

Tingjun Chen

Department of Electrical Engineering, Columbia University
801 CEPSR, 530 West 120 Street • New York, NY 10027 • +1 (917) 913-4849
Email: tingjun@ee.columbia.edu • Website: <http://www.columbia.edu/~tc2668>

RESEARCH INTERESTS

Internet-of-Things, energy harvesting networks, full-duplex networks, massive antenna systems, optical-wireless networks, and 5G networks: Physical layer and MAC layer algorithms, optimization, system design and implementation.

EDUCATION

Columbia University New York, NY
Ph.D. Candidate in Electrical Engineering, Cumulative GPA: 4.13/4.00 2014 - Present
Advisor: Prof. Gil Zussman
Wei Family Private Foundation Fellow (2014 - 2017)
M.Phil. in Electrical Engineering 2018
M.S. in Electrical Engineering, Final GPA: 4.13/4.00 2015
Edwin Howard Armstrong Memorial Award (2015)

Tsinghua University Beijing, China
B.Eng. in Electronic Engineering 2010 - 2014
Advisors: Prof. Zhisheng Niu and Prof. Sheng Zhou
Thesis: Power Control Policies for a Wireless Link with Energy Harvesting Transmitter and Receiver
Tsinghua University Outstanding Undergraduate Thesis Award

WORKING EXPERIENCE

Nokia Bell Labs Crawford Hill, NJ
Research Intern, Wireless Access Lab Summer 2018
Supervisors: Dr. Dmitry Chizhik and Dr. Jinfeng Du

HONORS AND AWARDS

- The 6th Heidelberg Laureate Forum Participant, 2018
Only 200 young researchers were selected from worldwide
- **Oscar and Verna Byron Fellowship**, Columbia Engineering, 2018
Selected based on academic achievement and clear potential for future success
- Millman Award for Outstanding Teaching Assistant, Columbia University EE Dept., 2018
- Qualcomm Innovation Fellowship Finalist, 2017
- National Instruments Academic Research Grant, 2017
- **ACM CoNEXT Best Paper Award**, 2016
- Honorable Mention Award, demo at the NYC Media Lab's Annual Summit, 2016
Selected from about 140 presented demos
- **Edwin Howard Armstrong Memorial Award**, Columbia University EE Dept., 2015
Awarded to one outstanding M.S. candidate, the highest recognition awarded by the department to an M.S. student
- **Wei Family Private Foundation Fellowship**, 2014 - 2017
Three-year fellowship granted to students of Chinese heritage. Only three fellowships were awarded in 2014 - 2017
- Outstanding Undergraduate Thesis Award, Tsinghua University, 2014
- Tsinghua Scholarship for Academic Advancement, 2013
- Tsinghua Scholarship for Literature and Art Excellence, 2012

PUBLICATIONS

Conference Proceedings

- **T. Chen**, J. Diakonikolas, J. Ghaderi, and G. Zussman, "Hybrid Scheduling in Heterogeneous Half- and Full-Duplex Wireless Networks," in *Proc. IEEE INFOCOM'18*, 2018. (acceptance rate: 19.1%)
- **T. Chen**, J. Diakonikolas, J. Ghaderi, and G. Zussman, "Fairness and Delay in Heterogeneous Half- and Full-Duplex Wireless Networks," in *Asilomar Conference on Signals, Systems, and Computers (to appear)*, 2018. **Invited Paper**
- M. Baraani Dastjerdi, N. Reiskarimian, **T. Chen**, G. Zussman, and H. Krishnaswamy, "Full Duplex Circulator-Receiver Phased Array Employing Self-Interference Cancellation via Beamforming," in *Proc. IEEE RFIC Symposium*, 2018.
- M. Baraani Dastjerdi, **T. Chen**, N. Reiskarimian, G. Zussman, and H. Krishnaswamy, "Self-Interference Cancellation via Beamforming in an Integrated Full Duplex Circulator-Receiver Phased Array," in *Proc. IEEE SPCOM'18 (to appear)*, 2018. **Invited Paper**
- **T. Chen**, J. Ghaderi, D. Rubenstein, and G. Zussman, "Performance Evaluation of Energy-Constrained Broadcast (EconCast) in Wireless Networks," in *Proc. IEEE WCNC'17 Workshop on Energy Harvesting and Remotely Powered Wireless Communications for the IoT*, 2017. **Invited Paper**
- **T. Chen**, J. Ghaderi, D. Rubenstein, and G. Zussman, "Maximizing Broadcast Throughput Under Ultra-Low-Power Constraints," in *Proc. ACM CoNEXT'16*, 2016. (acceptance rate: 17.6%) **Best Paper Award**
- H. Krishnaswamy, G. Zussman, J. Zhou, J. Marasevic, T. Dinc, N. Reiskarimian, and **T. Chen**, "Full-Duplex in a Hand-held Device - From Fundamental Physics to Complex Integrated Circuits, Systems and Networks: An Overview of the Columbia FlexICoN project," in *Asilomar Conference on Signals, Systems, and Computers*, 2016. **Invited Paper**
- J. Marasevic, **T. Chen**, J. Zhou, N. Reiskarimian, H. Krishnaswamy, and G. Zussman, "Full-Duplex Wireless: Algorithms and Rate Improvement Bounds for Integrated Circuit Implementations," in *Proc. ACM HotWireless'16*, 2016. **Invited Paper**
- R. Margolies, G. Grebla, **T. Chen**, D. Rubenstein, and G. Zussman, "Panda: Neighbor Discovery on a Power Harvesting Budget," in *Proc. IEEE INFOCOM'16*, 2016. (acceptance rate: 18.3%)
- **T. Chen**, S. Zhou, W. Chen, and Z. Niu, "Power Control Policies for a Wireless Link with Energy Harvesting Transmitter and Receiver," in *Proc. IEEE WiOpt'14*, 2014. (acceptance rate: 28.7%)

