

DANIEL K. MOLZAHN

Assistant Professor

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Education

University of Michigan

2013 – 2015 Dow Sustainability Fellow, Department of Electrical Engineering and Computer Science
• Supervisor: Dr. Ian Hiskens

University of Wisconsin–Madison

2013 Ph.D. Electrical Engineering (Electric Power Systems)
• Dissertation: *Application of Semidefinite Optimization Techniques to Problems in Electric Power Systems*
• 2014 Harold A. Peterson Best Dissertation Award, Second Place
• Advisor: Dr. Bernard Lesieutre
2012 M.P.A. La Follette School of Public Affairs
2010 M.S. Electrical Engineering
• Thesis: *Power System Models Formulated as Eigenvalue Problems and Properties of Their Solutions*
• Certificate in Energy Analysis and Policy
• Grainger Power Engineering Award
2008 B.S. Electrical Engineering, Mathematics
• Graduated with Highest Distinction Honors

Experience

2019 – Assistant Professor, Georgia Institute of Technology, School of Electrical and Computer Engineering
2015 – Computational Engineer, Argonne National Laboratory, Energy Systems Division

Awards

2022 National Science Foundation CAREER Award
2021 IEEE PES Outstanding Young Engineer Award
2021, 2020 Department of Energy ARPA-E Grid Optimization Competition Challenge 1: second place out of 27 teams, resulting in a \$400k prize. Challenge 2: six/seventh place out of 16 teams, resulting in a \$30k prize.

- 2020 PSCC 2020 Highlights Award, top 3% of papers at the Power Systems Computation Conference
- 2020 Working Group Award for Technical Report from the IEEE Power and Energy Society (PES) Power System Operation, Planning and Economics (PSOPE) Committee
- 2019 Thank a Teacher Certificate, Georgia Institute of Technology
- 2017 Best Reviewer 2017, IEEE Transactions on Smart Grid
- 2017 High-quality paper award, IEEE Manchester PowerTech Conference
- 2016 Best presentation in session award, American Control Conference
- 2013 Harold A. Peterson Best Dissertation Award, Second Place, Department of Electrical and Computer Engineering, University of Wisconsin—Madison
- 2010, 2008 Grainger Power Engineering Award
- 2009 National Science Foundation Graduate Research Fellowship
- 2008 Distinguished Fellowship, Department of Electrical and Computer Engineering, University of Wisconsin—Madison

Publications

In Review (Journal Articles)

1. I. Aravena, **D.K. Molzahn**, S. Zhang, F.E. Curtis, S. Tu, A. Wächter, E. Wei, E. Wong, A. Gholami, K. Sun, X.A. Sun, S.T. Elbert, J.T. Holzer, and A. Veeramany, “Recent Developments in Security-Constrained AC Optimal Power Flow: Overview of Challenge 1 in the ARPA-E Grid Optimization Competition,” submitted.
2. S. Talkington, D. Turizo, S. Grijalva, J. Fernandez, and **D.K. Molzahn**, “Conditions for Estimation of Sensitivities of Voltage Magnitudes to Complex Power Injections,” submitted.
3. B. Taheri, **D.K. Molzahn**, and S. Grijalva, “Improving Distribution System Resilience by Undergrounding Lines and Deploying Mobile Generators,” submitted.
4. O. Kuryatnikova, B. Ghaddar, and **D.K. Molzahn**, “Adjustable Robust Two-Stage Polynomial Optimization with Application to AC Optimal Power Flow,” submitted.
5. C. Hettle, S. Gupta, and **D.K. Molzahn**, “Fair and Reliable Reconnections for Temporary Disruptions in Electric Distribution Networks using Submodularity,” submitted.
6. F.E. Curtis, **D.K. Molzahn**, S. Tu, A. Wächter, E. Wei, and E. Wong, “A Decomposition Algorithm for Large-Scale Security-Constrained AC Optimal Power Flow,” submitted.
7. D. Turizo and **D.K. Molzahn**, “Invertibility Conditions for the Admittance Matrices of Balanced Power Systems,” submitted.

In Review (Conference Proceedings)

1. B. Taheri and **D.K. Molzahn**, “Restoring AC Power Flow Feasibility for Solutions to Relaxed and Approximated Optimal Power Flow Problems,” submitted.
2. A.D. Owen Aquinio, R. Harris, A. Kody, and **D.K. Molzahn**, “Comparing Machine Learning and Optimization Approaches for the $N - k$ Interdiction Problem Considering Load Variability,” submitted.

Monographs

- 2019 1. **D.K. Molzahn** and I.A. Hiskens, “A Survey of Relaxations and Approximations of the Power Flow Equations,” *Foundations and Trends in Electric Energy Systems*, vol. 4, no. 1-2, pp. 1-221, February 2019.

Journal Articles

- 2022 1. L.A. Roald, D. Pozo, A. Papavasiliou, **D.K. Molzahn**, J. Kazempour, and A. Conejo, “Power Systems Optimization under Uncertainty: A Review of Methods and Applications,” to appear in *Electric Power Systems Research*, to be presented at *22nd Power Systems Computation Conference (PSCC 2022)*.
2. A. Kody, S. Chevalier, S. Chatzivasileiadis, and **D.K. Molzahn**, “Modeling the AC Power Flow Equations with Optimally Compact Neural Networks: Application to Unit Commitment,” to appear in *Electric Power Systems Research*, to be presented at *22nd Power Systems Computation Conference (PSCC 2022)*.
3. S. Zeng, A. Kody, Y. Kim, K. Kim, and **D.K. Molzahn**, “A Reinforcement Learning Approach to Parameter Selection for Distributed Optimization in Power Systems,” to appear in *Electric Power Systems Research*, to be presented at *22nd Power Systems Computation Conference (PSCC 2022)*.
4. P. Buason, S. Misra, and **D.K. Molzahn**, “A Sample-Based Approach for Computing Conservative Linear Power Flow Approximations,” to appear in *Electric Power Systems Research*, to be presented at *22nd Power Systems Computation Conference (PSCC 2022)*.
5. M. Alkhraijah, C. Menendez, and **D.K. Molzahn**, “Assessing the Impacts of Nonideal Communications on Distributed Optimal Power Flow Algorithms,” to appear in *Electric Power Systems Research*, to be presented at *22nd Power Systems Computation Conference (PSCC 2022)*.
6. N. Patari, V. Venkataramanan, A.K. Srivastava, **D.K. Molzahn**, N. Li, and A. Annaswamy, “Distributed Optimization in Distribution Systems: Use Cases, Limitations, and Research Needs,” to appear in *IEEE Transactions on Power Systems*.
7. J. Liu, B. Cui, **D.K. Molzahn**, C. Chen, and X. Lu, “Optimal Power Flow for DC Networks with Robust Feasibility and Stability Guarantees,” *IEEE Transactions on Control of Network Systems*, vol. 9, no. 2, pp. 904-916, June 2022.
- 2021 8. D. Lee, K. Turitsyn, **D.K. Molzahn**, and L.A. Roald, “Robust AC Optimal Power Flow with Robust Convex Restriction,” *IEEE Transactions on Power Systems*, vol. 36, no. 6, pp. 4953-4966, November 2021.
9. M. Alkhraijah, M. Alowaiifeer, M. Alsaleh, A. Alfariis, **D.K. Molzahn**, “The Effects of Social Distancing on the Temperature-Demand Relationship,” *Energies*, vol. 14, no. 2, 2021.
10. M.R. Narimani, **D.K. Molzahn**, and M.L. Crow, “Tightening QC Relaxations of AC Optimal Power Flow Problems via Complex Per Unit Normalization,” *IEEE Transactions on Power Systems*, vol. 36, no. 1, pp. 281-291, January 2021.
11. A. Peña Ordieres, **D.K. Molzahn**, L.A. Roald, and A. Wächter, “DC Optimal Power Flow with Joint Chance Constraints,” *IEEE Transactions on Power Systems*, vol. 36, no. 1, pp. 147-158, January 2021.
12. **D.K. Molzahn** and C. Rehtanz, “Forward to the EPSR Special Issue for PSCC 2020,” *Electric Power Systems Research*, vol. 190, January 2021.

