

Curriculum Vitae

Joshua Adam Taylor

Contact Information

josh.taylor@utoronto.ca
<http://www.ele.utoronto.ca/~jttaylor>

10 King's College Road
Sandford Fleming Building, Room 1021C
Toronto, ON M5S 3G4, Canada

Education

Massachusetts Institute of Technology, Cambridge, MA
PhD, Mechanical Engineering, May 2011
SM, Mechanical Engineering, June 2008

Carnegie Mellon University, Pittsburgh, PA
BS, Mechanical Engineering, June 2006

Employment

University of Toronto, Electrical and Computer Engineering
Assistant professor, January 2013 - present
Associate director, Institute for Sustainable Energy, July 2015 - present

University of California, Berkeley, Electrical Engineering and Computer Sciences
Postdoctoral scholar, July 2011 - December 2012

Massachusetts Institute of Technology, Mechanical Engineering
Graduate research assistant, Fall 2006 - June 2011

Carnegie Mellon University, Mechanical Engineering
Undergraduate research assistant, Summer 2003 - Spring 2006

Naval Surface Warfare Center Carderock Division, Bethesda, MD
Intern, Summer 2005

Publications

Books and book chapters

- B1. J.A. Taylor. *Convex optimization of power systems*. Cambridge University Press, 2015
- B2. J.A. Taylor and J.L. Mathieu. “Uncertainty in Demand Response – Identification, Estimation, and Learning”. In: *The Operations Research Revolution*. Tutorials in Operations Research. INFORMS, 2015. Chap. 5, pp. 56–70. DOI: 10.1287/educ.2015.0137

Journal

- J1. M. Bazrafshan, N. Gatsis, A. Taha, and J.A. Taylor. “Coupling Optimal Power Flow with Transient Stability”. In: *Smart Grid, IEEE Transactions on* (2017). submitted
- J2. A. Lesage-Landry and J.A. Taylor. “The multi-armed bandit with stochastic plays”. In: *Automatic Control, IEEE Transactions on* (2017). submitted
- J3. B. Vellaboyana and J.A. Taylor. “Optimal decentralized control of DC-segmented power systems”. In: *Control Systems Technology, IEEE Transactions on* (2017). submitted
- J4. D. Fooladivanda and J.A. Taylor. “Energy-Optimal Pump Scheduling and Water Flow”. In: *Control of Network Systems, IEEE Transactions on* (2017)