Journal Publications

- **T. Chen**, J. Ghaderi, D. Rubenstein, and G. Zussman, "Maximizing Broadcast Throughput Under Ultra-Low-Power Constraints," *IEEE/ACM Transactions on Networking*, vol. 26, no. 2, pp. 779-792, Apr. 2018.
- N. Reiskarimian, T. Dinc, J. Zhou, **T. Chen**, M. Baraani Dastjerdi, J. Diakonikolas, G. Zussman, and H. Krishnaswamy, "A One-Way Ramp to a Two-Way Highway: Integrated Magnetic-Free Non-Reciprocal Antenna Interfaces for Full Duplex Wireless," *IEEE Microwave Magazine (to appear)*, 2017. **Invited Paper**
- J. Zhou, N. Reiskarimian, J. Marasevic, T. Dinc, **T. Chen**, G. Zussman, and H. Krishnaswamy, "Integrated Full Duplex Radios," *IEEE Communications Magazine*, vol. 55, no. 4, pp. 142-151, Apr. 2017. **Invited Paper**
- R. Margolies, G. Grebla, **T. Chen**, D. Rubenstein, and G. Zussman, "Panda: Neighbor Discovery on a Power Harvesting Budget," *IEEE Journal on Selected Areas in Communications, Series on Green Communications and Networking*, vol. 34, no. 12, pp. 3606-3619, Dec. 2016.
- S. Zhou, **T. Chen**, W. Chen, and Z. Niu, "Outage Minimization for a Fading Wireless Link with Energy Harvesting Transmitter and Receiver," *IEEE Journal on Selected Areas in Communications, Special Issue on Wireless Communications Powered by Energy Harvesting and Wireless Energy Transfer*, vol. 33, no. 3, pp. 496-511, Mar. 2015.

Demonstrations (Peer Reviewed)

- **T. Chen**, M. Baraani Dastjerdi, G. Farkash, J. Zhou, H. Krishnaswamy, and G. Zussman, "Demo Abstract: Open-Access Full-Duplex Wireless in the ORBIT Testbed," in *Proc. IEEE INFOCOM'18*, Honolulu, HI, Apr. 2018.
- **T. Chen**, J. Zhou, M. Baraani Dastjerdi, J. Diakonikolas, H. Krishnaswamy, and G. Zussman, "Demo Abstract: Full-Duplex with a Compact Frequency Domain Equalization-based RF Canceller," in *Proc. IEEE INFOCOM'17*, Atlanta, GA, May 2017.

- **T. Chen**, G. Chen, S. Jain, R. Margolies, G. Grebla, D. Rubenstein, and G. Zussman, “Demo Abstract: Power-Aware Neighbor Discovery for Energy Harvesting Things,” in *Proc. ACM SenSys’16*, Stanford, CA, Nov. 2016.
- **T. Chen**, J. Zhou, N. Grimwood, R. Fogel, J. Marasevic, H. Krishnaswamy, and G. Zussman, “Demo: Full-Duplex Wireless based on a Small-Form-Factor Analog Self-Interference Canceller,” in *Proc. ACM MobiHoc’16*, Paderborn, Germany, July 2016.

