

John W. Simpson-Porco

1 Personal Data

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2 Education

09/10–10/15 **Ph.D. in Mechanical Engineering**
University of California, Santa Barbara, CA, USA

09/06–05/10 **B.Sc. in Engineering Physics**
Queen's University, Kingston, ON, Canada

3 Employment History

3.1 Academic Appointments

07/20– **Assistant Professor**
Edward S. Rogers Sr. Department of Electrical and Computer Engineering
University of Toronto, Toronto, ON, Canada

07/20– **Adjunct Assistant Professor**
Department of Electrical and Computer Engineering
University of Waterloo, Waterloo, ON, Canada

04/16–06/20 **Assistant Professor**
Department of Electrical and Computer Engineering
University of Waterloo, Waterloo, ON, Canada

09/15–12/15 **Visiting Scientist**
Automatic Control Laboratory
Swiss Federal Institute of Technology (ETH) Zürich, Switzerland

4 Research Interests

My research interests are broadly in the area of feedback control theory, and in its application for the analysis and design of modern energy systems. Topics of interest in control include linear and nonlinear systems theory, distributed and decentralized control, and optimization-based control systems. Topics of interest in energy systems include bulk power system control and operations, control of microgrids, and building automation.

5 Honours and Awards

2020	IEEE PES Technical Committee Working Group Recognition Award for Outstanding Technical Report (for “Microgrid Stability Definitions, Analysis, and Examples”, PES-TR-66)	IEEE PES
2020	Best Task Force Award (for “Microgrid Stability Definitions, Analysis, and Examples”, PES-TR-66)	IEEE PES Power System Dynamic Performance Committee
2019	Distinguished Performance Award (institutional award)	Faculty of Engineering, University of Waterloo
2016	Outstanding Reviewer Award	New Journal of Physics
2016	CCDC Best Thesis Award (institutional award)	Center for Control, Dynamical Systems, and Computation
2015	CCDC Student of the Month (institutional award)	Center for Control, Dynamical Systems, and Computation
2014	Peter J. Frenkel Foundation Fellowship (one of two campus-wide awards per academic year)	Institute for Energy Efficiency
2014	Automatica Paper Prize (best paper prize, awarded once every three years)	International Federation of Automatic Control
2013	CCDC Fellowship (institutional scholarship)	Center for Control, Dynamical Systems, and Computation
2011-2014	NSERC Fellowship (the most prestigious Canadian fellowship)	Natural Sciences and Engineering Research Council of Canada
2010	CCDC Fellowship (institutional award)	Center for Control, Dynamical Systems, and Computation
2010	NSERC Fellowship (the most prestigious Canadian fellowship)	Natural Sciences and Engineering Research Council of Canada
2010	Engineering Physics Design Award (best senior thesis)	Department of Physics, Queen’s University
2010	CAP Prize Examination Award (institutional award)	Department of Physics, Queen’s University
2010	NSERC Summer Fellowship (national award)	Natural Sciences and Engineering Research Council of Canada
2009	Kern Partners Ltd. Scholarship	Faculty of Applied Science, Queen’s University

	(institutional award)	
2009	NSERC Summer Fellowship (national award)	Natural Sciences and Engineering Research Council of Canada
2008	James H. Rattray Scholarship (institutional award)	Faculty of Applied Science, Queen’s University
2006	Queen’s University Excellence Scholarship (institutional award)	Faculty of Applied Science, Queen’s University

6 Supervision

6.1 Graduate Student Supervision

09/21–	Spencer Kelly (MAsc, ECE, University of Toronto) <i>MAsc Thesis:</i> TBD
09/20–	Liangjie Chen (MAsc/PhD, ECE, University of Toronto) <i>MAsc Thesis:</i> A Fixed-Point Algorithm for the AC Power Flow Problem <i>PhD Thesis:</i> TBD
09/20–09/22	Anurag Agarwal (MAsc, ECE, University of Toronto) <i>MAsc Thesis:</i> Robust Feedback-Based Nash Equilibrium Seeking <i>Co-supervisor:</i> L. Pavel
09/20–	Youssef Al Falah (MAsc/PhD, ECE, University of Toronto) <i>MAsc Thesis:</i> Towards Optimal Steady-State Control of Multi-Terminal HVDC Systems <i>PhD Thesis:</i> TBD <i>Co-supervisor:</i> J. A. Taylor
01/20–	Ruiqi Li (PhD, ECE, University of Waterloo) <i>PhD Thesis:</i> Advances in Data-Driven Control of Linear and Nonlinear Systems <i>Co-supervisor:</i> S. L. Smith
09/19–	Ilyas Farhat (PhD, ECE, University of Waterloo) <i>PhD Thesis:</i> Area-Based Hierarchical Feedback Optimization for Active Distribution Networks
09/18–	Etinosa Ekomwenrenren (PhD, ECE, University of Waterloo) <i>PhD Thesis:</i> Area-Based Fast Frequency Control using Inverter-Based Resources
09/19–09/21	Enrique González (PhD, ECE, University of Waterloo and Universidad de Chile) <i>PhD Thesis:</i> “ Distributed Secondary Control of Hybrid ac/dc Microgrids ” <i>Co-supervisors:</i> M. Kazerani, D. Saez, R. Cardenas <i>Last known position:</i> Assistant Professor, Electrical Engineering, Universidad de Santiago de Chile
09/17–05/19	Liam S. P. Lawrence (MAsc, ECE, University of Waterloo) <i>MAsc Thesis:</i> “ The Optimal Steady-State Control Problem ” <i>Last known position:</i> PhD Student, Medical Physics, University of Toronto

VISITING GRADUATE STUDENTS

- 09/22– Babak Abdolmaleki, “Optimal voltage control in microgrids”
Last known position: PhD Candidate, NTNU
- 09/18–12/18 Jacqueline Llanos, “Congestion control in microgrids”
Last known position: Universidad de las Fuerzas Armadas ESPE, Ecuador
- 05/17–08/17 Jacqueline Llanos, “Congestion control in microgrids”
Last known position: Universidad de las Fuerzas Armadas ESPE, Ecuador
- 09/17–12/17 Nainar Karthikeyan, “Predictive control in active distribution networks”
Last known position: Research Scientist, Aalborg University
- 09/17–12/17 Juan Sebastian Gomez Quintero, “Distributed predictive control in microgrids”
Last known position: Assistant Professor, Universidad Andrés Bello (UNAB), Santiago, Chile.