- J5. J.A. Taylor, N. Luangsomboon, and D. Fooladivanda. “Allocating sensors and actuators via optimal estimation and control”. In: *Control Systems Technology, IEEE Transactions on* (2016). DOI: 10.1109/TCST.2016.2575799
- J6. S.F. Barot and J.A. Taylor. “A concise, approximate representation of a collection of loads described by polytopes”. In: *International Journal of Electrical Power & Energy Systems* 84 (2017), pp. 55–63. DOI: 10.1016/j.ijepes.2016.05.001
- J7. J.A. Taylor, J.L. Mathieu, D.S. Callaway, and K. Poolla. “Price and capacity competition in balancing markets with energy storage”. In: *Energy Systems* (2016), pp. 1–29. DOI: 10.1007/s12667-016-0193-9
- J8. J.A. Taylor, S.V. Dhople, and D.S. Callaway. “Power systems without fuel”. In: *Renewable and Sustainable Energy Reviews* 57 (May 2016), pp. 1322–1336. DOI: 10.1016/j.rser.2015.12.083
- J9. S. Sun, B. Liang, M. Dong, and J. A. Taylor. “Phase Balancing Using Energy Storage in Power Grids Under Uncertainty”. In: *IEEE Transactions on Power Systems* 31.5 (Sept. 2016), pp. 3891–3903. DOI: 10.1109/TPWRS.2015.2492359
- J10. S. Pirooz Azad, J.A. Taylor, and R. Iravani. “Decentralized Supplementary Control of Multiple LCC-HVDC Links”. In: *Power Systems, IEEE Transactions on* 31.1 (Jan. 2016), pp. 572–580. DOI: 10.1109/TPWRS.2015.2393372
- J11. J.A. Taylor. “Financial storage rights”. In: *Power Systems, IEEE Transactions on* 30.2 (Mar. 2015), pp. 997–1005. DOI: 10.1109/TPWRS.2014.2339016
- J12. J.A. Taylor and J.L. Mathieu. “Index Policies for Demand Response”. In: *Power Systems, IEEE Transactions on* 29.3 (May 2014), pp. 1287–1295. DOI: 10.1109/TPWRS.2013.2289972
- J13. J.A. Taylor, A. Nayyar, D.S. Callaway, and K. Poolla. “Consolidated Dynamic Pricing of Power System Regulation”. In: *Power Systems, IEEE Transactions on* 28.4 (Nov. 2013), pp. 4692–4700. DOI: 10.1109/TPWRS.2013.2268391
- J14. J.A. Taylor, D.S. Callaway, and K. Poolla. “Competitive energy storage in the presence of renewables”. In: *Power Systems, IEEE Transactions on* 28.2 (May 2013), pp. 985–996. DOI: 10.1109/TPWRS.2012.2210573
- J15. J.A. Taylor and F.S. Hover. “Conic AC transmission system planning”. In: *Power Systems, IEEE Transactions on* 28.2 (May 2013), pp. 952–959. DOI: 10.1109/TPWRS.2012.2214490