Technical Reports

- **T. Chen**, M. Baraani Dastjerdi, J. Zhou, H. Krishnaswamy, and G. Zussman, “Open-Access Full-Duplex Wireless in the ORBIT Testbed,” *arXiv preprint*: 1801.03069v2 [cs.NI], May 2018.
- **T. Chen**, J. Diakonikolas, J. Ghaderi, and G. Zussman, “Hybrid Scheduling in Heterogeneous Half- and Full-Duplex Wireless Networks,” *arXiv preprint*: 1801.01108 [cs.NI], Jan. 2018.
- **T. Chen**, J. Ghaderi, D. Rubenstein, and G. Zussman, “Maximizing Broadcast Throughput Under Ultra-Low-Power Constraints,” *arXiv preprint*: 1610.04203v2 [cs.NI], Apr. 2017.
- R. Margolies, G. Grebla, **T. Chen**, D. Rubenstein, and G. Zussman, “Panda: Neighbor Discovery on a Power Harvesting Budget,” *arXiv preprint*: 1601.06474 [cs.NI], Jan. 2016.
- S. Zhou, **T. Chen**, W. Chen, and Z. Niu, “Outage Minimization for a Fading Wireless Link with Energy Harvesting Transmitter and Receiver,” *arXiv preprint*: 1503.04255 [cs.IT], Mar. 2015.

Patents

- D. Rubenstein, G. Zussman, J. Ghaderi, R. Margolies, **T. Chen**, G. Grebla, “Systems and Methods for Throughput Enhancement Among Ultra-Low power Wireless Network Devices,” *U.S. Patent Application* No.15/211,740, filed July 2016.
- D. Rubenstein, G. Zussman, J. Ghaderi, **T. Chen**, “Systems and Methods for Asynchronous Discovery and Throughput Maximization Among Ultra-Low Power Wireless Networked Devices,” *U.S. Provisional Patent* No.62/288,330, filed Jan. 2016.
- D. Rubenstein, G. Zussman, R. Margolies, **T. Chen**, G. Grebla, “Systems and Methods for Asynchronous Discovery Among Ultra-Low Power Wireless Devices,” *U.S. Provisional Patent* No.62/217,624, filed Sept. 2015.
- D. Rubenstein, G. Zussman, R. Margolies, **T. Chen**, G. Grebla, “Systems and Methods for Asynchronous Discovery Among Ultra-Low Power Wireless Devices,” *U.S. Provisional Patent* No.62/193,501, filed July 2015.

ACADEMIC EXPERIENCE

Research Assistant, Columbia University, New York, NY Sept. 2014 - Present
 Wireless & Mobile Networking (WiMNet) Lab

- Develop PHY layer and MAC layer algorithms for full-duplex networks based on Radio Frequency Integrated Circuit (RFIC) implementation. Design an experimental testbed composed of both single- and multi-antenna full-duplex radio prototypes based on USRP software defined radios. Lead a team of M.S. and undergrad students to fabricate a custom-designed full-duplex testbed. Papers and demonstrations accepted to *IEEE Communications Magazine (invited)*, *IEEE Microwave Magazine (invited)*, *IEEE INFOCOM’18*, *IEEE RFIC Symposium’18*, *ACM HotWireless’16 (invited)*, *Asilomar’16 (invited)*, *IEEE INFOCOM’18 (demo)*, *IEEE INFOCOM’17 (demo)*, and *ACM MobiHoc’16 (demo)*. Gen-1 full-duplex prototype has been deployed at the [ORBIT testbed](#) and is the *world’s first remotely-accessible full-duplex node* that allows research in this area. This work is within the Full-Duplex Wireless: From Integrated Circuits to Networks ([FlexICoN](#)) project and in collaboration with Prof. Harish Krishnaswamy’s group.
- Develop and analyze centralized and distributed algorithms for neighbor discovery and broadcast throughput maximization in ultra-low-power networks, in which devices are powered by energy harvesting. Applications include object tracking, manufacturing, and Internet of Things (IoT). Implement and evaluate algorithms using a testbed composed of light energy harvesting transceivers. Papers and demonstration were published at *ACM CoNEXT’16 (Best Paper Award)*, *IEEE Journal on Selected Areas in Communications*, *IEEE INFOCOM’16*, *IEEE WCNC’17 workshop (invited)*, and *ACM SenSys’16 (demo)*. Three U.S. provisional patents and one U.S. patent were filed. This work is within the Energy Harvesting Active Networked Tags ([EnHANTs](#)) project and in collaboration with Prof. Dan Rubenstein and Prof. Javad Ghaderi.