6.2 Postdoctoral Fellow Supervision

- 04/19–04/21 Zhiyuan Tang
Last known position: Distinguished Associate Research Fellow, Sichuan University, PRC.
- 05/18–08/19 Mauricio Restrepo Restrepo (co-sup. C. Cañizares)
Last known position: Assistant Professor, Universidad del Norte, Barranquilla, Colombia
- 09/17–08/18 Mostafa Farrokhabadi (co-sup. C. Cañizares)
Last known position: Assistant Professor, University of Calgary, Calgary, AB, Canada.

6.3 Undergraduate Student Supervision

- 05/19–08/19 Audrey Avianto, “Fast feedback-based methods for training deep neural networks”
Last known position: BSc Student, University of Waterloo
- 09/17–12/17 Nicholas Olson, “Frequency regulation with battery energy storage”
Last known position: PhD Student, ECE, UT Austin

7 Teaching

- Winter '22 ECE 1659: Robust and Optimal Control
Winter '22 ECE 216: Signals and Systems
Fall '21 ECE 410: Linear Control Systems
Winter '21 ECE 216: Signals and Systems
Winter '21 ECE 1635H: Robust and Optimal Control
Fall '19 ECE 484-002: Digital Control Applications
Fall '19 ECE 484-001: Digital Control Applications
Spring '19 ECE 780-T10: Multivariable Control Systems II
Fall '18 ECE 484-002: Digital Control Applications

Fall '18	ECE 484-001: Digital Control Applications
Spring '18	ECE 780-T09: Network Systems and Control
Fall '17	ECE 484 Digital Control Applications
Spring '17	ECE 380 Analog Control Systems
Fall '16	ECE 484 Digital Control Applications

8 Research Funding

2022-2023	Data Sciences Institute – Seed Funding for Methodologists <i>Title:</i> “Control-Theoretic Tools for Analyzing Mini-Batch Gradient Descent” <i>Role:</i> Principal Investigator
2021-2022	Connaught Research Fund – New Researcher Award <i>Title:</i> “Robust-High Performance Algorithms for Feedback Optimization” <i>Role:</i> Principal Investigator
2018-2022	Electric Power Research Institute: Grid Operations <i>Title:</i> “Next Generation Grid Monitoring and Control” <i>Role:</i> Principal Investigator
2018-2019	NSERC Engage (Partner: Canadian Solar Solutions Inc.) <i>Title:</i> “Interface and Testing Platform Design for Canadian Renewable Energy Laboratory” <i>Role:</i> Principal Investigator
2017-2024	NSERC Discovery <i>Title:</i> “Real-Time Distributed Control for Low-Inertia Power Grids” <i>Role:</i> Principal Investigator
2017-2018	WISE-Cisco Smart Grid Research Fund <i>Title:</i> “Frequency Control Strategies for Future Microgrids” <i>Role:</i> Principal Investigator

9 Talks, Seminars, and Presentations

Invited Seminars

Nov '22	Delft Center for Systems and Control, TU Delft, Netherlands <i>Title:</i> “Advances in Feedback Control for Power Grid Modernization”
Nov '22	Workshop on polynomial optimization and applications in control and energy, CWI, Amsterdam, Netherlands <i>Title:</i> “A Theory of Solvability for Power Flow Equations”
Sep '21	Workshop on Resilient Autonomous Energy Systems, NREL, Golden, CO, USA <i>Title:</i> “Next-Generation Frequency and Voltage Control using Inverter-Based Resources”
Oct '20	Department of Mechanical and Aerospace Engineering, UC San Diego <i>Title:</i> “Advances in Feedback Control for Power Grid Modernization”
Oct '20	Waterloo Institute for Sustainable Energy, University of Waterloo

- Title: "Advances in Feedback Control for Power Grid Modernization"
- Feb '20 Center for Control, Dynamical Systems, and Computation, UC Santa Barbara
Title: "Frameworks for Feedback-Based Optimization with Application to Energy Systems"
- Feb '20 Department of Electrical and Computer Engineering, UC Riverside
Title: "Advances in Feedback Control for Grid Modernization"
- Jan '20 Department of Electrical and Computer Engineering, University of Toronto
Title: "Advances in Feedback Control for Grid Modernization"
- Nov '19 Department of Electrical and Computer Engineering, University of Toronto
Title: "Frameworks for Feedback-Based Optimization with Application to Energy Systems"
- Nov '19 Jan C. Willems Center for Systems and Control, Groningen, Netherlands
Title: "A Theory of Solvability for Power Flow Equations"
- May '19 Workshop on Mathematics of Energy Systems, Issac Newton Institute, Cambridge, UK
Title: "Optimal Steady-State Control with Application to Frequency Regulation of Power Grids"
- April '19 Innovative Optimization and Control Methods for Highly Distributed Autonomous Systems Workshop, National Renewable Energy Lab, Golden, CO, USA
Title: "Optimal Steady-State Control and Frequency Regulation of Transmission Systems"
- April '19 Electrical Engineering Department, University of Michigan, Ann Arbor, MI, USA
Title: "Optimal Steady-State Control and Frequency Regulation of Transmission Systems"
- Feb '19 Future Electric Power Systems and the Energy Transition, Champerey, Switzerland
Title: "A Theory of Solvability for Power Flow Equations"
- Jan '19 Automatic Control Lab, ETH Zürich
Title: "The Optimal Steady-State Control Problem"
- Mar '18 Electrical Engineering Department, Universidad de Chile
Title: "A Theory of Solvability for Power Flow Equations"
- April '17 Clarkson Center for Complex Systems Science, Clarkson University
Title: "A Theory of Solvability for Power Flow Equations"
- Mar '17 Electrical Engineering Department, Universidad de Chile
Title: "Lossy DC Power Flow"
- Mar '17 Workshop on Power Electronics and Control Strategies for Energy Storage Systems in Microgrids and Power Systems, Valparaiso, Chile
Title: "Distributed Control of Inverter-Based Power Grids"
- Jan '17 Center for Control, Dynamical Systems, and Computation, UC Santa Barbara
Title: "A Theory of Solvability for Power Flow Equations"
- Feb '16 Centre for Power and Information, University of Toronto
Title: "Distributed Control of Inverter-Based Power Grids"
- Jan '16 National Renewable Energy Lab, Golden, CO
Title: "Distributed Control of Inverter-Based Power Grids"
- Dec '15 Automatic Control Laboratory, Royal Institute of Technology (KTH) Stockholm
Title: "Distributed Control of Inverter-Based Power Grids"
- Nov '15 Engineering and Technology Institute, University of Groningen
Title: "Voltage Control of Micro and Power Grids"

