

# Steven H. Low

## Frank J. Gilloon Professor

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## Education

**PhD** in EE: Berkeley, 1992

**MSc** in EE: Berkeley, 1989

**BS** in EE: Cornell, 1987

## Appointments

### Primary appointments:

- **Frank J. Gilloon Professor**, 2/2018 – present  
**Professor**, 5/2006 – present  
**Associate Professor**, 8/2000 – 5/2006  
CMS Dept. and EE Dept., Caltech, Pasadena CA91125
- **Founder, CEO**, 4/2006 – 4/2008 (Chairman 2006 – 2012)  
FastSoft, Inc, Monrovia CA 91016
- **Senior Lecturer**, 5/1996 – 7/2000  
Dept. of EEE, University of Melbourne, Australia
- **Member of Technical Staff**, 8/1992 – 2/1996  
AT&T Bell Labs, Murray Hill, NJ  
This series of work has resulted in
  - IEEE William R. Bennett Prize for Best Original Paper in IEEE/ACM Transactions on Networking in 1996 for the paper "Anonymous Credit Cards and Their Collusion Analysis" (with N. Maxemchuk and S. Paul, 1997)
  - 1996 R&D 100 Award (1996)
  - Three patents (1995, 1997, 2000)
    - \* Anonymous credit card transactions (Low, Maxemchuk, Paul, 1995)
    - \* Document copying deterrent method using line and word shift techniques (Brassil, Low, Maxemchuk, O’Gorman, 1997)
    - \* Document copying deterrent method (Brassil, Low, Maxemchuk, O’Gorman, 2000)
  - 2 software prototypes, 8 journal and 30 conference papers

### Other appointments:

- **Visiting Professor**, Sept – Dec 2017  
Cornell Tech, New York, NY
- **Honorary Professor**, Jan 2017 – Dec 2019  
University of Melbourne, Dept of EEE, Australia
- **Changjiang Chair Professor**, Sept 2012 – August 2015  
**Qiushi Chair Professor**, Jan 2016 – June 2018  
Zhejiang University, Hangzhou, China

- **Honorary International Chair Professor**, 2012 – 2015  
National Taipei University of Technology, Taipei, Taiwan
- **Guest Professor**, 2010 – 2013  
Shanghai Jiao Tong University, China
- **Adjunct Professor**, 11/2008 – 10/2013  
Faculty of Information Communication Technologies, Swinburne University of Technology,  
Melbourne, Australia
- **Senior Fellow**, 8/2000 – 2004  
Dept. of EEE, University of Melbourne, Australia
- **Visiting Assistant Professor**, 2/1996 – 4/1996  
Dept. of EEE, University of Science and Technology, Hong Kong
- **Lecturer**, 9/1995 – 1/1996  
Dept. of ECE, Rutgers University, Piscataway, NJ
- **Consultant**, 9/1991 – 1/1992  
Transmission Development Division NEC, San Jose, CA
- **Research Engineer**, Summer 1991  
Advanced Technology Group, Apple Computer, Cupertino, CA
- **Yield Engineer**, Summer 1987  
Technology Development, Intel Corp., Santa Clara, CA
- **Engineering Co-op Intern**, Summer 1986  
System Technology Development, Intel Corp., Hillsboro, OR
- **Engineering Co-op Intern**, Fall 1985  
System Technology Development, Intel Corp., Hillsboro, OR

## Activities

- **Editorial board:**
  - Senior Editor (inaugural), IEEE Transactions on Control of Network Systems, 2014 – present
  - Senior Editor (inaugural), Steering Committee (Member 1/2013 – 1/2017, Chair 1/2015 – 1/2017), IEEE Transactions on Network Science and Engineering, 2014 – present
  - Member, Editorial Board, Elsevier Journal on Sustainable Energy, Grids and Networks, 2014 – present
  - NOW, Foundations and Trends in Energy Systems, 2014 – present
  - NOW, Foundations and Trends in Networking, 2014 – present
  - Senior Editor, IEEE Journal on Selected Areas in Communications (mentor for annual Series on Smart Grid Comm. 2012 – 2014), 2004 – 2014
  - IEEE Transactions on Automatic Control, 2010
  - IEEE/ACM Transactions on Networking, 1997 – 2006
  - Computer Networks Journal, 2003 – 2005
  - ACM Computing Surveys, 2004 – 2010

- **Advisory board or committee:**
  - National Light Rail (NLR) Network Research Committee, August 2004 – 2006
  - Networking and Information Technology Technical Advisory Group for the US President’s Council of Advisors on Science and Technology (PCAST), 2006 – 2007
  - Southern California Edison (SCE) Technology Advisory Board, April 2011 – Dec 2013
  - Caltech Resnick Institute, January 2013 –
  - External Examiner, Dept of Electrical & Electronic Engineering, The University of Hong Kong, 2014 – 2018
  - Advisory Committee on Information Engineering, The Chinese University of Hong Kong, 2016 – 2018
  - Powernet Advisory Group, Stanford University, 2016 – 2019
  - IEEE Fellows Evaluation Committee (Computer Society), 2017
  - Southern California Edison (SCE) EASE (Electric Access System Enhancement) Project Technical Advisory Committee, 2018 – 2021
- **Guest editor:**
  - IEEE Transactions on Control of Network Systems, Special issue on analysis, control and optimization of energy system networks, 2019
  - IEEE Transactions on Smart Grid, Special issue on distributed control and optimization for power systems, 2017
  - Series Mentor, IEEE Journal on Selected Areas in Communications, Annual Series on Smart Grid, 2012–2014
  - IEEE Journal on Selected Areas in Communications special issue on Nonlinear Optimization of Communication Systems, August 2006
  - IEEE Journal on Selected Areas in Communications special issue on Copyright and Privacy Protection, May 1998
- **Short courses:**
  1. **Real-time decision bootcamp: power systems:** Simons Institute for the Theory of Computing, UC Berkeley January 2018
  2. **Power systems analysis:** Zhejiang University, Hangzhou, China, April 2015
  3. **Mathematical analysis of Internet and power systems:** Skoltech, Moscow, Russia, September 2015
- **Tutorials/short courses:** Convex relaxation of optimal power flow
  1. **Grid Science Winter School**, Sante Fe, NM, January 2015
  2. **Lehigh University**, Energy Cluster, Bethlehem, PA, June 2014
  3. **Zhejiang University**, Hangzhou, China, March 2014 (joint with Prof Vincent Lau, HKUST, on *Control and optimization in wireless and power networks*)
  4. **Los Alamos National Lab**, Los Alamos, NM, August 2013
- **Tutorials/short courses:** Control and optimization of networks and TCP congestion control
  1. **PURSUIT Summer School**, Cambridge, England, August 2011