- Develop and implement an optical-wireless testbed that integrates software defined radios with customizable radio edge-cloud networks using real dark fiber through Manhattan for C-RAN applications. Testbed utilizes optical switching controlled by the software defined networking (SDN) control plane to send radio signals through multi-hop dark fiber network for real-time remote processing. Develop efficient algorithms across various layers of the network stack to optimize the system performance. This work is in collaboration with Prof. Dan Kilper's group at the University of Arizona.

Research Assistant, Tsinghua University, Beijing, China

Mar. 2013 - July 2014

Network Integration for Ubiquitous Linkage and Broadband (NiuLab)

Tsinghua National Laboratory for Information Science and Technology (TNList)

- Designed and analyzed optimal power control policies which minimize the outage probability for a wireless communication link with energy harvesting transmitter and receiver. Papers were published at *IEEE WiOpt'14* and *IEEE Journal on Selected Areas in Communications*.
- Developed a testbed which demonstrates signal splitting schemes in a hyper-cellular network for both GSM and GPRS protocols using USRP2 on OpenBTS platform.

Research Intern, Columbia University, New York, NY

Summer 2013

Wireless & Mobile Networking (WiMNet) Lab

- Developed MSP430 microcontroller-based prototype for the Energy Harvesting Active Networked Tags (**EnHANTs**) project. Implemented serial data forwarding method and data transmission method on an ARM architecture-based Raspberry Pi gateway.

PROFESSIONAL ACTIVITIES

Technical Program Committee (TPC): ACM MobiCom 2016 S³ Workshop

Student Member: ACM SIGMOBILE and IEEE

Journal and Magazine Reviews: IEEE/ACM Transactions on Networking (ToN) 2018, IEEE Communications Magazine 2017, IEEE Communications Letters 2017, IEEE Microwave Magazine 2017, Elsevier Physical Communication 2017, ACM Transactions on Embedded Computing Systems (TECS) 2016, ACM Transactions on Sensor Networks (ToSN) 2015

Conference Review: ACM MobiCom 2016, 2018, ACM MobiHoc 2015, 2016, 2017, 2018, ACM SIGMETRICS 2015, 2016, 2017, 2018, IFIP WD 2016, IEEE ICC 2015, 2016

Volunteer: IFIP Performance 2017, ACM MobiCom 2016, ACM MobiHoc 2015 TPC Meeting, IEEE ICC 2012

Mentoring and Advising: Jackson Welles (EE Undergrad), Jenny Li (Columbia College Undergrad), Guy Farkash (EE M.S.), Fan Yi (Visiting EE undergrad from Shanghai Jiao Tong University, China), Jinhui Song (Visiting EE undergrad from Tsinghua University, China), Aishwarya Rajen (Visiting EE undergrad from Anna University, India), Steven Alfano (EE M.S., **EE Department M.S. Research Award**), Gregory Chen (CS undergrad), Saahil Jain (CS undergrad), Nicole Grimwood (EE undergrad, **EE Department Undergraduate Research Award**), James Thompson (EE undergrad), Rel Fogel (EE M.S.), Rama Kompella (EE M.S.), Alexandre Simoes (Visiting EE undergrad from Universidade de Sao Paulo, Brazil)

Outreach: Science Expo at The School at Columbia University (Apr. 2018), High school outreach at the Manhattan Center for Science and Mathematics (Oct. 2015)

TALKS, DEMOS, AND ADDITIONAL PRESENTATIONS

- "Hybrid Scheduling in Heterogeneous Half- and Full-duplex Wireless Networks," IEEE INFOCOM, Honolulu, HI, Apr. 2018. (talk)
- "Open-Access Full-Duplex Wireless in the ORBIT Testbed," CATT Annual Research Review, NYU, Brooklyn, NY, Apr. 2018. (**invited demo and poster**)
- "Open-Access Full-Duplex Wireless in the ORBIT Testbed," Columbia Data Science Day, Columbia University, New York, NY, Mar. 2018. (demo)
- "Full-Duplex Wireless: A Two-Way Road to 5G," NIWeek Academic Forum, Austin, TX, May 2017. (poster)
- "Full-Duplex MIMO Wireless: From IC Design to Networking," Qualcomm Innovation Fellowship Final's Day, San Diego, CA, Apr. 2017. (talk and poster)

- “Full-Duplex Wireless: A Two-Way Road to 5G,” Columbia Data Science Day, Columbia University, New York, NY, Apr. 2017. (demo)
- “Performance Evaluation of Energy-Constrained Broadcast (EconCast) in Wireless Networks,” IEEE WCNC Workshop on Energy Harvesting and Remotely Powered Wireless Communications for the IoT, San Francisco, CA, Mar. 2017. (**invited paper**)
- “Full-duplex Wireless: Algorithms, Rate Improvement Bounds, and System Implementations,” WINLAB Workshop on Advanced Wireless Experimentation, Rutgers University, North Brunswick, NJ, Mar. 2017 (**invited talk**)
- “Maximizing Broadcast Throughput under Ultra-Low-Power Constraints,” ACM CoNEXT, Irvine, CA, Dec. 2016. (talk)
- “Double-Talk: Full-Duplex Wireless for Next-Generation Communications,” NYC Media Lab’s Annual Summit, Columbia University, New York, NY, Sept. 2016. (demo) **Honorable Mention Award**
- “A Self-Interference-Cancelling Full-Duplex Enabling Next-Generation Wireless Communications,” Columbia Data Science Day, Columbia University, New York, NY, Apr. 2016. (demo)
- “Power Control Policies for a Wireless Link with Energy Harvesting Transmitter and Receiver,” IEEE WiOpt, Hammamet, Tunisia, May 2014. (talk)

TEACHING

Teaching Assistant, Columbia University, New York, NY

- Computer Networks (CSEE S4119), Summer 2018
- Computer Networks (CSEE S4119, Columbia Video Network), Summer 2018
- Large Data Stream Processing (ELEN E6889), Spring 2018
- Wireless & Mobile Networking I (ELEN E6950), Fall 2017
- Wireless & Mobile Networking I (ELEN E6950, Columbia Video Network), Fall 2017
- Computer Networks (CSEE S4119), Summer 2017
- Computer Networks (CSEE S4119, Columbia Video Network), Summer 2017
- Computer Networks (CSEE W4119), Spring 2017
- Wireless & Mobile Networking I (ELEN E6950), Fall 2016
- Wireless & Mobile Networking I (ELEN E6950, Columbia Video Network), Fall 2016
- Wireless & Mobile Networking II (ELEN E6951), Spring 2016
- Wireless Communications (ELEN E4703), Spring 2015
- Wireless Communications (ELEN E4703, Columbia Video Network), Spring 2015

TECHNICAL SKILLS AND LANGUAGES

Programming Skills: C/C++, Python, Java, Visual Basic, HTML, Verilog HDL, nesC

Development Environments: Shell Script, Eclipse, Visual C++, Visual Studio, XCode

Applications: MATLAB, Xilinx, L^AT_EX, Emacs, Vim, GNU Radio, UHD, NI LabVIEW, Linux Wireless, Multisim, Modelsim, Spice/PSpice, Visio, IAR Embedded Workbench, AutoCAD

Operating Systems: Microsoft Windows, Linux (Ubuntu), Apple Mac OS X

Databases: SQL

SELECTED COURSES

Columbia University

- Topics in Computer Science: Video Over the Internet (COMS E6998, Fall 2017)
- Discrete Optimization (IEOR E8100, Spring 2017)
- Convex Optimization (EEOR E6616, Spring 2016)
- Learning and Optimization for Sequential Decision Making (IEOR E8100, Spring 2016)
- Graph Models: Inference and Optimization (IEOR E8100, Fall 2015)
- Topics in Computer Science: Networks Tags (COMS E6998, Fall 2015)

- Analysis of Algorithm II (COMS E6232, Spring 2015)
- Network Algorithms and Dynamics(ELEN E6909, Spring 2015)
- Optimization II (IEOR E6614, Spring 2015)
- Wireless and Mobile Networking I (ELEN E6950, Fall 2014)
- Analysis of Algorithms I (CSOR W4231, Fall 2014)
- Introduction to Deterministic Models (IEOR E4004, Fall 2014)
- Computer Communication Networks (ELEN E6761, Fall 2014)

Tsinghua University

- Stochastic Network Optimization Theory (Graduate, Rank 1st)
- Diploma Projects (Bachelor Thesis, Rank 1st)