- Oct '15 Automatic Control Laboratory, Swiss Federal Institute of Technology (ETH) Zürich
Title: "Conditions for Voltage Stability of Power Grids"
- June '15 Department of Electrical and Computer Engineering, University of Waterloo
Title: "Power Grid Stability and Distributed Control"
- May '15 Department of Electrical and Computer Engineering, University of British Columbia
Title: "Power Grid Stability and Distributed Control"
- Mar '15 Department of Electrical Engineering, University of Southern California
Title: "Power Grid Voltage Stability and Distributed Control"
- Mar '15 Advanced Power and Energy Systems, Pacific Northwest National Laboratory
Title: "Distributed Frequency and Voltage Control of Islanded Microgrids"
- Dec '13 Department of Information Engineering, University of Padova
Title: "Droop-Controlled Inverters in Microgrids: Stability, Secondary Control, & Optimization"

Workshop and Conference Presentations

- Dec '22 IEEE Conference on Decision and Control, Cancún, Mexico.
Title: "Low-Gain Stabilizers for Linear-Convex Optimal Steady-State Control"
- Sep '22 54th Annual Allerton Conference on Communication, Control, and Computing, Monticello, IL.
Title: "From Automatic Generation Control to Fast Frequency Control using Inverter-Based Resources"
- Dec '21 IEEE Conference on Decision and Control, Austin, TX, USA.
Title: "Stability of Projected Integral Control for Input-Constrained Discrete-Time Nonlinear Systems"
- Aug '21 Canadian Operations Research Conference, Toronto, ON, Canada.
Title: "Advances in Feedback Control for Power Grid Modernization"
- Mar '21 Conference on Information Science and Systems, Baltimore, MD, USA.
Title: "On Stability of Automatic Generation Control"
- Nov '19 **(Keynote)** Energy Open, Groningen, Netherlands.
Title: "Feedback Optimization of Uncertain Dynamic Systems with Application to Energy Systems".
- Jun '19 Tutorial on Distributed Control for Autonomous Power Grids, ECC, Naples, Italy.
Title: "Optimal and Distributed Frequency Control of Transmission Grids".
- Mar '19 Conference on Information Science and Systems, Baltimore, MD, USA
Title: "Optimal Steady-State Control and Frequency Regulation of Transmission Systems"
- Nov '18 INFORMS Annual Meeting, Phoenix, AZ, USA.
Title: "A Theory of Solvability for Power Flow Equations"
- Nov '18 INFORMS Annual Meeting, Phoenix, AZ, USA.
Title: "Optimal Steady-State Control for Frequency Regulation of Power Systems"
- Jun '18 American Control Conference, Milwaukee, WI.
Title: "A Hill-Moylan Lemma for Equilibrium-Independent Dissipativity"
- Dec '16 IEEE Conference on Decision and Control, Las Vegas, NV.
Title: "Quadratic Performance of Primal-Dual Methods for Distributed Optimization"
- Dec '16 IEEE Conference on Decision and Control, Las Vegas, NV.
Title: "Model-Free Wide-Area Monitoring of Power Grids via Cutset Voltages"

- Sept '16 54th Annual Allerton Conference on Communication, Control, and Computing, Monticello, IL.
Title: "Input/Output Analysis of Primal-Dual Gradient Algorithms"
- June '16 **(Keynote)** Workshop on Communications, Computation and Control for Resilient Smart Energy Systems (co-located with ACM e-Energy), Waterloo, ON
Title: "Distributed Control of Inverter-Based Power Grids"
- May '16 7th Biannual Meeting on System and Control Theory, Kingston, ON
Title: "Quadratic Performance of Distributed Optimization Algorithms"
- May '15 SIAM Conference on Applied Dynamical Systems, Salt Lake City, UT
Title: "Voltage Stability of Power Networks and Microgrids"
- Jan '15 LANL Grid Science Winter School and Conference, Santa Fe, NM
Title: "The Transmission Capacity of Power Networks"
- Dec '14 IEEE Conference on Decision and Control, Los Angeles, CA
Title: "Plug-and-play Control and Optimization in Microgrids"
- Dec '13 IEEE Conference on Decision and Control, Los Angeles, CA
Title: "Voltage Stabilization in Microgrids via Quadratic Droop Control"
- Oct '13 IEEE SmartGridComm, Vancouver, BC
Title: "Stability, Power Sharing, & Distributed Secondary Control in Droop-Controlled Microgrids"
- Nov '12 Southern California Control Workshop, San Diego, CA
Title: "Synchronization and Distributed Integral Control in Droop-Controlled Microgrids"
- Sept '12 IFAC Workshop on Distributed Estimation and Control in Networked Systems, Santa Barbara
Title: "Droop Controlled Inverters are Kuramoto Oscillators"
- May '12 LANL Workshop on Optimization and Control for Smart Grids, Santa Fe, NM
Title: "Droop Controlled Inverters are Kuramoto Oscillators"

Publications

Publication categories: Publications are organized into five categories: (1) journal articles submitted, in revision, accepted, or in-press waiting for issue and page numbers, (2) journal articles published, (3) peer-reviewed conference articles submitted, in revision, or accepted for publication, (4) peer-reviewed conference articles published, and (5) technical reports or other miscellaneous documents.