13. A. Venzke, **D.K. Molzahn**, and S. Chatzivasileiadis, “Efficient Creation of Datasets for Data-Driven Power System Applications,” *Electric Power Systems Research*, vol. 190, January 2021. Presented at *21st Power Systems Computation Conference (PSCC)*, June 29 – July 3, 2020.
14. B. Li, B. Cui, F. Qiu, and **D.K. Molzahn**, “Balancibility: Existence and Uniqueness of Power Flow Solutions under Voltage Balance Requirements,” *Electric Power Systems Research*, vol. 190, January 2021. Presented at *21st Power Systems Computation Conference (PSCC)*, June 29 – July 3, 2020. **PSCC 2020 Highlights Award, top 3% of papers at the 21st Power Systems Computation Conference.**
- 2020 15. A. Venzke, S. Chatzivasileiadis, and **D.K. Molzahn**, “Inexact Convex Relaxations of AC Optimal Power Flow Problems: Towards AC Feasibility,” *Electric Power Systems Research*, vol. 187, October 2020.
16. D. Lee, K. Turitsyn, **D.K. Molzahn**, and L.A. Roald, “Feasible Path Identification in Optimal Power Flow with Sequential Convex Restriction,” *IEEE Transactions on Power Systems*, vol. 35, no. 5, pp. 3648-3659, September 2020.
- 2019 17. A. Barzegar, **D.K. Molzahn**, and R. Su, “A Method for Quickly Bounding the Optimal Objective Value of an OPF Problem using a Semidefinite Relaxation and a Local Solution,” *Electric Power Systems Research*, vol. 177, December 2019.
18. M. Yao, **D.K. Molzahn**, and J.L. Mathieu, “A Multiperiod Optimal Power Flow Approach to Improve Power System Voltage Stability Using Demand Response,” *IEEE Transactions on Control of Network Systems*, special issue on *Analysis, Control, and Optimization of Energy System Networks*, vol. 6, no. 3, pp. 1015-1025, September 2019.
19. **D.K. Molzahn** and J. Wang, “Detection and Characterization of Intrusions to Network Parameter Data in Electric Power System Operations,” *IEEE Transactions on Smart Grid*, vol. 10, no. 4, pp. 3919-3928, July 2019.
- 2018 20. **D.K. Molzahn**, “Identifying and Characterizing Non-Convexities in Feasible Spaces of Optimal Power Flow Problems,” *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 65, no. 5, pp. 672-676, May 2018. Presented at *IEEE International Symposium on Circuits and Systems (ISCAS)*, special session on *On-line Identification, Control, & Optimization of Electric Power Systems*, 27-30 May 2018.
21. C. Jozs and **D.K. Molzahn**, “Lasserre Hierarchy for Large Scale Polynomial Optimization in Real and Complex Variables,” *SIAM Journal on Optimization*, vol. 28, no. 2, pp. 1017-1048, 2018.
22. **D.K. Molzahn**, “Identifying Redundant Flow Limits on Parallel Lines,” *IEEE Transactions on Power Systems (Letters)*, vol. 33, no. 3, pp. 1-3, May 2018.
23. O. Coss, J.D. Hauenstein, H. Hong, and **D.K. Molzahn**, “Locating and Counting Equilibria of the Kuramoto Model with Rank One Coupling,” *SIAM Journal on Applied Algebra and Geometry*, vol. 2, no. 1, pp. 45-71, 2018.
24. D. Wu, **D.K. Molzahn**, B.C. Lesieutre, and K. Dvijotham, “A Deterministic Method to Identify Multiple Local Extrema for the AC Optimal Power Flow Problem,” *IEEE Transactions on Power Systems*, vol. 33, no. 1, pp. 654-668, January 2018.
- 2017 25. J. Lavaei, S.H. Low, R. Baldick, B. Zhang, **D.K. Molzahn**, F. Dörfler, H. Sandberg, “Guest Editorial: Distributed Control and Efficient Optimization Methods for Smart Grid,” *IEEE Transactions on Smart Grid*, special issue on *Distributed Control and Efficient Optimization Methods for Smart Grid*, vol. 8, no. 6, pp. 2939-2940, November 2017.

26. **D.K. Molzahn**, F. Dörfler, H. Sandberg, S.H. Low, S. Chakrabarti, R. Baldick, and J. Lavaei, “A Survey of Distributed Optimization and Control Algorithms for Electric Power Systems,” *IEEE Transactions on Smart Grid, Special issue on Distributed Control and Efficient Optimization Methods for Smart Grid*, vol. 8, no. 6, pp. 2941-2962, November 2017.
27. **D.K. Molzahn**, “Computing the Feasible Spaces of OPF Problems,” *IEEE Transactions on Power Systems*, vol. 32, no. 6, pp. 4752-4763, November 2017.
28. **D.K. Molzahn**, “Incorporating Squirrel-Cage Induction Machine Models in Convex Relaxations of OPF Problems,” *IEEE Transactions on Power Systems (Letters)*, vol. 32, no. 6, pp. 4972-4974, November 2017.
29. J.F. Marley, **D.K. Molzahn**, and I.A. Hiskens, “Solving Multiperiod OPF Problems using an AC-QP Algorithm Initialized with an SOCP Relaxation,” *IEEE Transactions on Power Systems*, vol. 32, no. 5, pp. 3538-3548, September 2017.
30. **D.K. Molzahn**, C. Jozs, I.A. Hiskens, and P. Panciatici, “A Laplacian-Based Approach for Finding Near Globally Optimal Solutions to OPF Problems,” *IEEE Transactions on Power Systems*, vol. 32, no. 1, pp. 305-315, January 2017.
- 2016 31. **D.K. Molzahn** and I.A. Hiskens, “Convex Relaxations of Optimal Power Flow Problems: An Illustrative Example,” *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 63, no. 5, pp. 650-660, May 2016.
- 2015 32. **D.K. Molzahn** and I.A. Hiskens, “Sparsity-Exploiting Moment-Based Relaxations of the Optimal Power Flow Problem,” *IEEE Transactions on Power Systems*, vol. 30, no. 6, pp. 3168-3180, November 2015.
- 2014 33. **D.K. Molzahn**, B.C. Lesieutre, and C.L. DeMarco, “Approximate Representation of ZIP Loads in a Semidefinite Relaxation of the OPF Problem,” *IEEE Transactions on Power Systems, Letters*, vol. 29, no. 4, pp. 1864-1865, July 2014.
34. **D.K. Molzahn**, B.C. Lesieutre, and C.L. DeMarco, “A Sufficient Condition for Global Optimality of Solutions to the Optimal Power Flow Problem,” *IEEE Transactions on Power Systems, Letters*, vol. 29, no. 2, pp. 978-979, March 2014.
- 2013 35. **D.K. Molzahn**, J.T. Holzer, B.C. Lesieutre, and C.L. DeMarco, “Implementation of a Large-Scale Optimal Power Flow Solver Based on Semidefinite Programming,” *IEEE Transactions on Power Systems*, vol. 28, no. 4, pp. 3987-3998, November 2013.
36. **D.K. Molzahn**, B.C. Lesieutre, and C.L. DeMarco, “A Sufficient Condition for Power Flow Insolvability with Applications to Voltage Stability Margins,” *IEEE Transactions on Power Systems*, vol. 28, no. 3, pp. 2592-2601, August 2013.
37. **D.K. Molzahn** and B.C. Lesieutre, “Initializing Dynamic Power System Simulations Using Eigenvalue Formulations of the Induction Machine and Power Flow Models,” *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 60, no. 3, pp. 690-702, March 2013.
38. **D.K. Molzahn**, B.C. Lesieutre, and H. Chen, “Counterexample to a Continuation-Based Algorithm for Finding All Power Flow Solutions,” *IEEE Transactions on Power Systems, Letters*, vol. 28, no. 1, pp. 564-565, February 2013.
- 2011 39. **D.K. Molzahn** and C. Singletary, “An Empirical Investigation of Speculation in the MISO Financial Transmission Rights Auction Market,” *The Electricity Journal*, vol. 24, issue 5, pp. 57-68, June 2011.

Conference Proceedings

- 2022 1. A. Kody, A. West, and **D.K. Molzahn**, “Sharing the Load: Considering Fairness in De-energization Scheduling to Mitigate Wildfire Ignition Risk using Rolling Optimization,” to appear in *61st IEEE Control and Decision Conference (CDC)*, December 6-9, 2022.
2. M. Alkhraijah, R. Harris, S. Litchfield, D. Huggins, and **D.K. Molzahn**, “Analyzing Malicious Data Injection Attacks on Distributed Optimal Power Flow Algorithms,” to appear in *54th North American Power Symposium (NAPS)*, October 2-4, 2022.
3. A. Kody, R. Piansky, and **D.K. Molzahn**, “Optimizing Transmission Infrastructure Investments to Support Line De-energization for Mitigating Wildfire Ignition Risk,” to appear in *11th Bulk Power Systems Dynamics and Control Symposium (IREP 2022)*, July 25-30, 2022.
4. R. Harris, M. Alkhraijah, D. Huggins, and **D.K. Molzahn**, “On the Impacts of Different Consistency Constraint Formulations for Distributed Optimal Power Flow,” *Texas Power and Energy Conference (TPEC)*, February 28 - March 1, 2022.
- 2021 5. S. Xu, R. Ma, **D.K. Molzahn**, H.L. Hijazi, and C. Jozs, “Verifying Global Optimality of Candidate Solutions to Polynomial Optimization Problems using a Determinant Relaxation Hierarchy,” *60th IEEE Conference on Decision and Control (CDC)*, December 13-15, 2021.
6. A.D. Owen Aquino, L.A. Roald, and **D.K. Molzahn**, “Identifying Redundant Constraints for AC OPF: The Challenges of Local Solutions, Relaxation Tightness, and Approximation Inaccuracy,” *53rd North American Power Symposium (NAPS)*, November 14-16, 2021.
7. P. Buason and **D.K. Molzahn**, “Analysis of Fast Decoupled Power Flow via Multiple Axis Rotations,” *North American Power Symposium (NAPS)*, April 11-13, 2021.
8. A. Ivemeyer, M. Bossart, R.W. Kenyon, A. Sajadi, B.-M. Hodge, and **D.K. Molzahn**, “Assessing the Accuracy of Balanced Power System Models in the Presence of Voltage Unbalance,” *Power and Energy Conference at Illinois (PECI)*, April 1-2, 2021.
9. M. Alkhraijah, M. Alowaifeer, X. Li, M.J. Till, and **D.K. Molzahn**, “Reactive Power Planning using Security-Constrained AC Optimal Power Flow and Sensitivity Analyses,” *Power and Energy Conference at Illinois (PECI)*, April 1-2, 2021.
10. S. Tandon, S. Grijalva, and **D.K. Molzahn**, “Motivating the Use of Dynamic Line Ratings to Mitigate the Risk of Wildfire Ignition,” *Power and Energy Conference at Illinois (PECI)*, April 1-2, 2021.
11. M. Alkhraijah, M. Alowaifeer, S. Grijalva, and **D.K. Molzahn**, “Distributed Multi-Period DCOPF via an Auxiliary Principle Problem Algorithm,” *5th IEEE Texas Power and Energy Conference (TPEC)*, February 2-5, 2021.
- 2020 12. Z.J. Zhang, P.T. Mana, D. Yan, Y. Sun, and **D.K. Molzahn**, “Study of Active Line Flow Constraints in DC Optimal Power Flow Problems,” *IEEE SoutheastCon*, March 12-15, 2020.
- 2019 13. K. Girigoudar, **D.K. Molzahn**, and L.A. Roald, “On The Relationships Among Different Voltage Unbalance Definitions,” *North American Power Symposium (NAPS)*, 13-15 October 2019.
14. L.A. Roald and **D.K. Molzahn**, “Implied Constraint Satisfaction in Power System Optimization: The Impacts of Load Variations,” *57th Annual Allerton Conference on Communication, Control, and Computing*, 25-27 September 2019.
15. T. Mühlfordt, **D.K. Molzahn**, V. Hagenmeyer, and S. Misra, “Optimal Adaptive Power Flow Linearizations: Expected Error Minimization using Polynomial Chaos Expansion,” *IEEE Milan PowerTech*, 23-27 June 2019.

16. C. Josz, **D.K. Molzahn**, M. Tacchi, and S. Sojoudi, “Transient Stability Analysis of Power Systems via Occupation Measures,” *Innovative Smart Grid Technologies (ISGT)*, 17-20 February 2019.
17. **D.K. Molzahn** and L.A. Roald, “Grid-Aware versus Grid-Agnostic Distribution System Control: A Method for Certifying Engineering Constraint Satisfaction,” *52nd Hawaii International Conference on System Sciences (HICSS)*, 8-11 January 2019.
- 2018 18. M.R. Narimani, **D.K. Molzahn**, H. Nagarajan, and M.L. Crow, “Comparison of Various Trilinear Monomial Envelopes for Convex Relaxations of Optimal Power Flow Problems,” to appear in *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 26-28 November 2018.
19. M.R. Narimani, **D.K. Molzahn**, D. Wu, and M.L. Crow, “Empirical Investigation of Non-Convexities in Optimal Power Flow Problems,” *American Control Conference (ACC)*, 27-29 June 2018.
20. **D.K. Molzahn** and L.A. Roald, “Towards an AC Optimal Power Flow Algorithm with Robust Feasibility Guarantees,” *20th Power Systems Computation Conference (PSCC)*, 11-15 June 2018.
21. M.R. Narimani, **D.K. Molzahn**, and M.L. Crow, “Improving QC Relaxations of OPF Problems via Voltage Magnitude Difference Constraints and Envelopes for Trilinear Monomials,” *20th Power Systems Computation Conference (PSCC)*, 11-15 June 2018.
22. S. Misra, **D.K. Molzahn**, and K. Dvijotham, “Optimal Adaptive Approximations of the AC Power Flow Equations,” *20th Power Systems Computation Conference (PSCC)*, 11-15 June 2018.
23. J.A. Kersulis, I.A. Hiskens, C. Coffrin, and **D.K. Molzahn**, “Topological Graph Metrics for Detecting Grid Anomalies and Improving Algorithms,” *20th Power Systems Computation Conference (PSCC)*, 11-15 June 2018.
- 2017 24. M. Yao, **D.K. Molzahn**, and J.L. Mathieu, “The Impact of Load Models in an Algorithm for Improving Power System Voltage Stability via Demand Response,” *55th Annual Allerton Conference on Communication, Control, and Computing*, October 4-6, 2017.
25. L.A. Roald, **D.K. Molzahn**, and A.F. Tobler, “Power System Optimization with Uncertainty and AC Power Flow: Analysis of an Iterative Algorithm,” *IREP Symposium on Bulk Power System Dynamics and Control – X. The Power System of the Future: Global Dynamics arising from Distributed Actions*, August 27–September 1, 2017.
26. M. Yao, J.L. Mathieu, and **D.K. Molzahn**, “Using Demand Response to Improve Power System Voltage Stability Margins,” *IEEE PowerTech Manchester*, 18-22 June 2017.
High-quality paper award.
- 2016 27. K. Dvijotham and **D.K. Molzahn**, “Error Bounds on the DC Power Flow Approximation: A Convex Relaxation Approach,” *IEEE 55th Annual Conference on Decision and Control (CDC)*, 12-14 December 2016.
28. **D.K. Molzahn**, C. Josz, and I.A. Hiskens, “Moment Relaxations of Optimal Power Flow Problems: Beyond the Convex Hull,” *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 7-9 December 2016.
29. **D.K. Molzahn**, D. Mehta, and M. Niemerg, “Toward Topologically Based Upper Bounds on the Number of Power Flow Solutions,” *American Control Conference (ACC)*, 6-8 July 2016.
Best presentation in session award.

- 30. D. Mehta, **D.K. Molzahn**, K. Turitsyn, “Recent Advances in Computational Methods for the Power Flow Equations,” *American Control Conference (ACC)*, 6-8 July 2016.
- 31. **D.K. Molzahn**, C. Jozs, I.A. Hiskens, and P. Panciatici, “Computational Advances for Sparsity-Exploiting Moment Relaxations of the OPF Problem,” *19th Power Systems Computation Conference (PSCC)*, 20-24 June 2016.
- 32. **D.K. Molzahn**, I.A. Hiskens, and B.C. Lesieutre, “Calculation of Voltage Stability Margins and Certification of Power Flow Insolvability using Second-Order Cone Programming,” *49th Hawaii International Conference on System Sciences (HICSS)*, 5-8 January 2016.
- 2015 33. **D.K. Molzahn**, C. Jozs, I.A. Hiskens, and P. Panciatici, “Solution of Optimal Power Flow Problems using Moment Relaxations Augmented with Objective Function Penalization,” *IEEE 54th Annual Conference on Decision and Control (CDC)*, 15-18 December 2015.
- 34. **D.K. Molzahn**, Z.B. Friedman, B.C. Lesieutre, C.L. DeMarco, and M.C. Ferris, “Estimation of Constraint Parameters in Optimal Power Flow Data Sets,” *47th North American Power Symposium (NAPS)*, 4-6 October 2015.
- 35. **D.K. Molzahn** and I.A. Hiskens, “Mixed SDP/SOCP Moment Relaxations of the Optimal Power Flow Problem,” *IEEE PowerTech Eindhoven*, 29 June–2 July, 2015.
- 36. **D.K. Molzahn**, S.S. Baghsorkhi, and I.A. Hiskens, “Semidefinite Relaxations of Equivalent Optimal Power Flow Problems: An Illustrative Example,” *2015 IEEE International Symposium on Circuits and Systems (ISCAS)*, 24-27 May 2015.
- 2014 37. P. Panciatici, M.C. Campi, S. Garatti, S.H. Low, **D.K. Molzahn**, A.X. Sun, L. Wehenkel, “Advanced Optimization Methods for Power Systems,” *18th Power Systems Computation Conference (PSCC)*, 18-22 August 2014.
- 38. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxation of the Optimal Power Flow Problem,” *18th Power Systems Computation Conference (PSCC)*, 18-22 August 2014.
- 39. **D.K. Molzahn**, B.C. Lesieutre, and C.L. DeMarco, “Investigation of Non-Zero Duality Gap Solutions to a Semidefinite Relaxation of the Optimal Power Flow Problem,” *47th Hawaii International Conference on System Sciences (HICSS)*, 2014, 6-9 January 2014.
- 2013 40. A.R. Borden, **D.K. Molzahn**, B.C. Lesieutre, and P. Ramanathan, “Power System Structure and Confidentiality Preserving Transformation of Optimal Power Flow Model,” *51st Annual Allerton Conference on Communication, Control, and Computing*, 2-4 October 2013.
- 41. **D.K. Molzahn**, V. Dawar, B.C. Lesieutre, and C.L. DeMarco, “Sufficient Conditions for Power Flow Insolvability Considering Reactive Power Limited Generators with Applications to Voltage Stability Margins,” *IREP Symposium on Bulk Power System Dynamics and Control – IX. Optimization, Security, and Control of the Emerging Power Grid*, 25-30 August 2013.
- 2012 42. A.R. Borden, **D.K. Molzahn**, P. Ramanathan, and B.C. Lesieutre, “Confidentiality-Preserving Optimal Power Flow for Cloud Computing,” *50th Annual Allerton Conference on Communication, Control, and Computing*, pp. 1300-1307, 1-5 October 2012.
- 2011 43. B.C. Lesieutre, **D.K. Molzahn**, A.R. Borden, and C.L. DeMarco, “Examining the Limits of the Application of Semidefinite Programming to Power Flow Problems,” in *49th Annual Allerton Conference on Communication, Control, and Computing*, pp. 1492-1499, 28-30 September 2011.
- 44. D.R. Schwarting, **D.K. Molzahn**, C.L. DeMarco, and B.C. Lesieutre, “Topological and Impedance Element Ranking (TIER) of the Bulk-Power System,” *44th Hawaii International Conference on System Sciences (HICSS)*, 2011, pp. 1-10, 4-7 January 2011.

- 2010 45. **D.K. Molzahn** and B.C. Lesieutre, “An Eigenvalue Formulation for Determining Initial Conditions of Induction Machines in Dynamic Power System Simulations,” *2010 IEEE International Symposium on Circuits and Systems (ISCAS)*, pp. 2311-2313, 30 May–2 June 2010.

Plenary Lectures

- 2022 1. **D.K. Molzahn**, “A Review of Recent Developments in Nonlinear Optimization of Electric Power Systems,” plenary lecture at *IFAC Conference on Networked Systems (NecSys 22)*, July 5, 2022.

Other Conference and Workshop Presentations

- 2022 1. P. Buason, S. Misra, and **D.K. Molzahn**, “A Data-Driven Method to Identify Critical Location in Distribution Grids,” *Los Alamos National Laboratory Student Symposium*, Los Alamos, NM, August 1, 2022.
2. **D.K. Molzahn**, “Evaluating the Performance of Distributed Optimal Power Flow Algorithms with Nonideal Communications,” panel on *Distributed Optimization in the Power System: Advancement, Challenges, and Applications* during *IEEE Power and Energy Society General Meeting*, Denver, CO, July 12, 2022.
3. **D.K. Molzahn**, “Evaluating the Performance of Distributed Optimal Power Flow Algorithms with Nonideal Communications,” tutorial on *Distributed Optimization for Electric Power Systems: Needs, Algorithmic Developments, and Use Cases* during *IEEE Power and Energy Society General Meeting*, Denver, CO, July 17, 2022.
4. M. Alkhraijah, R. Harris, S. Litchfield, N. Foster, C. Raslawski, D. Huggins, and **D.K. Molzahn**, “Analyzing Malicious Data Injection Attacks on Distributed Optimal Power Flow Algorithms,” poster presentation at *5th Workshop on Autonomous Energy Systems at NREL*, Golden, CO, July 14, 2022.
5. **D.K. Molzahn**, “Overview of Research on Electric Power Systems,” *AI4All Summer Program at the Georgia Institute of Technology*, Atlanta, GA, June 16, 2022.
6. **D.K. Molzahn**, “Overview of Research on Electric Power Systems,” *AI4OPT Summer Sessions*, Atlanta, GA, June 7, 2022.
7. **D.K. Molzahn** and M. Alkhraijah, “Evaluating the Performance of Distributed Optimal Power Flow Algorithms with Nonideal Communications,” tutorial on *Distributed Optimization for Electric Power Systems: Needs, Algorithmic Developments, and Use Cases* during *13th Innovative Smart Grid Technologies (ISGT 2022)*, March 1-2, 2022.
- 2021 8. A. Kody, Y. Kim, K. Kim, and **D.K. Molzahn**, “Parameter Learning in Alternating Direction Method of Multipliers,” *INFORMS Annual Meeting 2021*, October 27, 2021.
9. M. Alkhraijah and **D.K. Molzahn**, “Evaluating the Performance of Distributed Optimization Algorithms with Nonideal Data Sharing,” *INFORMS Annual Meeting 2021*, October 27, 2021.
10. **D.K. Molzahn** and P. Buason, “A Bilevel Optimization Approach to Sensor Placement in Electric Distribution Systems,” *INFORMS Annual Meeting 2021*, October 26, 2021.
11. **D.K. Molzahn**, D. Lee, K. Turitsyn, and L.A. Roald, “Robust AC Optimal Power Flow with Robust Convex Restriction,” *NREL Workshop on Resilient Autonomous Energy Systems*, September 8, 2021.

12. P. Buason, S. Misra, and **D.K. Molzahn**, “Locating Sensors to Identify Violations of Critical Limits in Distribution Systems,” *IEEE Power and Energy Society General Meeting*, July 27, 2021.
13. **D.K. Molzahn**, M. Alkhrajiah, and C. Menendez, “Distributed Optimal Power Flow Algorithms with Nonideal Communications,” *SIAM Conference on Optimization*, July 20, 2021.
14. **D.K. Molzahn**, A. Kody, S. Tandon, A.S. Xavier, and F. Qiu, “Mitigating the Risk of Fault-Induced Wildfires using Transmission Switching,” *IISE Annual Conference*, May 25, 2021.
15. **D.K. Molzahn**, D. Lee, K. Turitsyn, and L.A. Roald, “Applications of Convex Restriction Techniques to Electric Power System Optimization Problems,” *Los Alamos National Laboratory Grid Science Winter School and Conference*, January 15, 2021.
16. S. Tandon, A. Kody, and **D.K. Molzahn**, “Operation and Planning of FACTS Devices for Wildfire Risk Reduction,” Poster presentation at *Los Alamos National Laboratory Grid Science Winter School and Conference*, January 12, 2021.
17. P. Buason and **D.K. Molzahn**, “Analysis of Fast Decoupled Power Flow via Multiple Axis Rotations,” Poster presentation at *Los Alamos National Laboratory Grid Science Winter School and Conference*, January 12, 2021.
18. M. Alkhrajiah and **D.K. Molzahn**, “The Impacts of Communication Errors on Distributed Algorithms for Optimal Power Flow Problems,” Poster presentation at *Los Alamos National Laboratory Grid Science Winter School and Conference*, January 12, 2021.
19. A.D. Owen Aquino, J.A. Huertas, G. Nilsson, K. Iles, S. Coogan, P. Van Hentenryck, and **D.K. Molzahn**, “How High Penetrations of Electric Vehicles Impacts the Way We Evacuate Cities,” Poster presentation at *Los Alamos National Laboratory Grid Science Winter School and Conference*, January 12, 2021.
- 2020 20. **D.K. Molzahn** and L.A. Roald, “Applications of Constraint Screening Methods to Electric Power Systems,” *INFORMS Annual Meeting 2020*, November 11, 2020.
21. **D.K. Molzahn**, A. Wächter, E. Wei, R. Tushen, F.E. Curtis, E. Wong, “Security-Constrained AC Optimal Power Flow: Team GO-SNIP,” *IEEE Power and Energy Society General Meeting*, August 4, 2020.
- 2019 22. **D.K. Molzahn**, “Convex Relaxations of the Power Flow Equations: Recent Advances and Emerging Applications,” *Georgia Tech Workshop on Electric Energy Systems and Operations Research*, Atlanta, GA, November 14-15, 2019.
23. **D.K. Molzahn**, S. Misra, K. Dvijotham, T. Mühlpfordt, and B. Li, “Optimal Adaptive Linearizations of the AC Power Flow Equations,” *INFORMS Annual Meeting 2019*, Seattle, WA, October 20-23, 2019.
24. **D.K. Molzahn**, M.R. Narimani, H. Nagarajan, and M.L. Crow, “Using Coordinate Transformations to Strengthen QC Relaxations of Optimal Power Flow Problems,” *INFORMS Annual Meeting 2019*, Seattle, WA, October 20-23, 2019.
25. **D.K. Molzahn** and L.A. Roald, “Applications of Constraint Screening Methods to Electric Power Systems,” *INFORMS Annual Meeting 2019*, Seattle, WA, October 20-23, 2019.
26. **D.K. Molzahn** and L.A. Roald, “Applications of Constraint Screening Methods to Electric Power Systems,” *Modeling and Optimization: Theory and Applications (MOPTA)*, Bethlehem, PA, August 14-16, 2019.

27. **D.K. Molzahn** and L.A. Roald, “An Overview of Robust AC Optimal Power Flow Problems,” *IEEE Power and Energy Society General Meeting*, Atlanta, GA, August 8, 2019.
28. M.R. Narimani, **D.K. Molzahn**, and M.L. Crow, “Tightening QC Relaxations of AC Optimal Power Flow Problems via Coordinate Transformations,” *IEEE Power and Energy Society General Meeting, Student Poster Session*, Atlanta, GA, August 4, 2019.
29. **D.K. Molzahn**, “Convex Relaxations of the Power Flow Equations: Overview and Selected Applications,” *ChrisFest: A Symposium in Honor of Christopher DeMarco*, Madison, WI, May 15, 2019.
30. **D.K. Molzahn**, S. Misra, and T. Mühlpfordt “Controlling Electric Power Grids: Computing Optimal Adaptive Approximations of the Power Flow Equations,” Poster presentation at *18th German-American Frontiers of Engineering Symposium organized by the Alexander von Humboldt Foundation (AvH) and the National Academy of Engineering (NAE)*, Hamburg, Germany, March 20-23, 2019.
- 2018 31. **D.K. Molzahn** and S. Misra, “Optimal Adaptive Approximations of the Power Flow Equations,” *Georgia Tech Workshop on Electric Energy Systems and Operations Research*, Atlanta, GA, November 15-16, 2018.
32. A. Venzke, S. Chatzivasileiadis, and **D.K. Molzahn**, “Recovery of Locally Optimal Solutions from Convex Relaxations of the AC Optimal Power Flow,” *INFORMS Annual Meeting 2018*, Phoenix, AZ, November 4-7, 2018.
33. **D.K. Molzahn** and L.A. Roald, “AC Optimal Power Flow with Robust Feasibility Guarantees,” *Modeling and Optimization: Theory and Applications (MOPTA)*, Bethlehem, PA, August 15-17, 2018.
34. **D.K. Molzahn**, H. Hijazi, and C. Jozs, “Quickly Certifying Global Optimality of a Candidate Optimal Power Flow Solution using a Moment Relaxation Hierarchy,” *Power Systems: Semi-Algebraic Techniques for Optimal Power Flow and Stability Assessment*, Paris, France, January 16-17, 2018.
- 2017 35. **D.K. Molzahn** and L.A. Roald, “AC Optimal Power Flow with Robust Feasibility Guarantees,” *Georgia Tech Workshop on Electric Energy Systems and Operations Research*, Atlanta, GA, November 9-10, 2017.
36. **D.K. Molzahn** and K. Dvijotham, “Error Bounds on Power Flow Linearizations: A Convex Relaxation Approach,” *INFORMS Annual Meeting 2017*, Houston, TX, October 22-25, 2017.
37. **D.K. Molzahn**, M. Yao, and J.L. Mathieu, “A Multi-Period OPF Approach to Improve Voltage Stability using Demand Response,” *INFORMS Annual Meeting 2017*, Houston, TX, October 22-25, 2017.
38. **D.K. Molzahn**, “Characterizing Non-Convexities in the Feasible Spaces of AC OPF Problems,” *INFORMS Annual Meeting 2017*, Houston, TX, October 22-25, 2017.
39. O. Coss, J.D. Hauenstein, H. Hong, and **D.K. Molzahn**, “Finding & Counting Equilibria of the Kuramoto Model for Coupled Oscillators,” *SIAM Conference on Applied Algebraic Geometry*, Atlanta, GA, July 31–August 4, 2017.
40. **D.K. Molzahn**, C. Jozs, I.A. Hiskens, and P. Panciatici, “A Laplacian-Based Approach for Finding Near Globally Optimal Solutions to OPF Problems,” *IEEE Power and Energy Society General Meeting, Transactions Paper Session*, Chicago, IL, July 19, 2017.

41. **D.K. Molzahn**, J.L. Mathieu, and M. Yao, "Power System Voltage Stability using Demand Response," *Staff Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software (Docket No. AD10-12-008)*, Federal Energy Regulatory Commission, Washington, DC, June 26-28, 2017.
42. **D.K. Molzahn** and K. Dvijotham, "Error Bounds on Power Flow Linearizations: A Convex Relaxation Approach," *Staff Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software (Docket No. AD10-12-007)*, Federal Energy Regulatory Commission, Washington, DC, June 26-28, 2017.
43. **D.K. Molzahn**, "A Tutorial on Convex Relaxations of the Power Flow Equations," *Modern Challenges in Power System Operation and Electricity Market: An Optimization Perspective*, DTU Summer School, Copenhagen, Denmark, June 12-16, 2017.
44. **D.K. Molzahn** and K. Dvijotham, "Error Bounds on Power Flow Linearizations: A Convex Relaxation Approach," *Banff International Research Station, Workshop on Optimization and Inference for Physical Flows on Networks (17w5165)*, March 7, 2017.
45. **D.K. Molzahn**, D. Wu, B.C. Lesieutre, and K. Dvijotham, "Computing Multiple Local Optima for OPF Problems using an Elliptical Tracing Algorithm," *INFORMS Computing Society Conference (ICS)*, Austin, TX, January 15-17, 2017.
46. **D.K. Molzahn** and K. Dvijotham, "Error Bounds on Power Flow Linearizations: A Convex Relaxation Approach," *Los Alamos National Laboratory, Center for Nonlinear Studies, Grid Science Winter School and Conference*, Santa Fe, NM, January 12-13, 2017.
- 2016 47. **D.K. Molzahn**, "Visualizing The Feasible Spaces of Optimal Power Flow Problems and Their Convex Relaxations," *INFORMS Annual Meeting 2016*, Nashville, TN, November 13-16, 2016.
48. J.-C. Gilbert, C. Josz, and **D.K. Molzahn**, "Plea for a Semidefinite Optimization Solver in Complex Numbers," *14th EUROPT Workshop on Advances in Continuous Optimization*, Warsaw, Poland, July 1-2, 2016.
49. **D.K. Molzahn**, "Visualizing the Feasible Spaces of Challenging OPF Problems," *Staff Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software (Docket No. AD10-12-007)*, Federal Energy Regulatory Commission, Washington, DC, June 27-29, 2016.
50. C. Josz and **D.K. Molzahn**, "Moment/Sum-of-Squares Hierarchy for Complex Polynomial Optimization," *INFORMS International*, Waikoloa Village, HI, June 12-15, 2016.
51. **D.K. Molzahn**, F. Qiu, and J. Wang, "Optimization of Electric Power Systems: Considering Uncertainty and Non-Convexity," Poster presentation at *Argonne National Laboratory Grid Day*, Lemont, IL, April 18, 2016.
- 2015 52. **D.K. Molzahn** and I.A. Hiskens, "Computational Advances for Moment Relaxations of Optimal Power Flow Problems," *INFORMS Annual Meeting 2015*, Philadelphia, PA, November 1-4, 2015.
53. **D.K. Molzahn**, I.A. Hiskens, and B.C. Lesieutre, "Calculation of Voltage Stability Margins and Certification of Power Flow Insolvability using Convex Relaxations," *INFORMS Annual Meeting 2015*, Philadelphia, PA, November 1-4, 2015.
54. **D.K. Molzahn** and I.A. Hiskens, "Sparsity-Exploiting Moment Relaxations of Optimal Power Flow Problems," *22nd International Symposium on Mathematical Programming*, Pittsburgh, PA, July 12-17, 2015.

55. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of the Optimal Power Flow Problem,” *SIAM Conference on Computational Science and Engineering*, Salt Lake City, UT, March 14-18, 2015.
- 2014 56. **D.K. Molzahn** and I.A. Hiskens, “Convex Optimization of Electric Power Systems,” *Dow Sustainability Fellows Symposium*, poster session, Ann Arbor, MI, November 15, 2014.
57. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of Optimal Power Flow Problems,” *INFORMS Annual Meeting 2014*, San Francisco, CA, November 9-12, 2014.
58. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of Optimal Power Flow Problems,” *Staff Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software (Docket No. AD10-12-005)*, Federal Energy Regulatory Commission, Washington, DC, June 23-25, 2014.
59. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxation of the Optimal Power Flow Problem,” *IBM and RTE Workshop on Convexification of the AC Optimal Power Flow Problem*, Dublin, Ireland, April 23, 2014.
- 2013 60. **D.K. Molzahn**, B.C. Lesieutre, C.L. DeMarco, and M.C. Ferris, “Application of Semidefinite Programming to Large-Scale Optimal Power Flow Problems,” *Staff Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software (Docket No. AD10-12-004)*, Federal Energy Regulatory Commission, Washington, DC, June 24-26, 2013.
61. M.C. Ferris, Z.B. Friedman, **D.K. Molzahn**, C.L. DeMarco, and B.C. Lesieutre, “ACOPF Models: Extending Data, Formulations, and Solution Methodology,” *Staff Technical Conference on Increasing Real-Time and Day-Ahead Market Efficiency through Improved Software (Docket No. AD10-12-004)*, Federal Energy Regulatory Commission, Washington, DC, June 24-26, 2013.
62. B.C. Lesieutre, **D.K. Molzahn**, and C.L. DeMarco, “Advanced Optimization Tools for OPF Formulations in Power Markets,” *Power Systems Engineering Research Center (PSERC) Industry-University Meeting, 2013*, Madison, WI, May 29-31, 2013.

Technical Reports

- 2019 1. S. Babaeinejadsarookolaee, A. Birchfield, R.D. Christie, C. Coffrin, C.L. DeMarco, R. Diao, M. Ferris, S. Fliscounakis, S. Greene, R. Huang, C. Jozs, R. Korab, B.C. Lesieutre, J. Maeght, **D.K. Molzahn**, T.J. Overbye, P. Panciatici, B. Park, J. Snodgrass, and R.D. Zimmerman, “The Power Grid Library for Benchmarking AC Optimal Power Flow Algorithms,” technical report by the IEEE PES PGLib Task Force, *arXiv:1908.02788*, August 2019.
2020 Working Group Award for Technical Report from the IEEE Power and Energy Society (PES) Power System Operation, Planning and Economics (PSOPE) Committee.
- 2016 2. **D.K. Molzahn**, “A Survey of Distributed Optimization Algorithms for Optimal Power Flow Problems,” Grid Modernization Initiative, Grid Architecture Project, November 2016.
3. S. Backhaus, K. Kalsi, S. Misra, **D.K. Molzahn**, J. Lian, E. Dall’Anese, M. Vuffray, S. Kundu, and K. Baker, “Grid Modernization Initiative Project 1.4.10 Control Theory Project Road Map,” October 2016.
4. **D.K. Molzahn**, M. Niemerg, D. Mehta, and J.D. Hauenstein, “Investigating the Maximum Number of Real Solutions to the Power Flow Equations: Analysis of Lossless Four-Bus Systems,” *arXiv:1603.05908*, March 2016.

- 2014 5. B.C. Lesieutre and **D.K. Molzahn**, “Optimization and Control of Electric Power Systems,” *Final Technical Report, DOE Grant #DE-SC0002319*, 17 October 2014.
- 2012 6. B.C. Lesieutre, C.L. DeMarco, and **D.K. Molzahn**, “Power System Deliverability Ranking of Critical Elements to Support Select Facilities,” *Report to the Federal Energy Regulatory Commission (not publicly available)*, January 2012.
7. B.C. Lesieutre, C.L. DeMarco, and **D.K. Molzahn**, “Power System Ranking of Nodal Locations,” *Report to the Federal Energy Regulatory Commission (not publicly available)*, January 2012.
- 2010 8. **D.K. Molzahn**, S.P. Williams, and R. Srinivasan, “Plug-In Vehicles in Madison, WI: Consumer Preferences, Charging Stations, and Distribution System Impacts,” *Energy Analysis and Policy Capstone Project Report to Madison Gas and Electric (not publicly available)*, 2010.

Invited Seminars

- 2022 1. **D.K. Molzahn**, “An Overview of Distributed Optimization in Electric Power Systems,” *Argonne National Laboratory CEEESA Seminar*, 22 April 2022.
2. **D.K. Molzahn**, “Recent Developments in Nonlinear Optimization of Electric Power Systems,” *West Virginia University ECE Department Seminar*, 28 March 2022.
3. A.K. Srivastava and **D.K. Molzahn**, “Distributed Optimization and Control for Enabling Power Grid Resiliency,” *IEEE Power and Energy Society Computing and Analytic Methods Subcommittee (CAMS) Webinar*, 17 January 2022.
- 2021 4. **D.K. Molzahn**, “A Review of Recent Developments in Nonlinear Optimization of Electric Power Systems,” *IEEE Power and Energy Society, University of California, Berkeley Student Chapter Seminar*, 7 April 2021.
5. **D.K. Molzahn**, “An Overview of Distributed Optimization in Electric Power Systems,” *IEEE Power and Energy Society, Atlanta Chapter Seminar*, 16 February 2021.
6. **D.K. Molzahn**, “An Overview of Distributed Optimization in Electric Power Systems,” *Georgia Tech Research Institute (GTRI) CIPHER Lab*, 19 January 2021.
- 2020 7. **D.K. Molzahn**, “Applications of Convex Restriction Techniques to Electric Power System Optimization Problems,” *Université catholique de Louvain, Mathematical Engineering Departmental Seminar*, 1 December 2020.
8. **D.K. Molzahn**, “Applications of Polynomial Optimization in Electric Power Systems,” *Georgia Institute of Technology, Algorithms and Randomness Center ThinkTankTalk*, 5 October 2020.
9. **D.K. Molzahn**, “A Review of Recent Developments in Nonlinear Optimization of Electric Power Systems,” *IEEE Power and Energy Society, Boston Chapter Seminar*, 23 June 2020.
10. **D.K. Molzahn**, “A Review of Recent Developments in Nonlinear Optimization of Electric Power Systems,” *Power Systems Engineering Research Center (PSERC) Webinar*, 10 March 2020.
- 2019 11. **D.K. Molzahn**, “Convex Relaxations of the Power Flow Equations: Overview and Selected Applications,” *Georgia Institute of Technology, ISyE Departmental Seminar*, 28 August 2019.
- 2018 12. **D.K. Molzahn**, “Achieving Robust Power System Operations using Convex Relaxations of the Power Flow Equations,” *ETH Zürich*, 12 November 2018.
13. **D.K. Molzahn**, “Convex Relaxations of the Power Flow Equations: Overview and Selected Applications,” *University of Colorado Boulder*, 25 September 2018.

14. **D.K. Molzahn**, “Recent Research in Power System Optimization: Approximation Error Quantification and Feasible Space Computation,” *ETH Zürich*, 31 May 2018.
15. **D.K. Molzahn**, “Optimal Power Flow with Robust Feasibility Guarantees,” *Argonne National Laboratory, Laboratory Directed Research and Development (LDRD) Seminar*, 17 April 2018.
16. **D.K. Molzahn**, “Characterizing Non-Convexities in the Feasible Spaces of OPF Problems and an Algorithm for Finding Multiple Local Optima,” *Los Alamos National Laboratory, Center for Nonlinear Studies*, 26 March 2018.
17. **D.K. Molzahn**, “Recent Research in Power System Optimization: Feasible Space Computation and Approximation Error Quantification,” *Boston University, Center for Information and Systems Engineering*, 23 February 2018.
18. **D.K. Molzahn**, “Recent Research in Power System Optimization: Feasible Space Computation and Approximation Error Quantification,” *Massachusetts Institute of Technology*, 22 February 2018.
- 2017 19. **D.K. Molzahn**, “Recent Research in Power System Optimization: Approximation Error Quantification, Feasible Space Computation, and Convex Relaxations,” *Northwestern University*, 30 November 2017.
20. **D.K. Molzahn** and L.A. Roald, “Recent Progress in Optimal Power Flow: A Survey of Convex Relaxations and an Algorithm for Robust Feasibility,” *Argonne National Laboratory, Mathematics and Computer Science Division*, 16 November 2017.
21. **D.K. Molzahn**, “Recent Research in Power System Optimization: Approximation Error Quantification, Feasible Space Computation, and Convex Relaxations,” *Purdue University*, 19 October 2017.
22. **D.K. Molzahn**, “Recent Research in Power System Optimization: Approximation Error Quantification, Feasible Space Computation, and Convex Relaxations,” *University of Aalborg*, 16 June 2017.
23. **D.K. Molzahn**, “Recent Research in Power System Optimization: Approximation Error Quantification, Feasible Space Computation, and Convex Relaxations,” *University of California, Berkeley*, 3 May 2017.
24. **D.K. Molzahn**, “Recent Research in Optimization of Electric Power Systems and Implications for Electricity Markets,” *Energy Policy Institute at the University of Chicago (EPIC)*, 21 February 2017.
- 2016 25. **D.K. Molzahn**, “Moment Relaxations of Optimal Power Flow Problems,” *Missouri University of Science and Technology*, 4 October 2016.
26. **D.K. Molzahn**, “Recent Developments in Moment Relaxations of Optimal Power Flow Problems,” *Columbia University*, 9 May 2016.
27. **D.K. Molzahn**, “Moment Relaxations of Optimal Power Flow Problems,” *Argonne National Laboratory*, 22 January 2016.
- 2015 28. **D.K. Molzahn**, “Computational Advances for Moment Relaxations of Optimal Power Flow Problems,” *University of Wisconsin–Madison*, 18 September 2015.
29. **D.K. Molzahn** and I.A. Hiskens, “Computational Advances for Moment Relaxations of Optimal Power Flow Problems,” *Réseau de transport d’électricité (RTE)*, 23 June 2015.
30. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of the Optimal Power Flow Problem,” *ETH Zürich*, 8 June 2015.

31. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of the Optimal Power Flow Problem,” *University of Notre Dame*, 16 April 2015.
32. **D.K. Molzahn** and I.A. Hiskens, “Optimization of Electric Power Systems,” *University of Michigan Dow Sustainability Seminar*, 26 February 2015.
33. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of the Optimal Power Flow Problem,” *University of Illinois at Urbana-Champaign*, 2 February 2015.
- 2014 34. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxations of the Optimal Power Flow Problem,” *University of California, Berkeley*, 6 November 2014.
35. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxation of the Optimal Power Flow Problem,” *Argonne National Laboratory*, 12 May 2014.
36. **D.K. Molzahn** and I.A. Hiskens, “Moment-Based Relaxation of the Optimal Power Flow Problem,” *University of Wisconsin–Madison*, 10 April 2014.
37. **D.K. Molzahn**, I.A. Hiskens, B.C. Lesieutre, and C.L. DeMarco, “Optimization and Other Research Topics in Electric Power Systems,” *University of Michigan Dow Sustainability Seminar*, 17 February 2014.
38. **D.K. Molzahn**, I.A. Hiskens, B.C. Lesieutre, and C.L. DeMarco, “Application of Semidefinite Optimization Techniques to the Optimal Power Flow Problem,” *Texas A&M University*, 20 January 2014.
- 2013 39. **D.K. Molzahn**, I.A. Hiskens, B.C. Lesieutre, and C.L. DeMarco, “Application of Semidefinite Optimization Techniques to the Optimal Power Flow Problem,” *Los Alamos National Laboratory, Center for Nonlinear Studies*, 30 October 2013.
40. B.C. Lesieutre and **D.K. Molzahn**, “A New Method for Estimating Maximum Power Transfer and Voltage Stability Margins to Mitigate the Risk of Voltage Collapse,” *PSEERC Webinar*, 15 October 2013.
41. **D.K. Molzahn**, “Research Topics in Electric Power Systems Engineering,” *University of Michigan Undergraduate Research Opportunity Program (UROP) Seminar*, 8 October 2013.
42. **D.K. Molzahn**, B.C. Lesieutre, and C.L. DeMarco, “Training on the TIER Methods for Ranking Transmission System Facilities,” *Federal Energy Regulatory Commission Training Session*, 18-20 June 2013.

Software Packages

- 2013 1. **D.K. Molzahn**, “SDP_PF: Implementation of Applications for a Semidefinite Programming Relaxation of the Power Flow Equations.”

A package of MATLAB code integrated with MATPOWER that implements the semidefinite programming relaxation of the optimal power flow problem for large-scale systems, a sufficient condition for global optimality of an optimal power flow solution, a power flow insolvability condition (including the possibility of generator reactive power limits), and voltage stability margins. Available in the current version of the MATPOWER distribution:
<http://www.pserc.cornell.edu/matpower/>

Fellowships

- 2013 1. University of Michigan, Dow Sustainability Fellows Program, “Optimization of Electric Power Systems”

- 2009 2. National Science Foundation, Graduate Research Fellowship Program, “Electricity Pricing Using Power Flow Tracing and Bilateral Contracts”
- 2008 3. Electrical and Computer Engineering Distinguished Fellowship, UW–Madison

Professional Service

1. Chair (2022) and Vice-chair (2020) of the Technical Program Committee for the *Power Systems Computation Conference*. Previously served as a member of the technical program committee (2016, 2018), reviewer, and session chair for this conference.
2. Faculty advisor for the Energy Club at the Georgia Institute of Technology (2019 – present)
3. Faculty advisor for the Georgia Tech Solar District Cup team (2021 – present), which won second place in their division in 2021
4. Panel member for review of National Science Foundation grant proposals
5. Co-chair of *IEEE Task Force on Benchmarks for Emerging Power System Algorithms*
6. Co-chair of *IEEE Working Group on Computational Challenges and Solutions for Implementing Distributed Optimization in the Power System*
7. Secretary of *IEEE Power and Energy Society Intelligent Grid and Emerging Technologies Coordinating Committee (IGETCC)*
8. Guest associate editor (special issue on distributed control and optimization) and reviewer for *IEEE Transactions on Smart Grid*. Included on list of “Best Reviewers” in 2017.
9. Guest associate editor (special issue on modeling, topology and control of grid-forming inverters) for *IEEE Journal of Emerging and Selected Topics in Power Electronics*.
10. Technical Program Committee member for *IEEE Global Conference on Signal and Information Processing*
11. Technical Program Committee member for *Intelligent System Applications to Power Systems*
12. Organizer of a session titled “Improving the Reliability and Resiliency of Electric Power Grids” for the National Academy of Engineering’s *2021 EU-US Frontiers of Engineering Symposium*
13. Session co-organizer for *INFORMS Annual Meeting* (2021)
14. Session co-organizer for *SIAM Conference on Optimization* (2021)
15. Session organizer for *Modeling and Optimization: Theory and Applications (MOPTA) (2018, 2019)*
16. Tutorial session co-organizer and reviewer for *American Control Conference* (2016)
17. Session chair and reviewer for *IEEE PowerTech Conference*
18. Session chair for *North American Power Symposium*
19. Poster judge for *Postdoctoral Research and Career Symposium*, Argonne National Laboratory
20. Journal reviewer for *Proceedings of the IEEE*
21. Journal reviewer for *IEEE Transactions on Power Systems*
22. Journal reviewer for *IEEE Transactions on Automatic Control*
23. Journal reviewer for *IEEE Transactions on Control of Network Systems*
24. Journal reviewer for *IEEE Transactions on Network Science and Engineering*
25. Journal reviewer for *IEEE Transactions on Industrial Informatics*
26. Journal reviewer for *International Journal of Electrical Power and Energy Systems*

27. Journal reviewer for *IET Generation, Transmission & Distribution*
28. Journal reviewer for *Journal of Modern Power Systems and Clean Energy*
29. Journal reviewer for *Sustainable Energy, Grids and Networks*
30. Journal reviewer for *Electric Power Systems Research*
31. Journal reviewer for *Electric Power Components and Systems*
32. Journal reviewer for *Mathematical Programming*
33. Journal reviewer for *Optimization Methods and Software*
34. Journal reviewer for *Automatica*
35. Journal reviewer for *IEEE Journal on Emerging and Selected Topics in Circuits and Systems*
36. Journal reviewer for *EURASIP Journal on Advances in Signal Processing*
37. Reviewer for *IEEE Conference on Decision and Control*
38. Reviewer for *IEEE Multiconference on Systems and Control*
39. Reviewer for *IEEE Power and Energy Society General Meeting*
40. Reviewer for *IEEE International Symposium on Circuits and Systems*
41. Reviewer for *Mediterranean Conference on Control and Automation*
42. Reviewer for *Intelligent System Applications to Power Systems Conference*
43. Reviewer for *Mediterranean Conference on Control and Automation*

Advised / Co-Advised Students and Postdocs

- 2021
 1. Mario Lopes, Georgia Institute of Technology, undergraduate student
 2. Ravi Kodali, Georgia Institute of Technology, undergraduate student
 3. Ryan Piansky, Georgia Institute of Technology, undergraduate and masters student
 4. Rachel Harris, Georgia Institute of Technology, doctoral student
 5. Michelle Paquette, Georgia Institute of Technology, undergraduate student
- 2020
 6. Shubham Tandon, Georgia Institute of Technology, masters student
 7. Abigail Ivemeyer, Georgia Institute of Technology, undergraduate and masters student. Recipient of the *2021 Roger P. Webb ECE Undergraduate Research Award* and the *2022 IEEE Power and Energy Society (PES) Outstanding Student Scholarship*
 8. Dilip Paruchuri, Georgia Institute of Technology, undergraduate student
 9. Emerald White, Georgia Institute of Technology, undergraduate student
 10. Sebastian Tapias, Georgia Institute of Technology, undergraduate student
 11. Daniel Turizo Arteaga, Georgia Institute of Technology, doctoral student
 12. Mohannad Alkhraijah, Georgia Institute of Technology, doctoral student
 13. Nathan Grice, Georgia Institute of Technology, masters student
 14. Carlos Menendez, Georgia Institute of Technology, masters student
 15. Javier Moreno, Universidad Pontificia Comillas, undergraduate student
- 2019
 16. Paprapee Buason, Georgia Institute of Technology, doctoral student
 17. Alejandro Owen Aquino, Georgia Institute of Technology, doctoral student

18. Dr. Alyssa Kody, Argonne National Laboratory, Maria Goeppert Mayer Fellow, co-advised with Dr. Feng Qiu
19. Dr. Bowen Li, Argonne National Laboratory, postdoctoral fellow
20. Maile Wobb, Georgia Institute of Technology, undergraduate student
- 2018 21. Alejandra Peña-Ordieres, Northwestern University, doctoral student with Prof. Andreas Waechter
22. Shenyinying (Ruby) Tu, Northwestern University, doctoral student with Prof. Andreas Waechter and Prof. Ermin Wei
23. Jonas Kersulis, University of Michigan, doctoral student with Prof. Ian Hiskens
- 2017 24. Wesley Chan, Northwestern University, undergraduate student
- 2016 25. Alireza Barzegar, Nanyang Technological University, doctoral student with Prof. Rong Su
26. Mohammad Rasoul Narimani, Missouri University of Science and Technology, doctoral student with Prof. Mariesa Crow
27. Aldo Tobler, ETH Zürich, masters student with Dr. Line Roald and Prof. Gabriela Hug

MS and PhD Committees

- 2022 1. Shixuan Zhang, Georgia Institute of Technology ISyE, “On Multistage Stochastic and Distributionally Robust Optimization: New Algorithms, Complexity Analysis, and Performance Comparison”
2. L  c Van Hoorebeeck, Universit   catholique de Louvain Applied Mathematics, “Nonconvex and Nonsmooth Economic Dispatch”
3. Julia Lindberg, University of Wisconsin–Madison ECE, “Convex Algebraic Geometry with Applications to Power Systems, Statistics and Optimization”
4. Kartik Sastry, Georgia Institute of Technology ECE, “Smart Charging of Electric Vehicles: Algorithms, Ramifications, and Hardware Development”
5. Yu-Cheng Chen, Georgia Institute of Technology ECE, “Cyber Threat Propagation Modeling in Cyber Physical Systems”
6. Siavash Sadeghi, Georgia Institute of Technology ECE, “Advanced Electric Motor Drive Systems for Ultra-Fast Electric Trains”
7. Cesar Guillermo Santoyo, Georgia Institute of Technology ECE, “Probabilistic Analysis Methods for Electric Vehicle Charging”
8. Kaiyu Liu, Georgia Institute of Technology ECE, “Dynamic State Estimation Based Protection of Power Electronic Systems”
- 2021 9. Christy Green, Georgia Institute of Technology ME, “Advanced Metering Infrastructure Data for Load Disaggregation and Demand-Side Management Analysis”
10. Shenyinying (Ruby) Tushen, Northwestern University ECE/IEMS, “Two-Stage Decomposition Algorithms and Their Application to Optimal Power Flow Problems”
11. Laurine Duchesne, University of Li  ge, Montefiore Institute, “Machine Learning of Proxies for Power Systems Reliability Management in Operation Planning”
12. Amin Gholami, Georgia Institute of Technology ISyE, “Structure-Aware Methods in Optimization and Control with Applications in Electric Power Systems”
13. Maad Alowaifeer, Georgia Institute of Technology ECE, “Microgrid Energy Management System with Ancillary Services to the Grid”

14. Zachary Kilwein, Georgia Institute of Technology CBE, “Merging First Principle Models with Machine Learning for the Optimization of Process and Energy Systems”
15. Gad Ilunga, Georgia Institute of Technology ECE, “Autonomous Quadratized Optimal Power Flow via Convex Solution – Sequential Linear Programming (CS-SLP)”
16. Emma Johnson, Georgia Institute of Technology ISyE, “Solution Techniques for Scaling Various Large-Scale Optimization Problems on the Transmission Grid”
17. Emeka Obikwelu, Georgia Institute of Technology ECE, “Electrical Power System Current and Voltage Instrumentation Channel Error Correction Using Unconstrained Weighted-Least-Squares (WLS) Dynamic State Estimation”
18. Kshitij Girigoudar, University of Wisconsin–Madison ECE, “Power Quality Improvement in Distribution Grids Using Three-phase Optimal Power Flow”
- 2020 19. Nawaf Nazir, University of Vermont EBE, “Optimization of Energy-Constrained Resources in Radial Distribution Networks with Solar PV”
20. Genyi Luo, Georgia Institute of Technology ECE, “Stray Flux Monitoring and Multi-Sensor Fusion Condition Monitoring for Squirrel Cage Induction Machines”
21. Evgeniya Tsybina, Georgia Institute of Technology ECE, “Residential Demand Response using a House as a Battery”
22. Xiangyu Han, Georgia Institute of Technology ECE, “Soft-Switching Solid-State Transformer for Traction Applications”
23. Boqi Xie, Georgia Institute of Technology ECE, “An Object-Oriented Distribution System Distributed Quasi-Dynamic State Estimator”
24. Alejandra Peña Ordieres, Northwestern University IEMS, “Nonlinear Programming Approximations of Chance Constraints”
25. Omer Lateef, Georgia Institute of Technology ECE, “Measurement-Based Parameter Estimation and Analysis of Power Systems”
26. Jiahao Xie, Georgia Institute of Technology ECE, “Time Domain Analysis of the Impact of Geomagnetically Induced Current on Power System”
27. Abdullah Alamri, Georgia Institute of Technology ECE, “Reliability Analysis Methods for Power Systems with Substantial Penetration of Renewable Generating Resources”
- 2019 28. Seyyed Mohammad Sadegh Vejdani, Georgia Institute of Technology ECE, “Service Revenue Evaluation Methodologies to Maximize the Benefits of Energy Storage”
29. Chiyang Zhong, Georgia Institute of Technology, ECE, “Autonomous Multi-Stage Flexible Optimal Power Flow”
30. Rohit Jinsiwale, Georgia Institute of Technology ECE, “Decentralized Operation and Control of Integrated Transactive Grids”
31. Hang Shao, Georgia Institute of Technology ECE, “Electromagnetic Modeling and Design Optimization of Synchronous Reluctance Machines and Single-Phase Induction Motors”
32. Shen Zhang, Georgia Institute of Technology ECE, “Multi-Objective Design, Optimization, and Condition Monitoring of High-Performance Electric Machines for Electric Propulsion”
33. Cheng Gong, Georgia Institute of Technology ECE, “Design and Control of Ultra-High Speed Switched Reluctance Machines Over 1 Million RPM”

34. Mengqi Yao, University of Michigan EECS, “Using Distributed Energy Resources to Improve Power System Stability and Voltage Unbalance”
- 2018 35. Dmitry Shchetinin, ETH Zürich ECE, “Optimization of Power System Operation: Approximations, Relaxations, and Decomposition”

Joint Appointments

1. Argonne Associate, Argonne National Laboratory, Energy Systems Division
2. Adjunct Professor, Missouri University of Science and Technology, Electrical and Computer Engineering Department

Memberships in Professional Organizations

1. NSF AI Institute for Advances in Optimization (Co-lead of the Energy Systems Use Case)
2. Strategic Energy Institute, