-Dependent Pricing of Broadband Data, *ACM SIGCHI 2013*.
- C. Joe-Wong**, S. Sen and S. Ha, Offering Supplementary Wireless Technologies: Adoption Behavior and Offloading Benefits, *IEEE INFOCOM 2013*.
- Y. Im, **C. Joe-Wong**, S. Ha, S. Sen, T. Kwon and M. Chiang, AMUSE: Empowering Users for Cost-Aware Offloading with Throughput-Delay Tradeoffs, *IEEE INFOCOM 2013* (mini-conference).
- S. Ha, S. Sen, **C. Joe-Wong**, Y. Im and M. Chiang, TUBE: Time-Dependent Pricing for Mobile Data, *ACM SIGCOMM 2012*.
- C. Joe-Wong**, S. Sen, T. Lan and M. Chiang, Multi-Resource Allocation: Fairness-Efficiency Tradeoffs in a Unifying Framework, *IEEE INFOCOM 2012*.
- S. Ha, **C. Joe-Wong**, S. Sen and M. Chiang, Pricing by Timing: Innovating Broadband Data Plans, *SPIE-OPTO Broadband 2012* (invited paper).
- C. Joe-Wong**, S. Ha and M. Chiang, Time-Dependent Broadband Pricing: Feasibility and Benefits, *IEEE ICDCS 2011*.

Workshop Papers, Demos, and Posters

A. Jauhri, **C. Joe-Wong** and J. P. Shen, On the Real-Time Vehicle Placement Problem, *Workshop on Machine Learning for Intelligent Transportation Systems 2017*.

S. Sen, **C. Joe-Wong**, S. Ha and M. Chiang, Time-Dependent Pricing in Mobile Data Plans: Results from a Field Deployment in Alaska, *WITS (Workshop on Internet Technologies and Systems) 2016*.

Y. Wang, **C. Joe-Wong** and S. Sen, Congestion Externalities, Content Exclusivity, and Internet Fragmentation, *WITS (Workshop on Internet Technologies and Systems) 2016* (poster).

L. Zheng and **C. Joe-Wong**, Understanding Rollover Data, *Smart Data Pricing Workshop 2016*.

C. Joe-Wong and S. Sen, Pricing the Cloud: Resource Allocations, Fairness, and Revenue, *WITS (Workshop on Internet Technologies and Systems) 2013*.

M.-J. Sheng, **C. Joe-Wong**, S. Ha, F. M. F. Wong and S. Sen, Smart Data Pricing: Lessons from Trial Planning, *Smart Data Pricing Workshop 2013*.

S. Sen, **C. Joe-Wong** and S. Ha, Economics of Shared Data Plans, *WITS 2012*.

S. Ha, S. Sen, **C. Joe-Wong**, R. Rill and M. Chiang, Demo: Enabling Mobile Time-Dependent Pricing, *ACM MobiSys 2012*.

S. Ha, S. Sen, **C. Joe-Wong**, J. Mifkovich, R. Rill, Y. Im, D. Butnariu, J. Bawa and M. Chiang, Demo: Pricing by Timing for Mobile Data, *IEEE INFOCOM 2012*.

C. Joe-Wong, S. Ha, S. Sen and M. Chiang, TUBE: Pricing by Timing, poster session at New York Computer Science and Economics Day, September 2011.

S. Ha, S. Sen, **C. Joe-Wong** and M. Chiang, TUBE Trials: Pricing by Timing, NECA (National Exchange Carrier Association) EXPO 2011.

C. Joe-Wong, S. Ha and M. Chiang, Time-Dependent Broadband Pricing, *ITA (Information Theory and Applications) Workshop 2011*.

Patents

M. Chiang, S. Ha, S. Sen and **C. Joe-Wong**, System and Method for Variable Pricing of Data Usage, U.S. Patent #9865009, January 2018.

M. Chiang, S. Ha, **C. Joe-Wong**, J. Shantigram and W. Sweldens, System and Method for Scheduling Mobile Data during a Spectrum Valley, U.S. Patent #9820291, November 2017.

J. Shantigram, M. Shi, **C. Joe-Wong** and S. Ha, System and Method for Coordinating Client-side Inference of Mobile Network Loading and Capacity, U.S. Patent #9794155, October 2017.

M. Chiang, S. Ha, **C. Joe-Wong**, H. S. Saluja, J. Shantigram and W. Sweldens, Client-Side Inference of Wireless Network States, U.S. Patent #9407508, August 2016.