Annotation: If the paper was written in collaboration with a graduate student, the student is marked with an asterisk. If the paper was written in collaboration with a post-doctoral fellow, the post-doctoral fellow is marked with a double asterisk.

Journal Articles (Submitted, In Revision, Accepted, or To-Appear)

- [NewJ2] E. Espina^{*}, R. Cárdenas-Dobson, **J. W. Simpson-Porco**, M. Kazerani, and D. Sáez, "A consensus-based distributed secondary control optimization strategy for hybrid microgrids," *IEEE Transactions on Smart Grid*, 2022, Submitted to TSG April 26th, 2022.

- [NewJ1] Z. Tang^{**}, E. Ekomwenrenren^{*}, **J. W. Simpson-Porco**, *et al.*, “Data-driven extension of “measurement-based fast coordinated voltage control for transmission grids”,” *IEEE Transactions on Power Systems*, 2022, Submitted to IEEE Power Engineering Letters.

Journal Articles (Published)

- [J33] N. S. Guzman^{*}, M. Arriaga^{**}, C. A. Cañizares, **J. W. Simpson-Porco**, K. Bhattacharya, and D. Sohm, “Regulation signal design and fast frequency control with energy storage systems,” *IEEE Transactions on Power Systems*, vol. 37, no. 1, pp. 224–236, Jan. 2022. DOI: [10.1109/TPWRS.2021.3086075](https://doi.org/10.1109/TPWRS.2021.3086075).
- [J32] **J. W. Simpson-Porco** and N. Monshizadeh, “Diagonal stability of systems with rank-1 interconnections and application to automatic generation control in power systems,” *IEEE Transactions on Control of Network Systems*, vol. 3, no. 3, pp. 1518–1530, Sep. 2022, Early Access on IEEE Xplore September 17th, 2021. Published September, 2022. DOI: [10.1109/TCNS.2021.3113266](https://doi.org/10.1109/TCNS.2021.3113266).
- [J31] E. Ekomwenrenren^{*}, Z. Tang^{**}, **J. W. Simpson-Porco**, E. Farantatos, M. Patel, and H. Hooshyar, “Hierarchical coordinated fast frequency control using inverter-based resources,” *IEEE Transactions on Power Systems*, vol. 36, no. 6, pp. 4992–5005, Nov. 2021. DOI: [10.1109/TPWRS.2021.3075641](https://doi.org/10.1109/TPWRS.2021.3075641).
- [J30] E. Espina^{*}, R. Cárdenas-Dobson, D. Sáez, M. Kazerani, and **J. W. Simpson-Porco**, “A consensus-based secondary control strategy for hybrid ac/dc microgrids with experimental validation,” *IEEE Transactions on Power Electronics*, vol. 36, no. 5, pp. 5971–5984, May 2021. DOI: [10.1109/TPEL.2020.3031539](https://doi.org/10.1109/TPEL.2020.3031539).
- [J29] L. S. P. Lawrence^{*}, **J. W. Simpson-Porco**, and E. Mallada, “Linear-convex optimal steady-state control,” *IEEE Transactions on Automatic Control*, vol. 66, no. 11, pp. 5377–5384, Nov. 2021. DOI: [10.1109/TAC.2020.3044275](https://doi.org/10.1109/TAC.2020.3044275).
- [J28] M. Restrepo^{**}, C. A. Cañizares, **J. W. Simpson-Porco**, P. Su, and J. Taruc, “Implementation and testing of energy management systems at the CANREL microgrid facility,” *Applied Energy*, vol. 290, p. 116 760, May 2021. DOI: [10.1016/j.apenergy.2021.116760](https://doi.org/10.1016/j.apenergy.2021.116760).
- [J27] **J. W. Simpson-Porco**, “Analysis and synthesis of low-gain integral controllers for nonlinear systems,” *IEEE Transactions on Automatic Control*, vol. 66, no. 9, pp. 4148–4159, Sep. 2021. DOI: [10.1109/TAC.2020.3035569](https://doi.org/10.1109/TAC.2020.3035569).
- [J26] —, “Low-gain stability of projected integral control for input-constrained discrete-time nonlinear systems,” *IEEE Control Systems Letters*, vol. 6, pp. 788–793, Jun. 2021. DOI: [10.1109/LCSYS.2021.3086682](https://doi.org/10.1109/LCSYS.2021.3086682).
- [J25] —, “On area control errors, area injection errors, and textbook automatic generation control,” *IEEE Transactions on Power Systems*, vol. 36, no. 1, pp. 557–560, Jan. 2021. DOI: [10.1109/TPWRS.2020.3029418](https://doi.org/10.1109/TPWRS.2020.3029418).
- [J24] —, “On stability of distributed-averaging proportional-integral frequency control in power systems,” *IEEE Control Systems Letters*, vol. 5, no. 2, pp. 677–682, Apr. 2021. DOI: [10.1109/LCSYS.2020.3004024](https://doi.org/10.1109/LCSYS.2020.3004024).

- [J23] Z. Tang^{**}, E. Ekomwenrenren^{*}, **J. W. Simpson-Porco**, E. Farantatos, M. Patel, and H. Hooshyar, “Measurement-based fast coordinated voltage control for transmission grids,” *IEEE Transactions on Power Systems*, vol. 36, no. 4, pp. 3416–3429, Jul. 2021. DOI: [10.1109/TPWRS.2020.3045379](https://doi.org/10.1109/TPWRS.2020.3045379).
- [J22] M. Farrokhabadi^{**}, C. A. Cañizares, **J. W. Simpson-Porco**, *et al.*, “Microgrid stability definitions, analysis, and examples,” *IEEE Transactions on Power Systems*, vol. 35, no. 1, pp. 13–29, Jan. 2020. DOI: [10.1109/TPWRS.2019.2925703](https://doi.org/10.1109/TPWRS.2019.2925703).
- [J21] J. S. Gómez^{*}, D. Sáez, **J. W. Simpson-Porco**, and R. Cárdenas, “Distributed predictive control for frequency and voltage regulation in microgrids,” *IEEE Transactions on Smart Grid*, vol. 11, no. 2, pp. 1319–1329, Mar. 2020. DOI: [10.1109/TSG.2019.2935977](https://doi.org/10.1109/TSG.2019.2935977).
- [J20] Y. Khayat, Q. Shafiee, R. Heydari, *et al.*, “On the secondary control architectures of ac microgrids: A survey,” *IEEE Transactions on Power Electronics*, vol. 35, no. 6, pp. 6482–6500, Jun. 2020. DOI: [10.1109/TPEL.2019.2951694](https://doi.org/10.1109/TPEL.2019.2951694).
- [J19] N. Karthikeyan^{*}, J. R. Pillai, B. Bak-Jensen, and **J. W. Simpson-Porco**, “Predictive control of flexible resources for demand response in active distribution networks,” *IEEE Transactions on Power Systems*, vol. 34, no. 4, pp. 2957–2969, Jul. 2019. DOI: [10.1109/TPWRS.2019.2898425](https://doi.org/10.1109/TPWRS.2019.2898425).
- [J18] J. Llanos^{*}, D. E. Olivares, **J. W. Simpson-Porco**, M. Kazerani, and D. Saez, “A novel distributed control strategy for optimal dispatch of isolated microgrids considering congestion,” *IEEE Transactions on Smart Grid*, vol. 10, no. 6, pp. 6595–6606, Nov. 2019. DOI: [10.1109/TSG.2019.2908128](https://doi.org/10.1109/TSG.2019.2908128).
- [J17] **J. W. Simpson-Porco**, B. K. Poolla^{*}, N. Monshizadeh, and F. Dörfler, “Input-output performance of linear-quadratic saddle-point algorithms with application to distributed resource allocation problems,” *IEEE Transactions on Automatic Control*, vol. 65, no. 5, pp. 2032–2045, Jul. 2019. DOI: [10.1109/TAC.2019.2927328](https://doi.org/10.1109/TAC.2019.2927328).
- [J16] F. Dörfler, **J. W. Simpson-Porco**, and F. Bullo, “Electrical networks and algebraic graph theory: Models, properties, and applications,” *Proceedings of the IEEE*, vol. 106, pp. 977–1005, 5 May 2018. DOI: [10.1109/JPROC.2018.2821924](https://doi.org/10.1109/JPROC.2018.2821924).
- [J15] **J. W. Simpson-Porco**, “A theory of solvability for lossless power flow equations – Part I: Fixed-point power flow,” *IEEE Transactions on Control of Network Systems*, vol. 5, no. 3, pp. 1361–1372, 2018. DOI: [10.1109/TCNS.2017.2711433](https://doi.org/10.1109/TCNS.2017.2711433).
- [J14] —, “A theory of solvability for lossless power flow equations – Part II: Conditions for radial networks,” *IEEE Transactions on Control of Network Systems*, vol. 5, no. 3, pp. 1373–1385, 2018. DOI: [10.1109/TCNS.2017.2711859](https://doi.org/10.1109/TCNS.2017.2711859).
- [J13] —, “Equilibrium-Independent Dissipativity with Quadratic Supply Rates,” *IEEE Transactions on Automatic Control*, vol. 64, no. 4, pp. 1440–1455, 2018. DOI: [10.1109/TAC.2018.2838664](https://doi.org/10.1109/TAC.2018.2838664).
- [J12] M. Todescato, **J. W. Simpson-Porco**, F. Dörfler, R. Carli, and F. Bullo, “Voltage stress minimization by optimal reactive power control,” *IEEE Transactions on Control of Network Systems*, vol. 5, no. 3, pp. 1467–1478, 2018. DOI: [10.1109/TCNS.2017.2722818](https://doi.org/10.1109/TCNS.2017.2722818).
- [J11] K. Dvijotham, E. Mallada, and **J. W. Simpson-Porco**, “High-voltage solution in radial power networks: Existence, properties and equivalent algorithms,” *IEEE Control Systems Letters*, vol. 1, no. 2, pp. 322–327, 2017. DOI: [10.1109/LCSYS.2017.2717578](https://doi.org/10.1109/LCSYS.2017.2717578).

- [J10] M. Pirani^{*}, E. Hashemi, **J. W. Simpson-Porco**, B. Fidan, and A. Khajepour, “A graph theoretic approach to the robustness of k -nearest neighbor vehicle platoons,” *IEEE Transactions on Intelligent Transportation Systems*, vol. 18, no. 11, pp. 3218–3224, Nov. 2017. DOI: [10.1109/TITS.2017.2671347](https://doi.org/10.1109/TITS.2017.2671347).
- [J9] **J. W. Simpson-Porco**, “Lossy DC Power Flow,” *IEEE Transactions on Power Systems*, vol. 33, no. 3, pp. 2477–2485, 2017. DOI: [10.1109/TPWRS.2017.2749042](https://doi.org/10.1109/TPWRS.2017.2749042).
- [J8] **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “Voltage stabilization in microgrids via quadratic droop control,” *IEEE Transactions on Automatic Control*, vol. 62, no. 3, pp. 1239–1253, 2017. DOI: [10.1109/TAC.2016.2585094](https://doi.org/10.1109/TAC.2016.2585094).
- [J7] F. Dörfler, **J. W. Simpson-Porco**, and F. Bullo, “Breaking the hierarchy: Distributed control & economic optimality in microgrids,” *IEEE Transactions on Control of Network Systems*, vol. 3, no. 3, pp. 241–253, 2016. DOI: [10.1109/TCNS.2015.2459391](https://doi.org/10.1109/TCNS.2015.2459391).
- [J6] **J. W. Simpson-Porco** and F. Bullo, “Distributed monitoring of voltage collapse sensitivity indices,” *IEEE Transactions on Smart Grid*, vol. 7, no. 4, pp. 1979–1988, Jul. 2016. DOI: [10.1109/TSG.2016.2533319](https://doi.org/10.1109/TSG.2016.2533319).
- [J5] **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “Voltage collapse in complex power grids,” *Nature Communications*, vol. 7, no. 10790, 2016. DOI: [10.1038/ncomms10790](https://doi.org/10.1038/ncomms10790).
- [J4] —, “On resistive networks of constant power devices,” *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 62, no. 8, pp. 811–815, 2015. DOI: [10.1109/TCSII.2015.2433537](https://doi.org/10.1109/TCSII.2015.2433537).
- [J3] **J. W. Simpson-Porco**, Q. Shafiee, F. Dörfler, J. M. Vasquez, J. M. Guerrero, and F. Bullo, “Secondary frequency and voltage control of islanded microgrids via distributed averaging,” *IEEE Transactions on Industrial Electronics*, vol. 62, no. 11, pp. 7025–7038, 2015. DOI: [10.1109/TIE.2015.2436879](https://doi.org/10.1109/TIE.2015.2436879).
- [J2] **J. W. Simpson-Porco** and F. Bullo, “Contraction theory on Riemannian manifolds,” *Systems & Control Letters*, vol. 65, pp. 74–80, 2014. DOI: [10.1016/j.sysconle.2013.12.016](https://doi.org/10.1016/j.sysconle.2013.12.016).
- [J1] **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “Synchronization and power sharing for droop-controlled inverters in islanded microgrids,” *Automatica*, vol. 49, no. 9, pp. 2603–2611, 2013. DOI: [10.1016/j.automatica.2013.05.018](https://doi.org/10.1016/j.automatica.2013.05.018).

Refereed Conference Articles (Submitted, In Revision, Accepted, or To-Appear)

- [NewC4] L. Chen^{*} and **J. W. Simpson-Porco**, “A fixed-point algorithm for the ac power flow problem,” in *American Control Conference*, Submitted., San Diego, CA, USA, May 2023.
- [NewC3] E. Ekomwenrenren^{*}, Z. Tang^{**}, **J. W. Simpson-Porco**, *et al.*, “An integrated frequency-voltage controller for next-generation power systems,” in *IEEE PES Innovative Smart Grid Technologies Conference Europe*, Accepted to ISGT Europe 2022 on August 16th, 2022., Novi Sad, Serbia, Oct. 2022.
- [NewC2] R. Li^{*}, **J. W. Simpson-Porco**, and S. L. Smith, “Data-driven model predictive control for linear time-periodic systems,” in *IEEE Conf. on Decision and Control*, To appear at IEEE CDC 2022., Cancún, Mexico, Dec. 2022.

- [NewC1] **J. W. Simpson-Porco**, “Low-gain stabilizers for linear-convex optimal steady-state control,” in *IEEE Conf. on Decision and Control*, To appear at IEEE CDC 2022., Cancún, Mexico, Dec. 2022.

Refereed Conference Articles (Published)

- [C28] A. Agarwal^{*}, **J. W. Simpson-Porco**, and L. Pavel, “Game-theoretic feedback-based optimization,” in *IFAC Workshop on Distributed Estimation and Control in Networked Systems*, vol. 55, Zürich, Switzerland, Jul. 2022, pp. 174–179. DOI: [10.1016/j.ifacol.2022.07.255](https://doi.org/10.1016/j.ifacol.2022.07.255).
- [C27] E. Ekomwenrenren^{*}, **J. W. Simpson-Porco**, E. Farantatos, M. Patel, A. Haddadi, and L. Zhu, “Data-driven fast frequency control using inverter-based resources,” in *IREP Bulk Power System Dynamics and Control Symposium*, Banff, AB, Canada, Jul. 2022, pp. 1–11. DOI: [10.48550/arXiv.2208.01761](https://doi.org/10.48550/arXiv.2208.01761).
- [C26] E. Espina^{*}, A. Navas, J. S. Gómez, *et al.*, “Experimental performance evaluation of a distributed secondary control strategy for hybrid ac/dc-microgrids in the event of communication loss/delay,” in *European Conference on Power Electronics and Applications*, Sep. 2021, pp. 1–10.
- [C25] M. Farrokhbadi^{**}, **J. W. Simpson-Porco**, and C. A. Cañizares, “Optimal design of voltage-frequency controllers for microgrids,” in *IEEE PowerTech*, Jun. 2021, p. 6. DOI: [10.1109/PowerTech46648.2021.9495073](https://doi.org/10.1109/PowerTech46648.2021.9495073).
- [C24] T. Zheng^{*}, J. W. Simpson-Porco, and E. Mallada, “Implicit trajectory planning for feedback linearizable systems: A time-varying optimization approach,” in *American Control Conference*, Denver, CO, USA, Jul. 2020, pp. 4677–4682. DOI: [10.23919/ACC45564.2020.9147997](https://doi.org/10.23919/ACC45564.2020.9147997).
- [C23] M. H. Basiri^{*}, J. G. Thistle, **J. W. Simpson-Porco**, and S. Fischmeister, “Kalman filter based secure state estimation and individual attacked sensor detection in cyber-physical systems,” in *American Control Conference*, Philadelphia, PA, USA, Jul. 2019, pp. 3841–3848. DOI: [10.23919/ACC.2019.8814963](https://doi.org/10.23919/ACC.2019.8814963).
- [C22] M. Colombino, **J. W. Simpson-Porco**, and A. Bernstein, “Towards robustness guarantees for feedback-based optimization,” in *IEEE Conf. on Decision and Control*, Nice, France, Dec. 2019, pp. 6207–6214. DOI: [10.1109/CDC40024.2019.9029953](https://doi.org/10.1109/CDC40024.2019.9029953).
- [C21] F. Dörfler, S. Bolognani, **J. W. Simpson-Porco**, and S. Grammatico, “Distributed control and optimization for autonomous power grids,” in *European Control Conference*, Naples, Italy, Jun. 2019, pp. 2436–2453. DOI: [10.23919/ECC.2019.8795974](https://doi.org/10.23919/ECC.2019.8795974).
- [C20] J. Llanos^{*}, J. Gomez, D. Saez, D. Olivares, and **J. W. Simpson-Porco**, “Economic dispatch by secondary distributed control in microgrids,” in *European Conference on Power Electronics and Applications*, Genova, Italy, Sep. 2019, pp. 1–10. DOI: [10.23919/EPE.2019.8915499](https://doi.org/10.23919/EPE.2019.8915499).
- [C19] B. K. Poolla^{*}, **J. W. Simpson-Porco**, N. Monshizadeh, and F. Dörfler, “Quadratic performance analysis of secondary frequency controllers,” in *IEEE Conf. on Decision and Control*, Nice, France, Dec. 2019, pp. 7492–7497. DOI: [10.1109/CDC40024.2019.9029647](https://doi.org/10.1109/CDC40024.2019.9029647).

- [C18] L. S. P. Lawrence^{*}, Z. E. Nelson, E. Mallada, and **J. W. Simpson-Porco**, “Optimal steady-state control for linear time-invariant systems,” in *IEEE Conf. on Decision and Control*, Miami Beach, FL, USA, Dec. 2018, pp. 3251–3257. DOI: [10.1109/CDC.2018.8619812](https://doi.org/10.1109/CDC.2018.8619812).
- [C17] M. Pirani^{*}, E. Hashemi, B. Fidan, **J. W. Simpson-Porco**, H. Sandberg, and K. H. Johansson, “Resilient estimation and control on k -nearest neighbor platoons: A network-theoretic approach,” in *IFAC Workshop on Distributed Estimation and Control in Networked Systems*, vol. 51, Groningen, Netherlands, 2018, pp. 22–27. DOI: [10.1016/j.ifacol.2018.12.005](https://doi.org/10.1016/j.ifacol.2018.12.005).
- [C16] **J. W. Simpson-Porco**, “A Hill-Moylan lemma for equilibrium-independent dissipativity,” in *American Control Conference*, Milwaukee, WI, USA, Jun. 2018, pp. 6043–6048. DOI: [10.23919/ACC.2018.8431557](https://doi.org/10.23919/ACC.2018.8431557).
- [C15] M. Pirani^{*}, E. Hashemi, B. Fidan, and **J. W. Simpson-Porco**, “ \mathcal{H}_∞ performance of mechanical and power networks,” in *IFAC World Congress*, vol. 50, Toulouse, France, Jul. 2017, pp. 5196–5201. DOI: [10.1016/j.ifacol.2017.08.453](https://doi.org/10.1016/j.ifacol.2017.08.453).
- [C14] M. Pirani^{*}, **J. W. Simpson-Porco**, and B. Fidan, “System-theoretic performance metrics for low-inertia stability of power networks,” in *IEEE Conf. on Decision and Control*, Melbourne, VIC, Australia, Dec. 2017, pp. 5106–5111. DOI: [10.1109/CDC.2017.8264415](https://doi.org/10.1109/CDC.2017.8264415).
- [C13] C. D. Persis, N. Monshizadeh, and **J. W. Simpson-Porco**, “The cost of dishonesty on optimal distributed frequency control of power networks,” in *IEEE Conf. on Decision and Control*, Las Vegas, NV, USA, Dec. 2016, pp. 7508–7513. DOI: [10.1109/CDC.2016.7799429](https://doi.org/10.1109/CDC.2016.7799429).
- [C12] **J. W. Simpson-Porco**, “Input/output analysis of primal-dual gradient algorithms,” in *Allerton Conf. on Communications, Control and Computing*, Monticello, IL, USA, Sep. 2016, pp. 219–224. DOI: [10.1109/ALLERTON.2016.7852233](https://doi.org/10.1109/ALLERTON.2016.7852233).
- [C11] **J. W. Simpson-Porco** and N. Monshizadeh, “Model-free wide-area monitoring of power grids via cutset voltages,” in *IEEE Conf. on Decision and Control*, Las Vegas, NV, USA, Dec. 2016, pp. 7508–7513. DOI: [10.1109/CDC.2016.7799429](https://doi.org/10.1109/CDC.2016.7799429).
- [C10] **J. W. Simpson-Porco**, B. K. Poolla^{*}, N. Monshizadeh, and F. Dörfler, “Quadratic performance of primal-dual methods with application to secondary frequency control of power systems,” in *IEEE Conf. on Decision and Control*, Las Vegas, NV, USA, Dec. 2016, pp. 1840–1845. DOI: [10.1109/CDC.2016.7798532](https://doi.org/10.1109/CDC.2016.7798532).
- [C9] E. Tegling, M. Andreasson, **J. W. Simpson-Porco**, and H. Sandberg, “Improving performance of droop-controlled microgrids through distributed PI-control,” in *American Control Conference*, Boston, MA, USA, Jul. 2016, pp. 2321–2327. DOI: [10.1109/ACC.2016.7525264](https://doi.org/10.1109/ACC.2016.7525264).
- [C8] **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “A solvability condition for reactive power flow,” in *IEEE Conf. on Decision and Control*, Osaka, Japan, Dec. 2015, pp. 2013–2017. DOI: [10.1109/CDC.2015.7402502](https://doi.org/10.1109/CDC.2015.7402502).
- [C7] M. Todescato, **J. W. Simpson-Porco**, F. Dörfler, R. Carli, and F. Bullo, “Optimal voltage support and stress minimization in power networks,” in *IEEE Conf. on Decision and Control*, Osaka, Japan, Dec. 2015, pp. 6921–6926. DOI: [10.1109/CDC.2015.7403310](https://doi.org/10.1109/CDC.2015.7403310).

- [C6] F. Dörfler, **J. W. Simpson-Porco**, and F. Bullo, “Plug-and-play control and optimization in microgrids,” in *IEEE Conf. on Decision and Control*, Los Angeles, CA, USA, Dec. 2014, pp. 211–216. DOI: [10.1109/CDC.2014.7039383](https://doi.org/10.1109/CDC.2014.7039383).
- [C5] B. Gentile, **J. W. Simpson-Porco**, F. Dörfler, S. Zampieri, and F. Bullo, “On reactive power flow and voltage stability in microgrids,” in *American Control Conference*, Portland, OR, USA, Jun. 2014, pp. 759–764. DOI: [10.1109/ACC.2014.6859434](https://doi.org/10.1109/ACC.2014.6859434).
- [C4] H. Bouattour, **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “Further results on distributed secondary control in microgrids,” in *IEEE Conf. on Decision and Control*, Florence, Italy, Dec. 2013, pp. 1514–1519. DOI: [10.1109/CDC.2013.6760097](https://doi.org/10.1109/CDC.2013.6760097).
- [C3] **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “Voltage stabilization in microgrids via quadratic droop control,” in *IEEE Conf. on Decision and Control*, Florence, Italy, Dec. 2013, pp. 7582–7589. DOI: [10.1109/CDC.2013.6761093](https://doi.org/10.1109/CDC.2013.6761093).
- [C2] **J. W. Simpson-Porco**, F. Dörfler, Q. Shafiee, J. M. Guerrero, and F. Bullo, “Stability, power sharing, & distributed secondary control in droop-controlled microgrids,” in *IEEE Int. Conf. on Smart Grid Communications*, Vancouver, BC, Canada, Oct. 2013, pp. 672–677. DOI: [10.1109/SmartGridComm.2013.6688036](https://doi.org/10.1109/SmartGridComm.2013.6688036).
- [C1] **J. W. Simpson-Porco**, F. Dörfler, and F. Bullo, “Droop-controlled inverters are Kuramoto oscillators,” in *IFAC Workshop on Distributed Estimation and Control in Networked Systems*, Santa Barbara, CA, USA, Sep. 2012, pp. 264–269. DOI: [10.3182/20120914-2-US-4030.00055](https://doi.org/10.3182/20120914-2-US-4030.00055).

Technical Reports / Other

- [TR1] **J. W. Simpson-Porco**, “Low-gain stabilizers for linear-convex optimal steady-state control (extended version),” U. Toronto, Tech. Rep., 2022, Available online.
- [TR2] —, “Low-gain stability of projected integral control for input-constrained discrete-time nonlinear systems (extended version),” U. Toronto, Tech. Rep., 2021, Available online.
- [TR3] M. Restrepo**, C. A. Cañizares, and **J. W. Simpson-Porco**, “Development of a diesel genset emulator and energy management systems for the canadian renewable energy laboratory,” University of Waterloo, Tech. Rep., Sep. 2019, Private report for Canadian Solar Solutions Inc.
- [TR4] M. Farrokhabadi**, C. A. Cañizares, **J. W. Simpson-Porco**, *et al.*, “Microgrid stability definitions, analysis, and modeling,” IEEE-PES Task Force on Microgrid Stability Analysis and Modeling, Tech. Rep. PES-TR-66, Apr. 2018.

10 Professional Activities and Service

10.1 Society Memberships

2020–
2010–
IEEE PES Power System Dynamic Performance Committee
Institute for Electrical and Electronics Engineers (IEEE)
Student Member, 2010–2015
Member, 2015–present
Senior Member, 2022–present

2010– Member, IEEE Control Systems Society (CSS)
2015– Member, IEEE Power and Energy Society (PES)

10.2 Editorships

2020– Associate Editor, IEEE Transactions on Smart Grid
2020– Associate Editor, IEEE Power & Energy Society Letters

10.3 Technical Program Committee Member

2018 IEEE Smart Grid Comm, Control and Operation Symposium
2017 IEEE Smart Grid Comm, Control and Operation Symposium
2016 IEEE GLOBECOMM, Workshop on Cyber-Physical Smart Grid Security and Resilience

10.4 IEEE PES Task Force Participation

'20-'22 Section Lead, Task Force on Microgrid Stability Analysis and Modeling II
'17-'19 Contributor, Task Force on Microgrid Stability Analysis and Modeling I

10.5 Conference Invited Sessions Organized

2021 “Optimization and Control for Energy Systems” *Canadian Operations Research Conference*, Toronto, ON, Canada.
2021 “Control-Theoretic Methods in Optimization” *Canadian Operations Research Conference*, Toronto, ON, Canada.
2018 “Real-time optimization in power networks”, *INFORMS Annual Meeting*, Phoenix, AZ, USA

10.6 External Grant Reviewer

2020 MITACS Accelerate
2020 NSERC Canada Research Chair Program
2019 Swiss National Science Foundation
2019 NSERC Discovery Program

10.7 Technical Reviewer

Journals IEEE Transactions on Automatic Control ◦ IEEE Transactions on Control Systems Technology ◦ IEEE Transactions on Circuits and Systems ◦ IEEE Emerging and Selected Topics in Circuits and Systems ◦ Automatica ◦ IEEE Transactions on Power Systems ◦ IEEE Transactions on Smart Grid ◦ IEEE Transactions on Power Electronics ◦ IEEE Transactions on Sustainable Energy ◦ Nature Communications ◦ New Journal of Physics

Conferences IEEE Conference on Decision and Control ◦ American Control Conference ◦ IFAC Workshop on Distributed Estimation and Control in Networked Systems ◦ IFAC Symposium on Robust Control Design ◦ IFAC Workshop on Lagrangian and Hamiltonian Methods for Non Linear Control ◦ IEEE Multiconference on Systems and Control ◦ IEEE Smart Grid Comm

11 University Service

11.1 PhD Thesis Committee Member

2022	Mattia Giaccagli, Automatique, Université Claude Bernard of Lyon 1, LAGEPP
2022	Bolin Gao, ECE, University of Toronto
2021	Baheej Alghamdi, ECE, University of Waterloo
2020	Nur Zengin, SYDE, University of Waterloo
2020	Ahmad Bilal Asghar, ECE, University of Waterloo
2020	Ivan Calero, ECE, University of Waterloo
2019	Juan C. Machado, Electrical Engineering, LSS-Supelec Paris
2019	Bala Kameshwar Poolla, IFA, Swiss Federal Institute of Technology (ETH) Zürich
2016	Ebrahim Moradi Shahrivar, ECE, University of Waterloo

11.2 MSc Thesis Committee Member

2022	Kuei-Fang (Albert) Hsueh (ECE, Supervisor: D. Kundur), University of Toronto
2020	Ahmad Abdel Gawad (ECE, Supervisor: M. Broucke), University of Toronto
2018	Joel Simard (ECE, Supervisor: D. E. Miller and C. Nielsen), University of Waterloo
2017	Dario Peralta (ECE, Supervisor: C. Canizares), University of Waterloo
2017	Come Carquex (ECE, C. Rosenberg), University of Waterloo