- J16. J.A. Taylor and F.S. Hover. “Convex Models of Distribution System Reconfiguration”. In: *Power Systems, IEEE Transactions on* 27.3 (Aug. 2012), pp. 1407–1413. ISSN: 0885-8950. DOI: 10.1109/TPWRS.2012.2184307
- J17. J.A. Taylor and F.S. Hover. “Laplacians for flow networks”. In: *SIAM J. of Disc. Math.* 25.3 (2011), pp. 1349–1364. DOI: DOI:10.1137/100787726
- J18. J.A. Taylor and F.S. Hover. “Linear Relaxations for Transmission System Planning”. In: *Power Systems, IEEE Transactions on* 26.4 (Nov. 2011), pp. 2533–2538. ISSN: 0885-8950. DOI: 10.1109/TPWRS.2011.2145395
- J19. G.F. Christopher, N.N. Noharuddin, J.A. Taylor, and S.L. Anna. “Experimental observations of the squeezing-to-dripping transition in T-shaped microfluidic junctions”. In: *Phys. Rev. E* 78.3 (Sept. 2008), p. 036317. DOI: 10.1103/PhysRevE.78.036317

Conference

- C1. A. Lesage Landry and J.A. Taylor. “Learning to shift thermostatically controlled loads”. In: *Hawaii International Conference on System Sciences*. Jan. 2017
- C2. Y. Tian and J.A. Taylor. “Sparsity-promoting controller design for VSC-based microgrids”. In: *Signal and Information Processing (GlobalSIP), IEEE Global Conference on*. Dec. 2016
- C3. S. Barot and J.A. Taylor. “An outer approximation of the Minkowski sum of convex conic sets with application to demand response”. In: *Decision and Control (CDC), IEEE 55th Annual Conference on*. Dec. 2016, pp. 4233–4238. DOI: 10.1109/CDC.2016.7798912
- C4. M. Bazrafshan, N. Gatsis, A. Taha, and J.A. Taylor. “Augmenting the optimal power flow for stability”. In: *Decision and Control (CDC), IEEE 55th Annual Conference on*. Dec. 2016, pp. 4104–4109. DOI: 10.1109/CDC.2016.7798891
- C5. A. Stupar, T. Mcrae, N. Vukadinovic, A. Prodic, and J.A. Taylor. “Multi-Objective Optimization and Comparison of Multi-Level DC-DC Converters using Convex Optimization Methods”. In: *European Conference on Power Electronics and Applications*. Sept. 2016
- C6. A. Stupar, J.A. Taylor, and A. Prodic. “Posynomial Models of Inductors for Optimization of Power Electronic Systems by Geometric Programming”. In: *IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)*. June 2016
- C7. J.L. Mathieu and J.A. Taylor. “Controlling Nonlinear Batteries for Power Systems: Trading Off Performance and Battery Life”. In: *Power Systems Computation Conference*. June 2016
- C8. J.A. Taylor and J.L. Mathieu. “Strategic Bidding in Electricity Markets with Only Renewables”. In: *American Control Conference*. June 2016
- C9. D. Fooladivanda and J.A. Taylor. “Optimal pump scheduling and water flow in water distribution networks”. In: *Decision and Control (CDC), IEEE 54th Annual Conference on*. Dec. 2015, pp. 5265–5271. DOI: 10.1109/CDC.2015.7403043
- C10. D. Fooladivanda and J.A. Taylor. “Dispatching thermal power plants under water constraints”. In: *53rd Annual Allerton Conference on Communication, Control, and Computing*. Sept. 2015, pp. 396–401. DOI: 10.1109/ALLERTON.2015.7447031
- C11. B.R. Vellaboyana, A. Oroojlooyjadid, D. Fooladivanda, J.A. Taylor, and L.V. Snyder. “Optimal scheduling of networked energy storages”. In: *Signal and Information Processing (GlobalSIP), IEEE Global Conference on*. Dec. 2015, pp. 982–986. DOI: 10.1109/GlobalSIP.2015.7418344
- C12. S. F. Barot and J.A. Taylor. “Load aggregation for demand response using polytopic models and the Minkowski sum”. In: *CIGRE Canada Conference*. Aug. 2015
- C13. S. Sun, J.A. Taylor, M. Dong, and B. Liang. “Distributed Real-Time Phase Balancing for Power Grids with Energy Storage”. In: *American Control Conference*. July 2015, pp. 3032–