Academic Service

TPC member: ACM SIGMETRICS 2018, IEEE INFOCOM 2018–2019, ACM MobiHoc 2017–2018, NetEcon 2017–2018, ITC29, Fog World Congress 2017, IEEE INFOCOM Workshops on Smart Data Pricing 2013–16

Organizing Committee: Smart Data Pricing Forum, University of Minnesota 2018

Tutorial Chair: IEEE WiOpt 2018

Student Activities Chair: ACM SIGMETRICS, ACM MOBICOM 2018

Co-Chair: Sixth Workshop on Smart Data Pricing (with IEEE INFOCOM) 2017

Web Chair: Fog World Congress 2017

Co-Chair: Wireless of the Students, by the Students, and for the Students (S³) Workshop 2014
Co-located with ACM MobiCom.

Reviewer for: IEEE/ACM Transactions on Networking, IEEE Journal on Selected Areas in Communications, IEEE Transactions on Information Theory, ACM Transactions on Modeling and Performance Evaluation of Computing Systems, ACM Transactions on Internet Technology, IEEE Transactions on Mobile Computing, IEEE Transactions on Smart Grid, IEEE Transactions on Automatic Control, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Communications, IEEE Network, IEEE Communications Letters, IEEE Transactions on Wireless Communications.

Outreach Activities

SDP Girls (<https://sdpgirls.wordpress.com/>) 2017–
Online blog about smart data pricing, research in computer networks, and being a woman in STEM. Co-founded with Jiasi Chen and Liang Zheng.

Panelist for the NCWIT Aspirations in Computing Award Ceremony 2018

N2Women Mentor at IEEE INFOCOM 2018

Smart Data Pricing 2017

Research@CMU (Professional development program for area educators)

The Economics of Energy Choices 2017

Summer Engineering Experience (SEE) for Girls, CMU College of Engineering

Judge for CMU ECE's Grace Hopper Conference Scholarships 2017–2018

Junior Faculty Panel 2016

Rising Stars in EECS Workshop, hosted by CMU

Smart Data Pricing: From Mathematical Theory to a Startup Company 2016

Program for Women and Mathematics, Institute for Advanced Study and Princeton University

Invited Talks and Panels

Learning to Compete in Networked Systems	2018
University of California, Riverside	
Smart Data Pricing: Creating Incentives for Better Quality-of-Experience	2017
Samsung Research America	
Network Optimization in Urban Environments: Smart Grids and Taxis	2017
Carnegie Mellon University (Civil and Environmental Engineering)	
Letting Go of Network Neutrality: Some Implications for Internet Stakeholders	2017
University of California, Berkeley	
Applied and Cognitive Symposium: Human Usage of the Worldwide Web	2017
Eastern Psychological Association Annual Meeting	
The Demand Side of Network Management: Using Incentives to Alleviate Network Congestion	2017
Intel Corporation, BAE Systems	
Using Pricing to Manage the Cloud	2017
Johns Hopkins University, California Institute of Technology, Yelp Inc., Microsoft Research, IBM T.J. Watson Research Center	
Smart Data Pricing: Incentives in Network Resource Allocation	2016
ECE Department Seminar, Carnegie Mellon University	
Understanding Fairness in Multi-Resource Allocation	2016
University of Pennsylvania (Wharton); Cornell University; Stanford Graduate School of Business	
Smart Data Pricing	2015, 2016
Purdue University; University of Waterloo; Johns Hopkins University; Georgia Institute of Technology; University of California, San Diego; Carnegie Mellon University; Massachusetts Institute of Technology; Duke University; University of Pennsylvania; Rice University; Arizona State University; University of Illinois, Urbana-Champaign; University of Southern California	
Optimal Control Landscapes for Molecules Described by Classical Mechanics	2015
Multidisciplinary Research Seminar, Princeton University	
An Economic Look at Sponsoring and Trading Mobile Data	2015
Alcatel-Lucent Bell Labs	
Valuation for High-Tech Startups Panel	2015
Princeton University Keller Center	
Sponsored Data and Net Neutrality	2015
Chinese University of Hong Kong Workshop on Network Optimization and Economics	
Whom to Charge: Open Toll-free and Zero-rating	2015
SDP Industry Forum Panel, Princeton, NJ, USA	

- Multi-Resource Allocation: Fairness, Efficiency, and Applications** 2015
Korea Advanced Institute of Science and Technology; Cornell University; University of California, Los Angeles; University of Southern California; California Institute of Technology
- Industry-Academia Panel** at the Third International Workshop on Smart Data Pricing 2014
- Smart Data Pricing** 2012
Time Warner Cable/NYC Media Labs Research Summit
- Pricing Complementary Wireless Technologies** 2012
PACM Graduate Student Seminar, Princeton University
- Multi-Resource Allocation: Fairness-Efficiency Tradeoffs in a Unifying Framework** 2012
NEC Labs; Applied Communication Sciences; Princeton University
- TUBE: Pricing by Timing** 2011
Princeton University Keller Center Innovation Forum

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<http://www.andrew.cmu.edu/user/cjoewong/CV.pdf>