2. **KTH (Royal Institute of Technology)**, Automatic Control Department, Stockholm, Sweden, August 2010
  3. **Lund University**, Automatic Control Department, Lund, Sweden, August 2010
  4. **IEEE ISIT (International Symposium on Information Theory)**, Seattle, WA, July 2006 (with Mung Chiang and Rob Calderbank, Princeton)
  5. **IEEE Infocom**, Miami, FL, March 2005 (with Mung Chiang, Princeton)
  6. **IEEE Globecom**, Dallas, TX, November 2004 (with Mung Chiang, Princeton)
  7. **ACM Sigcomm**, San Diego, CA, August, 27-28, 2001
  8. **ACM Sigmetrics**, Cambridge, MA, June 16, 2001
  9. **IEEE Infocom**, Alaska, April 2001 (with Matthew Roughan, AT&T Labs - Research)
  10. **Grampians Workshop**, Australia, December 8, 2000
  11. **IEEE ICC (International Conference on Communications)**, New Orleans, USA, June 23, 2000
- **Workshop and invited session organization** (partial list)
    1. Program on Real-time Decision Making at Simons Institute for the Theory of Computing, January – May 2018, UC Berkeley (with Josh Bloom (UC Berkeley), Richard Karp (UC Berkeley, chair), Evdokia Nikolova (UT Austin), Balaji Prabhakar (Stanford))
    2. Melbourne Workshop on Future Power Systems, December 2017, University of Melbourne (with Pierluigi Mancarella, UMelb)
    3. IEEE CDC Pre-conference Workshop on Smart Grids, December 2010 (with Nader Motee, Kishan Baheti)
    4. Princeton CISS Invited Session on control and optimization of networks, March 2006 (with Mung Chiang)
    5. IEEE CCW Invited Session on control and optimization of networks, October 2005
    6. International Conference on Complementarity, Duality, and Global Optimization, August 2005 (with Mung Chiang)
    7. ACM Sigmetrics Invited Session on control and optimization of networks, June 2005
    8. IEEE CDC Invited Session on control and optimization of networks, December 2004
    9. Princeton CISS Invited Session on optimization of communication systems, March 2004 (with Mung Chiang)
    10. IEEE CCW Invited Session on control and optimization of networks, October 2004
  - **Panel organization:**
    1. Entrepreneurship in Networking Research, IEEE Infocom, Phoenix, AZ, April 2008
    2. Sustainable Computing and Networking, IEEE Infocom, Shanghai, China, April 2011
  - **Technical program committee** (partial and outdated):
    - Power Systems Computation Conference (PSCC): 2016, 2018
    - IREP (Bulk Power Systems Dynamics and Control Symposium): 2017
    - IEEE Infocom (1999, 2001–12, (Area TPC Chair: 2008, 2010–13), Tutorial co-Chair, 2012))
    - ACM Sigcomm (2004, 2006, 2007)

- ACM Sigcomm Asia (2005)
  - ACM Sigmetrics (2003, tutorial co-chair)
  - ACM CoNEXT (2010)
  - INFORMS (2006)
  - IEEE Information Theory Workshop (2004)
  - IEEE ICNP (2002, 2003)
  - IEEE Computer Communications Workshop (2000, 2001, 2004, 2005)
  - International Telegraphic Congress (ITC) (2010)
  - IEEE ICC (2003, 2004)
  - Institute for Pure and Applied Mathematics (IPAM) Workshop on “Large Scale Communication Networks” (2002, 2003 (Reunion))
  - International Workshop on Protocols for Fast Long-Distance Networks (PFLDnet) (2003 (co-chair), 2004 (steering committee), 2005, 2006, 2008, 2009)
  - IWQoS (2000, 2002)
  - SPIE ITCOM Conference on performance and control of Network Systems (1997, 1998, 2001, 2002, 2003),
  - High Performance Switching and Routing (HPSR) conference (2003, 2005)
  - IEEE ICON (2000,2001,2003)
  - International Conference on Optical Internet (2003)
  - International Workshop on Digital Watermarking (2002)
  - International Workshop on Digital Communications (2001)
  - Workshop on Information Hiding (1996 - 2001)
  - IFIP Fifth International Conference on Broadband Communications (1999)
- **Program co-chair:**
    - TPC co-chair, ACM e-Energy, Waterloo, Canada, June 2016
    - Technical Program Co-chair, International Teletraffic Congress, San Francisco, CA, Sept 2011
    - First International Workshop on Protocols for Fast Long-Distance Networks (PFLDnet), CERN, Geneva, Switzerland, January 2003
    - IEEE Workshop on Computer Aided Modeling, Analysis and Design of Communication Networks, New York, NY, May 2002

## Honors and awards

- 2017 Prize Conference Paper for paper “Event detection and localization in distribution grids with phasor measurement units” by Ardakanian, Yuan, Dobbe, von Meier, Low and Tomlin, IEEE Power Energy Society General Meeting, July 2017 (“Best of the best” Conference Paper, only 4 out of 69 Best Conference Papers out of more than 1,400 conference submissions)
- 2017 IEEE William R. Bennett Prize for paper “Multipath TCP algorithms: theory, design and implementation” by Peng, Walid, Hwang and Low in IEEE/ACM Transactions on Networking, February 2016

- 2015 Power System Analysis, Computing and Economics Technical Committee Prize Paper Award for paper “Zero duality gap in optimal power flow problem by Lavaei and Low in IEEE Transactions in Power Systems, February 2012
- Honorary Professor, Jan 2017 – Dec 2019  
University of Melbourne, Dept of EEE, Australia
- Changjiang Chair Professor, Sept 2012 – August 2015  
Qiushi Chair Professor, Jan 2016 – June 2018  
Zhejiang University, Hangzhou, China
- Honorary International Chair Professor, 2012 – 2015  
National Taipei University of Technology, Taipei, Taiwan
- Keynote, IFIP WG7.3 Performance Conference, Amsterdam, Netherlands, October 2011
- Okawa Foundation Research Grant, 2011
- Guest Professor, 2010 – 2013  
Shanghai Jiao Tong University, China
- Adjunct Professor, 11/2008 – 10/2013  
Faculty of Information Communication Technologies, Swinburne University of Technology, Melbourne, Australia
- IEEE Fellow, 2008
- Best Paper Award, IEEE Mobile Ad-hoc and Sensor Systems (MASS), (with Tao Cui, Lijun Chen, Tracey Ho and Lachlan L. H. Andrew), 2007
- Member, Networking and Information Technology Technical Advisory Group for the US President’s Council of Advisors on Science and Technology (PCAST), 2006 – 2007
- Internet2 Land Speed Record, Supercomputing Conference, 2003
- 1997 IEEE William R. Bennett Prize for Best Original Paper “Anonymous credit cards and their collusion analysis” by Low, Maxemchuk and Paul in IEEE/ACM Transactions on Networking, December 1996
- 1996 R&D 100 Award (1996)
- 9 US Patent Awards (Bell Labs: 1995, 1997, 2000; Caltech: 2010, 2010, 2011; FastSoft: 2013, 2014; Bell Labs: 2014)
- AT&T Smartcard Contest Award for Most Innovative Application (1994)
- University Fellowships & Scholarships (UC-Berkeley, 1987)
- Rank First in Graduating Class of Cornell Engineering College (1987)
- Dean’s Honor List (Cornell 1984-87)

## Invited talks

- **Plenary/Keynote/Distinguished lectures:**

1. Distinguished Lecture Series, University of Texas, San Antonio, TX, April 2018
2. Panelist, National Academies of Sciences, Engineering and Medicine Monthly Webinar on Mathematical Frontiers of Electric Grid, Washington, DC, February 2018
3. Distinguished Lecture Series, KTH (Royal Institute of Technology), Stockholm, Sweden, May 2017
4. Distinguished Speaker Series, EECS, Northwestern University, Chicago, IL, March 2017
5. Distinguished Visitor, ECE Department Colloquium, University of British Columbia Vancouver, BC, Canada, January 2017
6. Keynote, The Conference on Uncertainty in Artificial Intelligence (UAI), Jersey City, NJ, June 2016
7. Distinguished Speaker, Information Modeling and Control of Complex Systems Workshop (IMaCCS), Ohio State University, Columbus, OH, May 2016
8. Keynote, The 50th Conference on Information Sciences and Systems (CISS), Princeton, NJ March 2016
9. Distinguished Lectures Series, University of Toronto, Canada, November 2015
10. Keynote, NSF Early-Career Investigators Workshop on Cyber-Physical Systems in Smart Cities, Seattle, WA, April 2015
11. Keynote, The 9th International Conference on Information, Communications and Signal Processing (ICICS 2013), Tainan, Taiwan, December 2013
12. Keynote, Information Processing Challenges in the Smart Grid, the IEEE Global Signal and Information Processing Conference, Austin, TX, December 2013
13. Plenary Speaker, Systems & Optimization Aspects of Smart Grid Challenges, Tucson, AZ, March 2013.
14. Distinguished Speaker Series, Northeastern University, Boston, MA, November 2012
15. Keynote, Seventh Annual Coordinated Science Laboratory (CSL) Student Conference, University of Illinois, Urbana-Champaign, IL, January 2012
16. Keynote, IEEE GLOBECOM Workshop on Smart Grid Communications and Networks, Houston, TX, December 2011
17. Keynote, IFIP WG7.3 Performance Conference, Amsterdam, Netherlands, October 2011
18. Distinguished Speaker Series in Information Technology, Rensselaer Polytechnic Institute, February 2005
19. IEEE First Workshop on Provisioning & Transport for Hybrid Networks (PATHNets), San Jose, CA, October 2004
20. The Second ARC-TCP Workshop: Models and algorithms for TCP/IP Networks, Ecole Normale Supérieure, Paris, France, November 2003
21. European Union RTN Summer School on Multi-Agent Control, Hamilton Institute, National University of Ireland, Maynooth, Ireland, September 2003
22. Disney Digital Network Roundtable, Burbank, CA, (broadcast to Disney World (FL), ABC (NY), ESPN (CT), Disney Internet Group (WA), Disneyland (LA)), August 2003
23. Workshop on Networking games and resource allocation, Institute of Applied Mathematical Research, Petrozavodsk, Russia, July 2002

• **Invited talks:**

1. December 2018: IEEE Conference on Decision and Control (CDC invited sessions), Miami Beach, FL
2. November 2018: INFORMS Annual Meeting, Phoenix, AZ (Organizers: Andy Sun, Kostya Turitsyn)
3. February 2018: National Academies of Sciences, Engineering and Medicine Monthly Webinar on Mathematical Frontiers of Electric Grid, Washington, DC (Organizer: Michelle Schwalbe)
4. February 2018: NSF Workshop Real-time Learning and Decision-making in Dynamic Systems, NSF Headquarter, Alexandria, VA (Organizers: Le Xie and Tony Kuh)
5. January 2018: Simons Institute Program on Real-time Decision Making Bootcamp, UC Berkeley, CA (Organizer: Richard Karp)
6. January 2018: RTE Workshop on Semi-Algebraic Techniques for Optimal Power Flow and Stability Assessment, Paris, France (Organizers: Jean-Bernard Lasserre and Patrick Panciatici)
7. December 2017: Symposium on Information Processing Challenges in the Smart Grid at the IEEE GlobalSIP, Austin, TX (presenter: Yujie Tang)
8. November 2017: Workshop on Electric Energy Systems and Operations Research, Georgia Tech, Atlanta, GA (Organizer: Andy Sun)
9. October 2017: INFORMS Annual Meeting, Energy I - Electricity, Houston, TX (presenter: Changhong Zhao)
10. September 2017: NREL Workshop on Autonomous Energy Grid, Golden, CO (Organizer: Emiliano Dall'Anese)
11. July 2017: International School for Materials for Energy and Sustainability VI, Pasadena, CA (Organizer: Harry Atwater)
12. July 2017: IEEE Power Engineering Society General Meeting, Panel Session, Chicago, IL (presenter: Changhong Zhao)
13. April 2017: Duke Workshop on Optimization Under Uncertainty and Data-Driven Science and Engineering, Durham, NC
14. March 2017: The 51st Conference on Information Sciences and Systems (CISS), Baltimore, MD (presenter: Yujia Tang)
15. January 2017: Grid Science Winter School and Conference, Sante Fe, NM
16. December 2016: Symposium on Information Processing Challenges in the Smart Grid at the IEEE GlobalSIP, Austin, TX
17. November 2016: EPRI Infrastructure Working Group Meeting, San Francisco, CA
18. October 2016: IEEE ICCCI (Keynote), Wuhan, China
19. September 2016: MIT IDSS (Institute Data, Systems and Society) Launch Workshop, Boston, MA
20. July 2016: IEEE American Control Conference (ACC), Tutorial on Recent Advances on Computational Methods for the Power Flow Equations, Boston, MA
21. June 2016: Simons Institute Workshop on Real-time Decision Making, Simons Institute for the Theory of Computing, Berkeley, CA
22. June 2016: Keynote, The Conference on Uncertainty in Artificial Intelligence (UAI), Jersey City, NJ



23. May 2016: Distinguished Speaker, Information Modeling and Control of Complex Systems Workshop (IMaCCS), Ohio State University, Columbus, OH
24. March 2016: Keynote, The 50th Conference on Information Sciences and Systems (CISS), Princeton, NJ
25. Feb 2016: Industrial & Systems Engineering Dept Colloquium, Georgia Institute of Technology, Atlanta, GA
26. Feb 2016: Information Theory and Applications Workshop, Scripps Seaside Forum, San Diego, CA
27. Jan 2016: Workshop on Frontiers in Distributed Optimization and Control of Sustainable Power Systems, NREL, Golden, CO
28. Jan 2016: IPAM (Institute of Pure and Applied Math) Workshop on Optimization and Equilibrium in Energy Economics, UCLA, CA
29. November 2015: Distinguished Lectures Series, University of Toronto, Canada
30. October 2015: Symposium on Building California's Flexible Grid, Southern California Edison, Huntington Beach, CA.
31. September 2015: Energy Colloquium, Skoltech, Moscow, Russia
32. July 2015: The 22nd International Symposium on Mathematical Programming, Pittsburgh, PA (presenter: Enrique Mallada)
33. June 2015: Advanced Mathematical Methods for Energy Systems: from Theory to Practice, Skoltech, Moscow, Russia
34. April 2015: NSF Early-Career Investigators Workshop on Cyber-Physical Systems in Smart Cities, Seattle, WA (Keynote)
35. March 2015: Workshop on Information and Communication Systems and their Application to Vertical Sectors, Uruguay
36. January 2015: Grid Science Winter School and Conference, Sante Fe, NM
37. December 2014: The 53rd IEEE Conference on Decision and Control, invited sessions on power systems, Los Angeles, CA (presenters: Q. Peng, C. Zhao)
38. November 2014: The 48th Annual Asilomar Conference on Signals, Systems, and Computers invited session on Power Networks, Pacific Grove, CA
39. October 2014: Inaugural Symposium of the IEEE Transactions on Control of Network Systems, Boston, MA
40. October 2014: The Swedish Linnaeus center LCCC (Lund Center for Control of Complex Engineering Systems) Workshop on "Dynamics and Control in Networks", Lund University, Lund, Sweden
41. Sept/Oct 2014: The 52nd Annual Allerton Conference on Communication, Control, and Computing, invited session on "Control and Optimization in Electrical Energy Systems: Smart Grid Applications and Beyond", Monticello, IL (presenter: Enrique Mallada)
42. August 2014: The 18th Power Systems Computation Conference (PSCC) invited session on "Advanced optimization methods for power systems", Wroclaw, Poland
43. August 2014: The 19th World Congress of the International Federation of Automatic Control (IFAC), invited session on "Towards Automated Load Controls in Smart Grids", Cape Town, South Africa (presenter: Enrique Mallada)
44. June 2014: International Symposium on Circuits and Systems, invited session on "Applications of Advanced Nonlinear System Theory to Smart Grids", Melbourne, Australia

45. May 2014: SIAM Conference on Optimization, invited session on “Optimization in Inference and Control”, San Diego, CA (presenter: Subhonmesh Bose)
46. April 2014: RTE-IBM workshop on “Semidefinite Programming for Optimal Power Flow Problems”, Dublin, Ireland
47. February 2014: The 8th Information Theory and Applications (ITA) Workshop, San Diego, CA
48. Feb 2014: The 9th Annual Carnegie-Mellon Conference on the Electricity Industry, Pittsburgh, PA
49. December 2013: The 9th International Conference on Information, Communications and Signal Processing (ICICS 2013), Tainan, Taiwan
50. December 2013: Symposium on Information Processing Challenges in the Smart Grid at the IEEE GlobalSIP, Austin, TX
51. November 2013: Asilomar Conference on Signals, Systems, and Computers invited session on Power Networks, Pacific Grove, CA
52. October 2013: 51st Annual Allerton Conference on Communication, Control and Computing invited session on power systems, Monticello, IL
53. Sept 2013: Science and Technology Innovators’ Speaker Series, University of Minnesota, Minneapolis, MN
54. June 2013: 2013 International Workshop on Mathematical Issues in Information Sciences, Xi’an, China
55. June 2013: FERC (Federal Energy Regulatory Commission’s) Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software, Washington DC
56. June 2013: American Control Conference Tutorial on Pathways Towards Smart, Flexible, Efficient Power Systems, Washington DC
57. June 2013: 12th International Electric Power Control Center (EPCC) Workshop, Bedford Springs, PA
58. May 2013: Workshop on Modeling and Simulation of Cyber-Physical Energy Systems, Berkeley, CA
59. March 2013: Workshop on Systems & Optimization Aspects of Smart Grid Challenges, Tucson, AZ
60. February 2013: The 7th Information Theory and Applications (ITA) Workshop, UCSD, San Diego, CA
61. December 2012: 51st IEEE Conference on Decision and Control, Maui, HI
62. December 2012: Interdisciplinary Workshop on Smart Grid Design & Implementation, Gainesville, FL
63. December 2012: IEEE Globecom Workshop on Smart Grid Communications: Design for Performance, Anaheim, CA
64. December 2012: Asia Pacific Signal and Information Processing Association (APSIPA) Annual Summit and Conference, Los Angeles, CA
65. October 2012: GridWise Architecture Council Meeting, Irving, TX
66. October 2012: KE<sup>2</sup> Leadership Roundtable and Forum, Resnick Institute, Caltech, CA
67. October 2012: 50th Annual Allerton Conference on Communication, Control and Computing invited session on power systems, Monticello, IL

68. July 2012: CU Energy Day Workshop, Chinese University of Hong Kong
69. July 2012: Network Science Workshop, Chinese University of Hong Kong
70. June 2012: Federal Energy Regulatory Commissions (FERC) Conference: Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software, Washington DC
71. June 2012: GreenMetrics 2012 Workshop (in conjunction with Sigmetrics), London, UK
72. May 2012: Center for Nonlinear Studies (CNLS) Annual Conference on “Optimization and Control for Smart Grids”, Los Alamos National Laboratory, Santa Fe, NM
73. May 2012: Santa Fe Institute Workshop on “Power Grids as Complex Networks”, Santa Fe, NM
74. March 2012: Annual Conference on Information Sciences and Systems (CISS), Princeton, NJ
75. March 2012: The 8th Annual Carnegie Mellon Conference on the Electricity Industry: Emerging Phenomena in Changing Electric Energy Systems, Pittsburgh, PA
76. Feb 2012: The 7th Annual Information Theory and Application Workshop, San Diego, CA
77. Jan 2012: Seventh Annual Coordinated Science Laboratory (CSL) Student Conference, University of Illinois, Urbana-Champaign, IL
78. December 2011: IEEE GLOBECOM Workshop on Smart Grid Communications and Networks (Keynote), Houston, TX
79. November 2011: Workshop on Energy Security and Resilient Control Systems, Marina del Ray, CA
80. October 2011: FIP WG7.3 Performance Conference (Keynote), Amsterdam, Netherlands
81. October 2011: IEEE Computer Communications Workshop (CCW), Hyannis, MA
82. Sept 2011: Alumni College 2010 “Practical Applications of Sustainable Resources”, Caltech, Pasadena, CA
83. August 2011: Hamilton Institute Workshop Network Science Workshop, Dublin, Ireland
84. August 2011: PURSUIT Summer School, Cambridge, England
85. June 2011: Santa Barbara Control Workshop on “Decision Dynamics and Control in MultiAgent Systems”, UC, Santa Barbara, CA
86. May 2011: “IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid),” Panel, Newport Beach, CA
87. May 2011: “Dynamical Systems Approaches in Smart Power Grids” at SIAM conference on Application of Dynamical Systems, Snowbird, UT
88. May 2011: Workshop on Dynamics, Control and Pricing in Power Systems, Linnaeus Excellent Center, Lund University, Sweden
89. April 2011, EDGE Lab Open House, Princeton, NJ
90. March 2011: USC Rusch Honors Colloquium, University of Southern California, LA, CA
91. February 2011: Workshop on Cyber-Physical Applications in Smart Electric Power Systems, NCSU, Raleigh, NC
92. February 2011: The 6th Information Theory and Applications (ITA) Workshop, UCSD, San Diego, CA
93. January 2011: KACST Smart Grid Workshop, Riyadh, Saudi Arabia

94. November 2010: Southern California Symposium on Network Economics and Game Theory, Los Angeles, CA
95. November 2010: INFORMS Annual Meeting, Distributed Algorithm and Optimization, Austin, TX
96. November 2010: IEEE Workshop on “A Systems Approach Toward Green Energy Production and Adaptive Power Distribution”, CSULB, Long Beach, CA
97. October 2010: DIMACS Workshop on Algorithmic Decision Theory for the Smart Grid, Rutgers University, Piscataway, NJ
98. October 2010: Southern California Edison Smart Grid Research Symposium, USC, Los Angeles, CA
99. March 2010: Workshop on Distributed Decisions via Games and Price Mechanisms, Lund University, Sweden
100. February 2010: The 5th Information Theory and Applications (ITA) Workshop, UCSD, San Diego, CA
101. Oct 2009: Southern California Symposium on Network Economics and Game Theory, Los Angeles, CA (panelist)
102. October 2009: INFORMS Annual Meeting, San Diego, CA
103. February 2009: The 2009 Information Theory and Applications Workshop, UCSD, San Diego, CA
104. November 2008: IPAM Workshop on New Mathematical Frontiers in Network Multi-Resolution Analysis, Institute for Pure and Applied Mathematics, UCLA, CA
105. October 2008: Workshop on the Frontiers in Distributed Communication, Sensing and Control, Yale University, New Haven, CT
106. August 2008: US-Korea Conference on Science, Technology and Entrepreneurship, San Diego, CA
107. June 2008: JASON Summer Study on Large Data, San Diego, CA
108. May 2008: IEEE ICC (International Conference on Communications), Panel on Transport Protocols in Next Generation Communications
109. April 2008: Workshop on The future of TCP: Train-wreck or Evolution? Stanford University, Palo Alto, CA
110. March 2008: ACCESS Industrial Workshop, KTH, Stockholm, Sweden
111. Jan 2008: The 2008 Information Theory and Applications Workshop, UCSD, San Diego, CA
112. Sept 2007: The 45th Annual Allerton Conference on Communication, Control, and Computing, Monticello, IL
113. Feb 2007: The Fifth International Workshop on Protocols for FAST Long-Distance Networks, ISI, Marina Del Rey, CA
114. Feb 2007: The IEEE 21st Annual Computer Communications Workshop (CCW), Pittsburgh, PA
115. Jan 2007: The 2007 Information Theory and Applications Workshop, UCSD, San Diego, CA
116. October 2006: The 44th Annual Allerton Conference on Communication, Control, and Computing, Monticello, IL

117. August 2006: International Workshop on Complex Systems and Networks (IWCSN 2006), Vancouver, BC, Canada
118. March 2006: IEEE Information Theory Workshop (ITW'2006), Punta del Este, Uruguay
119. March 2006: IRTF End-to-end Task Force Meeting, ISI/USC, Marina Del Rey, CA
120. December 2005: Workshop on QoS and Traffic Control, Ecole Normale Suprieure, Paris, France
121. November 2005: INFORMS Annual Meeting (Optimization and Games in Communication Networks Session), New Orleans, LA
122. November 2005: INFORMS Annual Meeting (Network Optimization Session), New Orleans, LA
123. July 2005: Workshop on the Complex Behavior of Adaptive, Network-Centric Systems, University of Maryland, College Park, MD
124. June 2005: Institute for Mathematics and Applications (IMA), Wireless Communications Workshop, Minniapolis, MN
125. May 2005: International ICFA Workshop on HEP Networking, Grids, and Digital Divide Issues for Global e-Science, Daegu, Korea
126. May 2005: SCMJ IT Workshop, Caltech, LA
127. March 2005: RAND Workshop on Network Science, Arlington, VA
128. Feb 2005: Internet2 Joint Tech Workshop, Salt Lake City, UT
129. Jan 2005: Computational Science Workshop for Underrepresented Groups, USC, Los Angeles, CA
130. October 2004: IEEE Computer Communication Workshop (CCW), Bonita Springs, FL
131. October 2004: Internet 0: Past, Present, and Future, The Center for Bits and Atoms, MIT, Boston, MA
132. September 2004: Fall Internet2 Member Meeting, Austin, TX
133. July 2004: Optical Network Testbeds Workshop, NASA Ames, CA
134. July 2004: 16th International Symposium on Mathematical Theory of Networks and Systems(MTNS 2004), K.U.Leuven, Belgium
135. July 2004: Workshop on Economics of Communication Networks, Montreal, Canada (presenter: Ao Tang)
136. March 2004: Distinguished Panel on Hot Research Topics in Computer Networking, University of Science and Technology, Hong Kong
137. February 2004: Institute for Mathematics and Applications (IMA), Workshop on Robustness in Complex Systems, Minniapolis, MN
138. November 2003: INRIA Workshop on Congestion Control, Paris, France
139. October 2003: IEEE Computer Communication Workshop (CCW), Laguna Beach, CA (presenter: David Wei)
140. October 2003: Allerton Conference, Monticello, IL (presenter: Ao Tang)
141. October 2003: Institute for Pure and Applied Mathematics (IPAM), Reunion Workshop on "Large Scale Communication Networks", Lake Arrowhead, CA
142. August 2003: Internet2 Joint Technology Meeting, Lawrence, KS
143. August 2003: Army Research Office Symposium on Science and Complex Adaptive Systems, Research Triangle Park, NC

144. July 2003: Algorithmic Game Theory and the Internet, Saarbrücken, Germany
145. July 2003: IEEE Information Theory Workshop, Hong Kong, China (Workshop cancelled due to SARS)
146. May 2003: CENIC (Corporation for Education Network Initiative in California) 2003 - On the Road to a Gigabit, Santa Barbara, CA
147. March 2003: High Energy Physics Data Grid Workshop at KEK (High Energy Accelerator Research Organization), Japan
148. October 2002: IEEE Information Theory Workshop, Bangalore, India
149. October 2002: Allerton Conference, Monticello, IL
150. October 2002: IEEE Computer Communication Networks, Santa Fe, NM
151. June 2002: Workshop on High-speed Networking, New York, NY
152. March 2002: Institute for Pure and Applied Mathematics (IPAM), Workshop on “Large Scale Communication Networks”, UCLA, CA
153. February 2002: Decision and Control Symposium (IDC 2002), Adelaide, Australia
154. January 2002: Winter School on “Nonlinear Phenomena in Communication Networks”, UCSD, San Diego, CA
155. December 2001: Winter Simulation Conference, Arlington, VA
156. October 2001: Allerton Conference, Monticello, IL
157. August 2001: Institute for Mathematics and Applications (IMA), Minneapolis, MN
158. March 2001: Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), Rutgers University, NJ
159. March 2001: National Institute of Statistical Science (NISS), Research Triangular Park, NC
160. December 2000: First IEEE Pacific-Rim Conference on Multimedia, University of Sydney, Australia
161. October 2000: IEEE Computer Communication Networks (CCW), Captiva Island, FL
162. November 1999: INFORMS Fall 1999 Meeting, Philadelphia, PA
163. October 1999: IEEE Computer Communication Networks (CCW), Estes Park, CO
164. June 1997: The 9th INFORMS Applied Probability Conference, Boston, MA
165. April 1995: IEEE Information Theory Workshop, St. Louis, MO
166. March 1993: Interdisciplinary Workshop on Coordination and Complexity, Berkeley, CA

• **Invited seminars/colloquia:**

**Arizona State University** (10/2014), **Berkeley** (2/1998, 2/2001, 4/2002, 4/2006, 4/2012, 5/2014, 11/2014), **Boston University** (6/2001, 10/2003, 11/2011), **Caltech** (6/1999), **Cambridge (UK)**, (6/1999), **Chinese University of Hong Kong** (3/2004, 7/2012, 4/2016), **Cornell** (11/1999, 10/2003, 2/2012, 3/2015, 11/2016, 10/2017), **ETH (Zurich, Switzerland)** (6/2016), **Georgia Tech** (6/1998, 9/2010, 2/2016, 11/2017), **Harvard** (9/2016), **Hong Kong University of Science & Technology** (10/2005, 8/2012), **KTH (Stockholm, Sweden)** (3/2008, 5/2017) **McGill** (4/2012), **Melbourne University, Australia** (7/2004, 12/2011, 9/2012, 8/2016), **MIT** (10/2003, 2/2007, 9/2016), **National Tsinghua University, Taiwan** (11/2012), **Northeastern** (11/2012), **Northwestern** (3/2017), **Polytechnic University** (11/1999), **Princeton** (11/1999, 10/2003), **Purdue** (10/2001), **RPI** (3/2002), **Shanghai Jiaotong University, China** (4/2011, 8/2012), **Skoltech, Moscow, Russia**

(3/2014, 9/2015), **Stanford** (1/2002, 2/2004, 4/2012, 1/2014, 11/2016), **SUNY Buffalo** (1/2013), **Swinburne University, Australia** (7/2004, 12/2011, 9/2012), **Tsinghua University, China** (5/2008, 8/2012, 5/2015, 7/2015, 4/2016), **University of British Columbia** (2/2017), **University of Hong Kong** (8/2012, 7/2015), **UC Irvine** (10/1999, 4/2009), **UC LA** (8/1998, 10/1999, 2/2001, 1/2003, 11/2013), **UC Riverside** (11/2001, 11/2011), **UC San Diego** (3/2012, 4/2012), **UIUC** (1/2012), **UMaryland** (College Park, 12/1999, 4/2004), **UMass** (Amherst, 12/1999), **UMichigan** (Ann Arbor, 3/2013, 9/2016), **UMinnesota** (Minneapolis, 9/2013), **UPenn** (3/2003), **USC** (11/2001, 1/2002, 7/2003, 12/2014, 11/2016), **UTexas** (Austin, 12/1999), **UTexas** (A&M, 9/2012), **UTexas** (San Antonio, 4/2018), **UToronto** (11/2015), **UWashington** (Seattle, 5/2008, 2/2014), **UWaterloo** (Canada, 10/2013), **UWisconsin** (Madison, 4/2012), **Zhejiang University** (China, 8/2012, 3/2014, 6/2015, 4/2016)

**Alstom Grid**, **GE** (Seattle, 7/2016), **AT&T Labs** (NJ, 2/1998), **Bell Labs** (NJ, 2/1998, 6/2001, 2/2012), **Cisco** (CA, 10/2000, 6/2003, 2/2005), **Google** (CA, 6/2004), **HP Labs** (CA, 8/2004), **IBM T. J. Watson Research** (Yorktown Heights, NY, 10/2003), **IBM Research** (Almaden, CA, 8/2004), **IBM Research** (Dublin, Ireland, 4/2014), **Los Alamos National Lab** (NM, 4/2011, 8/2013), **Nortel Labs** (UK, 6/1999), **Pacific Northwest National Lab** (WA, 2/2016), **QualComm** (CA, 10/2009), **SUN** (CA, 6/2003), **Symantec** (CA, 8/2004), **Telstra Research Lab** (Australia, 8/1999)

## Visits

- Cornell Tech, New York, NY, 9 -12/2017
- University of Melbourne, Australia, 7-8/2017
- Zhejiang University, Hangzhou, China, 3-5/2014, 3-5/2015, 6-7/2015, 4-5/2016
- Lund University, Lund, Sweden, 7-8/2010
- Melbourne University, Australia, 7-8/2004
- Melbourne University, Australia, 8-10/2000
- Lee Center for Advanced Networking, Caltech, CA, 10/1999
- Bell Labs, Murray Hill, 12/1998-1/1999
- Bell Labs, Holmdel, NJ, 12/1997-2/1998
- AT&T Labs, Shannon Lab, NJ, 12/1996-3/1997
- University of Science & Technology, Hong Kong, 2-4/1996

## Mentoring/Service (seriously outdated)

- **PhD Graduates (Caltech after 2000):**
  1. David Lapsley (PhD, 1999, Melbourne University), Lucent, Massachusetts (first job)
  2. Jiantao Wang (with Doyle), PhD 2005, Goldman Sachs
  3. Lijun Chen (with Doyle), PhD 2006, U Colorado, Boulder
  4. Lun Li (with Doyle), PhD 2006, OpenX, Pasadena
  5. Mortada Meyhar, PhD 2006, Yahoo! (first job)
  6. Kevin Tang, PhD 2006, Cornell ECE

7. David Wei, PhD 2006, Google (first job), Facebook
8. Jayakrishnan Nair (with A. Wierman), PhD 2012, Indian Institute of Sciences
9. Subhonmesh Bose, PhD 2014, UIUC ECE
10. Na Li (with J. Doyle), PhD 2014, Harvard EAS
11. Zhenhua Liu (with A. Wierman), PhD 2014, SUNY Stony Brook
12. Lingwen Gan, PhD 2015, Facebook (first job)
13. Desmond Cai (with A. Wierman), PhD 2016, Singapore A\*STAR (first job)
14. Qiuyu Peng, PhD 2016, Google (first job)
15. Changhong Zhao, PhD 2016, NREL (first job)

• **MS Graduates:**

- George Lee (MS, 2011, Caltech), FastSoft
- Masoud Farivar (MSc, EE, 2010, Caltech)
- Kevin Phan (MSc, EE, 2009, Caltech), then UCLA
- Cheng Hu (MSc, CS, 2006, Caltech), first position: Investment firm
- John Pongsajapan (MSc, CS, 2006, Caltech), first position: Google
- Craig Cameron (MSc, 2002, Caltech), first position: Melbourne University, Australia
- Sanjeeva Athuraliya (MSc, 2000, Caltech), first position: in New Zealand
- Youngmi Ohk (MSc, 1998, Melbourne University), first position: SCI Technology Lab, Australia

- **Current PhD students:** Niangjun Chen (CS with Wierman, 2012), Yuejie Tang (EE 2013), Daniel Guo (CMS, 2014), Zach Lee (EE 2016), Chen Liang (CMS 2016), Fengyu Zhou (EE 2016), Tongxin Li (CMS 2017), Lucien Werner (CMS 2017)

• **Postdocs (excluding own students):**

- James Anderson (Oxford, 2016 – )
- Krishnamurthy Dvijotham, CMI Fellow (UW Seattle, 2014 – 2016): PNNL
- Enrique Mallada, CMI Fellow (Cornell, 2013 – 2015): Johns Hopkins
- Yunjian Xu, CMI Fellow (MIT, 2012 – 2013): Singapore University of Technology and Design
- Eilyan Bitar (Berkeley, 2011 – 2012): Cornell
- Dennice Gayme (Caltech, 2011 – 2012): Johns Hopkins
- Libin Jiang, CMI Fellow (Berkeley, 11/2010 – 2012): Qualcomm
- Sachin Adlakha, CMI Fellow (Stanford, 9/2010 – 2013): startup
- Chee-Wei Tan (Princeton, 11/2008 – 10/2009): City University of Hong Kong
- Lachlan Andrew (RMIT, 10/2005 – 9/2008): Swinburne University, Melbourne
- Bartek Wydrowski (Melbourne, 1/2004 – 12/2005): Google
- Joon-Young Choi (SNU, Korea, 2/2004 – 2/2005)
- Werner Almsberger (EPFL, 12/2002 – 6/2003)
- Cheng Jin (Michigan, 7/2002 – 9/2005): FastSoft (Founder)
- Ki-Baek Kim (SNU, Korea, 10/2001 – 2/2003)



- **Teaching:**

- **Caltech:**

- Developed and taught ee/cs/est 135 Power Systems Analysis (since 2013)
    - Developed and taught networking courses CS/EE145ab and later cs/ee143, since 2000
    - Participated in CDS110 (2003, 2004) and CDS270

- **Melbourne:** introductory and advanced networking, digital communications, digital signal processing.

- **Service:** CS Department Steering Committee, 1/2002 – 10/2007

# Grants and technology transfer

## External grants

Total funding 2001–2017: ~\$20M. *Only* external grants on which I'm the Caltech PI are listed.

1. **NSF CPS:** Demand and workload management for data centers with increased renewable penetration, (1739355, Prime: Arizona State), 2017–2020
2. **NSF CISE AitF:** Algorithmic challenges in smart grids: control, optimization & learning, (1637598), 2016–2020
3. **NSF: EPCN:** Design, stability and optimality of cyber-networks for frequency regulation in smart grids, (1619352), 2016–2019
4. **ARPA-E NODES:** Network Optimized Distributed Energy Systems, (DE-AR0000699, Prime: NREL), 2016–19
5. **ARPA-E GRID DATA:** Generating Realistic Information for the Development of Distribution and Transmission Algorithms, (DE-AR0000715, Prime: Michigan), 2016–18
6. **NSF PFI AIR:** Optimal adaptive charging system, (1602119), 2016–17
7. **Skoltech:** Energy systems, 2015–18
8. **DTRA:** Adaptive algorithms for overload control under cascading failure in multilayer networks (Prime: Ohio State), 2014–18
9. **Los Alamos National Lab:** Smart grid research, 2013–16
10. **ARPA-E GENI:** Scalable real-time decentralized volt/var control, 2012–15
11. **Taiwan National Science Council:** Uncertainty mitigation in renewable integration, 2012–15
12. **Cisco:** Architectures, algorithms and models for smart connected societies, 2011
13. **SCE:** Smart grid research, 2009–2014
14. **NSF NetSE Large (CNS-0911041):** A theory of network architecture, with Candes, Chandy, Doyle and Murray, 2009–14
15. **ARO MURI (Berkeley Prime Award W911NF-08-1-0233):** Tools for the analysis and design of complex multi-scale networks, with Doyle, 2008–14
16. **Greentouch Consortium, Bell Labs, Alcatel-Lucent:** Energy efficient networking, 2011–14
17. **Okawa Foundation** Research Grant, 2011
18. **DoE (DE-EE0002890):** Power minimization techniques for networked datacenters, with Tang (Cornell) 2010–11
19. **ARO DURIP (W911NF-08-1-0513):** WAN-in-Lab at 10Gbps, with Andrew, 2008–09
20. **NSF NeTS (CNS-0520349):** Collaborative Research: Optimization and Games in Interdomain Routing, with Doyle and Zhang (UCLA), 2006

21. **NSF NeTS** (CNS-0435520): Counter-Intuitive Behavior in General Networks, 2005–07
22. **ARO Network Science**: Networked control systems, with Doyle, Murray, 2005–06
23. **NSF CRCRD** (CNS-0417607): Control and Optimization of Communication Systems, with Chiang (Princeton), 2004–06
24. **ARO DURIP** (W911NF-04-1-0095): Hybrid WAN in Lab with Doyle, Newman, Psaltis, Yip, 2004–05
25. **NSF RI** (EIA-0303620): WAN in Lab with Doyle, Newman, Psaltis, Yip (Cisco), 2003–08
26. **NSF STI** (ANI-0230967): Multi-Gbps TCP: Data Intensive Networks for Science & Engineering, with Bunn, Doyle, Newman, 2002–05
27. **AFOSR** (F49620-03-1-0119): Large Scale Self-Organizing Information Distribution System, 2002–05
28. **ARO Networking Research**: Analytical Theory of Protocols, with Doyle, 2002–05
29. **NSF ITR** (ANI-0113425): Optimal and Robust TCP Congestion Control, with Doyle, 2001–04
30. **Cisco ARTI**:
  - University Research Program: 2002, 2003, 2011
  - WAN in Lab: 2005
31. **Misc**: Intel (2001), Microsoft (2001), Sun (2002), Juniper (2003), Level(3) (2003), Corning (2003)

## Technology transfer

- FastSoft, Inc., co-founder, CEO (2006–08), Chairman of the Board (2006–12)
- PowerFlex Systems, Inc., co-founder, Chairman of the Board (2017 – )
- 9 US patent awards (Bell Labs: 1995, 1997, 2000; Caltech: 2010, 2010, 2011; FastSoft: 2013, 2014; Bell Labs: 2014); 8 pending (2018)

## Publications

Only refereed and invited articles are included. Some of the conferences (e.g., IEEE Infocom) have acceptance rate lower than or comparable to leading networking journals, e.g. 15%–25%.

**Google Scholar** (April 2018): 28,140 citations, h-index = 75

### Book

1. Steven H. Low. Analytical methods for network congestion control, Morgan and Claypool Publishers, July 2017

### Journal/Book chapter/Magazine

1. Ashish Cherukuri, Enrique Mallada, Steven H. Low and Jorge Cortes. The role of convexity on saddle-point dynamics: Lyapunov function and robustness, *IEEE Trans. on Automatic Control*, accepted 2017
2. Zhaojian Wang, Feng Liu, Steven H. Low, Changhong Zhao and Shengwei Mei. Distributed frequency control with operational constraints, part I: per-node power balance, *IEEE Trans. on Smart Grid*, accepted 2017
3. Zhaojian Wang, Feng Liu, Steven H. Low, Changhong Zhao and Shengwei Mei. Distributed frequency control with operational constraints, part II: network power balance, *IEEE Trans. on Smart Grid*, accepted 2017
4. Yingjun Zhang and Changhong Zhao and Wanrong Tang and Steven H. Low. Profit maximizing planning and control of battery energy storage systems for primary frequency control, *IEEE Trans. on Smart Grid*, 9(2):712–723, March 2018
5. Qiuyu Peng and S. H. Low. Distributed optimal power flow algorithm for radial networks, I: balanced single phase case, *IEEE Trans. on Smart Grid*, 9(1):111–121, January 2018
6. Enrique Mallada, Changhong Zhao and S. H. Low. Optimal load-side control for frequency regulation in smart grids, *IEEE Trans. on Automatic Control*, 62(12): 6294–6309, December 2017
7. Daniel K. Molzahn, Florian Dörfler, Henrik Sandberg, Steven H. Low, Sambuddha Chakrabarti, Ross Baldick, and Javad Lavaei. A survey of distributed optimization and control algorithms for electric power systems, *IEEE Trans. on Smart Grid*, special issue on Distributed control and efficient optimization methods for smart grid, 8(6):2941–2962, November 2017
8. Yujie Tang and Steven H. Low. Optimal placement of energy storage in distribution networks, *IEEE Trans. on Smart Grid*, special issue on Distributed control and efficient optimization methods for smart grid, 8(6):3094–3103, November 2017
9. Yujie Tang, Krishnamurthy Dvijotham, and Steven H. Low. Real-time optimal power flow, *IEEE Trans. on Smart Grid*, special issue on Distributed control and efficient optimization methods for smart grid, 8(6):2963–2973, November 2017
10. Yunjian Xu and S. H. Low. An efficient and incentive compatible mechanism for wholesale electricity markets, *IEEE Trans. Smart Grid*, 8(1):128–138, January 2017
11. Lingwen Gan and S. H. Low. An online gradient algorithm for optimal power flow on radial networks (invited), *IEEE Journal on Selected Areas in Communications*, Special issue on Emerging technologies in communications, 34(3):625–638, March 2016

12. Yunjian Xu, Na Li, and S. H. Low. Demand response with capacity constrained supply function bidding, *IEEE Trans. Power Systems*, 31(2):1377–1394, March 2016
13. Q. Peng, A. Walid, J. Hwang and S. H. Low. Multipath TCP: Analysis, Design, and Implementation, *IEEE/ACM Trans. Networking*, 24(1): 596 - 609, February 2016
14. J. U. Nair, M. Andreasson, L. L. H. Andrew, S. H. Low and J. C. Doyle. On channel failures, file fragmentation policies, and heavy-tailed completion times, *IEEE/ACM Trans. on Networking*, 24(1):529–541, February 2016
15. S. Bose, D. Gayme, K. M. Chandy and S. H. Low. Quadratically constrained quadratic programs on acyclic graphs with application to power flow, *IEEE Trans. on Control of Network Systems*, 2(3):278–287, September 2015
16. Qiuyu Peng, Yujie Tang, and Steven H. Low. Feeder reconfiguration in distribution networks based on convex relaxation of OPF, *IEEE Trans. on Power Systems*, 33(4):1793–1804, July 2015
17. Z. Liu, M. Lin, A. Wierman, S. H. Low and L. L. H. Andrew. Greening geographical load balancing, *IEEE/ACM Trans. on Networking*, 23(2):657–671, April 2015
18. S. Bose, S. H. Low, T. Teeraratkul and B. Hassibi. Equivalent relaxations of optimal power flow, *IEEE Trans. on Automatic Control*, 60(3):729–742, March 2015
19. L. Gan, N. Li, U. Topcu and S. H. Low. Exact convex relaxation of optimal power flow in radial networks, *IEEE Trans. Automatic Control*, 60(1):72–87, January 2015
20. L. Gan and S. H. Low. Optimal power flow in direct current networks, *IEEE Trans. Power Systems*, 29(6): 2892–2904, November 2014
21. S. H. Low. Convex relaxation of optimal power flow, II: exactness, *IEEE Trans. on Control of Network Systems*, 1(2): 177–189, June 2014
22. S. H. Low. Convex relaxation of optimal power flow, I: formulations and equivalence, *IEEE Trans. on Control of Network Systems*, 1(1): 15–27, March 2014
23. C. Zhao, U. Topcu, L. Li and S. H. Low. Design and stability of load-side primary frequency control in power systems, *IEEE Trans. on Automatic Control*, 59(5):1177–1189, 2014
24. D.W.H. Cai, S. Adlakha, S. H. Low, P. De Martini and K. M. Chandy. *Impact of residential PV adoption on retail electricity rates*, *Energy Policy*, 62(C):830–843, 2013
25. C. Zhao, U. Topcu and S. H. Low. *Optimal load control via frequency measurement and neighborhood area communication*, *IEEE Trans. on Power Systems*, 28(4):3576–3587, November 2013
26. M. Farivar and S. H. Low. *Branch flow model: relaxations and convexification (Parts I and II)*, *IEEE Trans. on Power Systems*, 28(3):2554–2572, August 2013
27. L. Gan, U. Topcu and S. H. Low. *Optimal decentralized protocol for electric vehicle charging*, *IEEE Trans. on Power Systems*, 228(2):940–951, May 2013
28. L. Chen, T. Ho, M. Chiang, S. H. Low and J. C. Doyle. *Congestion control for Multicast Flows with Network Coding*, *IEEE Trans. on Information Theory*, 58 (9):5908–5921, September 2012
29. D. Cai, T. Q. S. Quek, C. W. Tan and H. Low. *Max-min SINR coordinated multipoint downlink transmission - duality and algorithms*, *IEEE Trans. on Signal Processing*, 2012.

30. K. Wang, F. Ciucu, C. Lin and S. H. Low. *A stochastic power network calculus for integrating renewable energy sources into the power grid*, IEEE Journal on Selected Areas in Communications, Smart Grid Series, July 2012
31. Z. Liu, M. Lin, A. Wierman, S. H. Low and L. L. H. Andrew. *Geographical load balancing with renewables*, ACM Sigmetrics Performance Evaluation Review (PER), March 2012
32. L. Chen, N. Li, L. Jiang and S. H. Low. *Optimal demand response: problem formulation and deterministic case* (invited), In Control and Optimization Theory for Electric Smart Grids, Aranya Chakraborty and Marija Ilic, Editors, Springer 2012
33. J. Lavaei and S. H. Low. *Zero duality gap in optimal power flow problem*, IEEE Trans. on Power Systems, 27(1):92-107, February 2012
34. C. W. Tan, S. Friedland and S. H. Low, *Nonnegative matrix inequalities and their application to nonconvex power control optimization*, SIAM Matrix Analysis and Application, 2011
35. C. W. Tan, S. Friedland and S. H. Low, *Spectrum management in multiuser cognitive wireless networks: optimality and algorithm*, IEEE Journal on Selected Areas in Communications, 29:2, February 2011
36. A. Tang, L. Andrew, K. Jacobsson, K. Johansson, H. Hjalmarsson and S. H. Low. *Queue dynamics with window flow control*, IEEE/ACM Trans. on Networking, 18(5): 1422-1435, October 2010
37. L. Chen, S. H. Low and J. C. Doyle, *Random access game and medium access control design*, IEEE/ACM Trans. on Networking, 18(4): 1303-1316, 2010
38. A. Tang, X. Wei, S. H. Low and M. Chiang. *Equilibrium of heterogeneous congestion control protocols: optimality and stability*, IEEE/ACM Trans. on Networking, 18(3): 844-857, 2010.
39. L. Chen, S. H. Low and J. C. Doyle. *Cross-layer design in multihop wireless networks* (Invited), Special Issue on Wireless for the Future Internet, Computer Networks Journal, 2010.
40. L.L.H. Andrew, S.H. Low and B. P. Wyrowski. *Understanding XCP: equilibrium and fairness*, IEEE/ACM Trans. on Networking, 17(6):1697-1710, 2009
41. K. Jacobsson, L.L.H. Andrew, A.K. Tang and S.H. Low. *An Improved Link Model for Window Flow Control and Its Application to FAST TCP*, IEEE Trans. on Automatic Control, 54(3):551-564, Mar 2009
42. Ao Tang, Lachlan L. H. Andrew, Mung Chiang and Steven H. Low. *Transport Layer*, in Encyclopedia of Computer Systems Engineering, Wiley, January 2009
43. X. Wang, K. Kar and S. H. Low. *End-to-end fair rate optimization in wire-cum-wireless networks*, Ad Hoc Networks, Elsevier, 7:473-485, 2009
44. T. Cui, L. Chen and S.H. Low. *A game-theoretic framework for medium access control*, IEEE Journal on Selected Areas in Communications, 26(7):1116-1127, September 2008
45. A. Tang, J. Wang, S. H. Low and M. Chiang. *Equilibrium of heterogeneous congestion control protocols: existence and uniqueness*, IEEE/ACM Trans. on Networking, 15(4):824-837, Aug 2007
46. M. Mehyar, D. Spanos, J. Pongsajapan, S. H. Low and R. M. Murray. *Asynchronous distributed averaging on communication networks*, IEEE/ACM Trans. on Networking, 15(3):512-520, Aug 2007

47. J. Y. Choi, K. Koo, J. S. Lee and S. H. Low. *Global finite-time convergence of TCP Vegas without feedback information delay*, International Journal of Control, Automation and Systems, February 2007
48. M. Chiang, S. H. Low, A. R. Calderbank and J. C. Doyle. *Layering as optimization decomposition*, Proceedings of the IEEE, 95(1):255–312, January 2007
49. L. Chen, S. H. Low and J. C. Doyle. *Dual scheduling algorithm in a generalized switch: asymptotic optimality and throughput optimality*, in High-Performance Packet Switching Architectures, Itamar Elhanany and Mounir Hamdi (Eds.), Springer, 2007
50. D. X. Wei, C. Jin, S. H. Low and S. Hegde. *FAST TCP: motivation, architecture, algorithms, performance*, IEEE/ACM Trans. on Networking, 14(6):1246–1259, December 2006
51. W.-H. Wang, M. Palaniswami and S. H. Low. *Application-oriented flow control: fundamentals, algorithms and fairness*, IEEE/ACM Trans. on Networking, 14(6):1282–1291, December 2006
52. B. Wydrowski, S. Hegde, M. Suchara, R. Witt and S. H. Low. *Grid networks and TCP services, protocols, and technologies*, in Grid Networks: Enabling Grids with Advanced Communication Technology, F. Travostino, J. Mambretti, G. Karmous-Edwards (Eds.), John Wiley & Sons, May 2006
53. J. Wang, D. X. Wei, J.-Y. Choi and S. H. Low. *Modeling and stability of FAST TCP (invited)*, in IMA Volumes in Mathematics and its Applications, Prathima Agrawal M. Andrew, P. J. Fleming, G. Yin, L. Zhang (Eds.), Springer, NY, 2006
54. A. Tang, J. Wang and S. H. Low. *Counter-intuitive throughput behaviors in networks under end-to-end control*, IEEE/ACM Trans. on Networking, 14(2):355–368, April 2006
55. A. Tang, J. Wang, S. Hegde and S. H. Low. *Equilibrium and fairness of networks shared by TCP Reno and Vegas/FAST (invited)*, Telecommunications Systems Journal special issue on High Speed Transport Protocols, 30(4): 417–439, December 2005
56. J. C. Doyle, D. Alderson, L. Li, S. H. Low, M. Roughan, S. Shalunov, R. Tanaka, and W. Willinger. *The “Robust Yet Fragile” Nature of the Internet*, Proceedings of the National Academy of Sciences, 102(40):14123–14475, Oct. 2005
57. H. Newman, J. Bunn, R. Cavanaugh, I. Legrand, S. H. Low, S. McKee, D. Nae, S. Ravot, C. Steenberg, X. Su, M. Thomas, F. van Lingen, Y. Xia. *The UltraLight Project: The Network as an Integrated and Managed Resource in Grid Systems for High Energy Physics and Data Intensive Science*, Computing in Science & Engineering, Special issue on Grid Computing, pages 38–47, November/December 2005
58. J. Wang, L. Li, S. H. Low and J. C. Doyle. *Cross-layer optimization in TCP/IP networks*, IEEE/ACM Trans. on Networking, 13(3):582–568, June 2005
59. F. Paganini, Z. K. Wang, J. C. Doyle and S. H. Low. *Congestion control for high performance, stability and fairness in general networks*, IEEE/ACM Trans. on Networking, 13(1):43–56, February 2005
60. C. Jin, D. X. Wei, S. H. Low, G. Buhrmaster, J. Bunn, D. H. Choe, R. L. A. Cottrell, J. C. Doyle, W. Feng, O. Martin, H. Newman, F. Paganini, S. Ravot, S. Singh. *FAST TCP: From Theory to Experiments*, IEEE Network, 19(1):4–11, January/February 2005
61. M. Mehyar, D. Spanos and S. H. Low. *Duality-based TCP congestion control with error analysis (invited)*, in Performance Evaluation and Planning Methods for the Next Generation Internet, André Girard, Brunilde Sansò and Felisa Vázquez-Abad (Eds.), Springer, 2005

62. D. H. Choe and S. H. Low. *Stabilized Vegas (invited)*, in Advances in Communication Control Networks, Lecture Notes in Control and Information Sciences , Vol. 308, Tarbouriech, Sophie; Abdallah, Chaouki; Chiasson, John (Eds.), Springer 2004
63. N. Duffield and S. H. Low. *Allocating commodity resources in aggregate traffic networks*, Performance Evaluation, 57(3):279–306, July 2004
64. A. Tang, J. Wang and S. H. Low. *Understanding CHOKe: throughput and spatial characteristics*, IEEE/ACM Trans. on Networking, 12(4):694–707, August 2004
65. S. H. Low and R. Srikant. *A mathematical framework for designing a low-loss, low-delay Internet (invited)*, Networks and Spatial Economics, special issue on “Crossovers between transportation planning and telecommunications”, 4:75–101, March 2004
66. S. H. Low, F. Paganini, J. Wang and J. C. Doyle. *Linear Stability of TCP/RED and a Scalable Control (invited)*, Computer Networks Journal, 43(5):633-647, December 2003
67. J. C. Doyle, J. Carlson, S. H. Low, F. Paganini, G. Vinnicombe, W. Willinger, J. Hickey, P. A. Parrilo and L. Vandenberghe. *Robustness and the Internet: Theoretical foundations*, in *Robust design: a repertoire from biology, ecology, and engineering*, (E. Jen, ed.), Oxford University Press, 2003
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69. W.H. Wang, M. Palaniswami and S. H. Low. *Necessary and Sufficient Conditions for Optimal Flow Control in Multirate Multicast Networks*, IEE Proceedings - Communications, 150(5):385-390, October 2003
70. S. H. Low. *A Duality Model of TCP and Queue Management Algorithms*, IEEE/ACM Trans. on Networking, 11(4):525–536, August 2003
71. W.H. Wang, M. Palaniswami and S. H. Low. *Optimal Flow Control and Routing in Multiple-Path Networks*, Performance Evaluation, 52(2-3):119-132, 2003
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