3037. DOI: 10.1109/ACC.2015.7171798

- C14. J.A. Taylor and L. Scardovi. “Decentralized control of DC-segmented power systems”. In: *Communication, Control, and Computing, 52nd Annual Allerton Conference on*. Invited. Sept. 2014, pp. 1046–1050. DOI: 10.1109/ALLERTON.2014.7028570
- C15. J.A. Taylor. “Financial rights and tracing for energy storage”. In: *PES General Meeting*. July 2014, pp. 1–5. DOI: 10.1109/PESGM.2014.6938936
- C16. J.A. Taylor and J.L. Mathieu. “Index Policies for Demand Response Under Uncertainty”. In: *Decision and Control (CDC), IEEE 52nd Annual Conference on*. Invited. Dec. 2013, pp. 6262–6267. DOI: 10.1109/CDC.2013.6760879
- C17. A. Nayyar, J.A. Taylor, A. Subramanian, D.S. Callaway, and K. Poolla. “Aggregate flexibility of collections of loads”. In: *Decision and Control (CDC), IEEE 52nd Annual Conference on*. Invited. Dec. 2013, pp. 5600–5607. DOI: 10.1109/CDC.2013.6760772
- C18. J.A. Taylor, A. Nayyar, D.S. Callaway, and K. Poolla. “Dynamic pricing in consolidated ancillary service markets”. In: *European Control Conference*. July 2013, pp. 3032–3037
- C19. A. Subramanian, J.A. Taylor, E. Bitar, D. Callaway, K. Poolla, and P. Varaiya. “Optimal power and reserve capacity procurement policies with deferrable loads”. In: *Decision and Control (CDC), IEEE 51st Annual Conference on*. Dec. 2012, pp. 450–456. DOI: 10.1109/CDC.2012.6426102
- C20. J.A. Taylor, J.L. Mathieu, D.S. Callaway, and K. Poolla. “Price and capacity competition in zero-mean storage and demand response markets”. In: *50th Annual Allerton Conference on Communication, Control, and Computing*. Invited. 2012, pp. 1316–1323. DOI: 10.1109/Allerton.2012.6483370
- C21. J.A. Taylor, D.S. Callaway, and K. Poolla. “Inventory control of storage in distribution systems”. In: *American Control Conference*. June 2012, pp. 2147–2152. DOI: 10.1109/ACC.2012.6315148
- C22. J.A. Taylor and F.S. Hover. “Conic relaxations for transmission system planning”. In: *North American Power Symposium*. Aug. 2011, pp. 1–4. DOI: 10.1109/NAPS.2011.6024861
- C23. J.A. Taylor and F.S. Hover. “Lift-and-project relaxations of AC microgrid distribution system planning”. In: *Grand Challenges in Modeling and Simulation*. June 2011
- C24. J.A. Taylor, E. Gilbertson, J. Chalfant, and F.S. Hover. “Linear network design for AC shipboard distribution systems”. In: *IEEE Electric Ship Technologies Symposium*. Apr. 2011. DOI: 10.1109/ESTS.2011.5770866
- C25. J.A. Taylor and F.S. Hover. “Economical simulation in particle filtering using interpolation”. In: *Information and Automation, 2009. ICIA '09. International Conference on*. June 2009, pp. 1326–1330. DOI: 10.1109/ICINFA.2009.5205122
- C26. J.A. Taylor, F.S. Hover, and A. Ouroua. “Uncertainty analysis of large-scale power systems using collocation”. In: *Grand Challenges in Modeling and Simulation*. June 2008
- C27. J. Langston, J.A. Taylor, F.S. Hover, J. Simpson, M. Steurer, and T. Baldwin. “Uncertainty analysis for a large-scale transient simulation of a notional all-electric ship pulse load charging scenario”. In: *Probabilistic Methods Applied to Power Systems*. May 2008
- C28. J.A. Taylor and F.S. Hover. “High Dimensional Stochastic Simulation and Electric Ship Models”. In: *Electric Ship Technologies Symposium*. May 2007, pp. 402–407. DOI: 10.1109/ESTS.2007.372117

Theses

- T1. J.A. Taylor. “Conic optimization of electric power systems”. PhD thesis. Massachusetts Institute of Technology, 2011. URL: <http://dspace.mit.edu/handle/1721.1/67601>

T2. J.A. Taylor. “Uncertainty analysis of power systems using collocation”. MA thesis. Massachusetts Institute of Technology, 2008. URL: <http://dspace.mit.edu/handle/1721.1/45891>

Invited talks

- *Power systems without fuel*. Keynote, Symposium on Signal and Information Processing for Smart Grid Infrastructures, GlobalSIP. Washington, DC, Dec. 2016
- *Leveraging energy storage and demand response in power system operations*. Pontificia Universidad Católica de Chile. Santiago, Chile, Oct. 2016
- *Leveraging energy storage and demand response in power system operations*. MAESTRO group, INRIA. Sophia-Antipolis, France, June 2016
- *Representing storage and demand response in power system operations*. Centre for Power and Information Research Showcase, University of Toronto. Toronto, ON, Apr. 2016
- *Representing storage and demand response in power system operations*. Mechanical & Industrial Engineering Colloquium, New Jersey Institute of Technology. Newark, NJ, Feb. 2016
- *Representing storage and demand response in power system operations*. Workshop on frontiers in distributed optimization and control of sustainable power systems, National Renewable Energy Laboratory. Boulder, CO, Jan. 2016
- *Strategic Price Bidding in Electricity Markets with Only Renewables*. INFORMS Annual Meeting. Philadelphia, PA, Nov. 2015
- *Representing storage and demand response in power system operations*. Control Seminar, University of Michigan. Ann Arbor, MI, Oct. 2015
- *Dispatching Thermal Power Plants under Water Constraints*. 53rd Annual Allerton Conference on Communication, Control, and Computing. Monticello, IL, Oct. 2015
- *Financial storage rights*. Industrial and Systems Engineering Seminar, Lehigh University. Bethlehem, PA, Jan. 2015
- *Financial storage rights*. UC Berkeley. Berkeley, CA, Nov. 2014
- *Financial rights for energy storage*. INFORMS Annual Meeting. San Francisco, CA, Nov. 2014
- *Decentralized control of DC-segmented power systems*. 52nd Annual Allerton Conference on Communication, Control, and Computing. Monticello, IL, Oct. 2014
- *Financial storage rights*. Purdue University. West Lafayette, IN, Sept. 2014
- *Load-based power system regulation: algorithms and incentives*. Center for Nonlinear Studies, Los Alamos National Lab. Los Alamos, NM, Apr. 2014
- *Load-based power system regulation: algorithms and incentives*. Informal Systems Seminar, McGill University. Montreal, Quebec, Mar. 2014
- *Leveraging aggregations of flexible loads*. Pillai Institute of Information Technology, Engineering, Media Studies & Research. Navi Mumbai, India, Dec. 2013
- *Load-based power system regulation: algorithms and incentives*. Electric Energy Systems Group, Electrical and Computer Engineering, Carnegie Mellon University. Pittsburgh, PA, Oct. 2013
- *Learning algorithms for demand response*. UC Berkeley. Berkeley, CA, Oct. 2013
- *Restless Bandit Index Policies for Demand Response*. INFORMS Annual Meeting. Minneapolis, MN, Oct. 2013
- *Load-based power system regulation: algorithms and incentives*. Information, Systems, and Networks Seminar, Electrical Engineering Department, Cornell University. Ithaca, NY, Sept.

2013

- *Load-based power system regulation: algorithms and incentives*. Mechanical Engineering Department, Columbia University. New York, NY, Sept. 2013

Service

Editorial board

- *IEEE Canada Conference Editorial Board*. 2016-2018

Session organizer

- *INFORMS Annual Meeting*. Optimization in converter-based power systems. 2016

Technical program committee

- *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*. Symposium on Signal and Information Processing for Smart Grid Infrastructures. 2016
- *Workshop on System and Control Perspectives for Smart City*. 2015
- *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*. Symposium on Signal and Information Processing for Optimizing Future Energy Systems. 2015
- *IEEE International Conference on Smart Grid Communications (SmartGridComm)*. Architectures, Control and Operation for Smart Grids and Microgrids Symposium. 2015
- *CIGRÉ Canada Conference on Power Systems*. Trends in Power System Planning and Operating for Evolving Grid. 2014
- *IEEE International Conference on Smart Grid Communications (SmartGridComm)*. Architectures, Control, and Operation for Smart Grids, Microgrids and Distributed Resources Symposium. 2014
- *IEEE International Conference on Smart Grid Communications (SmartGridComm)*. Symposium on Demand Side Management, Demand Response, and Dynamic Pricing. 2013

Community engagement

- Panelist, *The Future of Energy Symposium*, Oakville Chamber of Commerce. June, 2015

Reviewer

IEEE Transactions on {Automatic Control, Control of Network Systems, Energy Conversion, Power Systems, Smart Grid}; IEEE Journal on Selected Areas in Communications; IET Generation, Transmission & Distribution; International Journal of Electrical Power & Energy Systems; Energy Economics; NSF, NSERC, CHIST-ERA

Teaching

University of Toronto, Department of Electrical and Computer Engineering

Instructor

- Signals and Systems (ECE216S), Winter 2013 - 2016
- Energy Systems and Distributed Generation (ECE413), Winter 2014 - 2016
- Circuit Analysis (ECE413), Fall 2016
- Mathematical Methods in Power Systems (ECE1094H), Winter 2015, Fall 2015-2016

Supervision

Graduate students

1. Suhaïl F. Barot, PhD, 2013 - 2017.
2. Bharath R. Vellaboyana, MASc, 2014 - 2016.
3. Antoine Lesage-Landry, MASc, 2015 - present.
4. Andrija Stupar, PhD, Fall 2015 - present. *Co-advised with A. Prodic.*
5. Yanhua Tian, MASc, 2015 - present.
6. Abu Alam, MEng, 2016.
7. Zhongbin Huang, MASc, 2016 - present. *Co-advised with B. Liang.*

Postdoctoral fellows

1. Sahar PiroozAzad, Fall 2013 - Fall 2014. PhD from UofT; co-supervised with R. Iravani
Current position: assistant professor at U. Alberta.
2. Dariush Fooladivanda, Winter 2015 - Winter 2016. PhD from Waterloo
Current position: Postdoc at U. Illinois Urbana-Champaign.

Visiting students

1. Tianlei Zang, 2014, PhD student at Southwest Jiaotong University; co-supervised with R. Iravani.
2. Ahmad Taha, summer 2014, PhD student at Purdue University.
3. Rodrigo Henriquez, summer 2016, Masters student at Pontificia Universidad Católica de Chile.
4. Mirna Grzañić, summer 2016, Masters student at University of Zagreb.

Undergraduate students

1. Michael Vukovich, 2013 - 2015. Received NSERC USRA in 2013, 2014.
Topic: combinatorial optimization and learning algorithms for demand response
2. Stuti Rungee, 2013 - 2014. Engineering science 4th year research.
Topic: weather forecasting to predict electricity consumption.
3. Alex Yee, 2013 - 2014. Engineering science 4th year research.
Topic: time of use pricing for energy efficiency.
4. Wonjune Cho, 2014 - 2015. 4th year design project (ECE496).
Topic: machine learning for demand response.
5. Chen Wei, 2014 - 2015. 4th year design project (ECE496).
Topic: clustering algorithms for classifying energy users.
6. Wen Tao, 2014 - 2015. 4th year design project (ECE496).
Topic: clustering algorithms for classifying energy users.
7. Thomas Alexandre, 2015 - 2016. Engineering science 4th year research.
Topic: mass Adoption of Electric Vehicles
8. Nam Song, 2015 - 2016. Engineering science 4th year research.
Topic: economic dispatch of power systems with renewables
9. Devangini Mishra, 2015 - 2016. 4th year design project (ECE496).
Topic: cooling power plants with wastewater
10. Parmita Chakrabarty, 2015 - 2016. 4th year design project (ECE496).
Topic: cooling power plants with wastewater

11. Natchanon Luangsomboon, 2015 - 2016.
Topic: optimal planning for transient stability.
12. Amr Mohamed Sabr, 2016 - 2017. Engineering science 4th year research.
Topic: machine learning for demand response.
13. David Simons, 2016 - 2017. Engineering science 4th year research.
Topic: coupling power and transportation.

Funding

Note: Items are displayed as [year(s); my role as applicant; source; amount (total, annual); purpose (operating or equipment)], followed by the project title.

1. 2013; PI; ECE; \$100,000; operating.
Startup funds.
2. 2013; PI; Connaught new researcher award; total: \$10,000, annual: \$10,000; Operating.
Project: Coordinated control of distributed energy resources.
3. 2014-2019; PI; NSERC Discovery; total: \$150,000, annual: \$30,000; Operating.
Project: Control and economics of power systems with renewables.
4. 2014-2016; PI; HydroOne Networks; total: \$120,000, annual: \$60,000 (\$52,173 after 15% overhead); Operating.
Project: Flexible utilization of storage in distribution systems with renewables.
5. 2015-2017; PI; NSERC Collaborative Research and Development (Industry partner: HydroOne Networks); total: \$104,346, annual: \$52,173; Operating.
Project: Optimal utilization of energy storage in distribution systems.
6. 2013; PI; Canada Foundation for Innovation Leaders Opportunity Fund & Ontario Research Fund match; total: \$187,378, annual: \$187,378; Equipment.
Project: Real-time digital simulation of large, renewable powered distribution systems with energy storage.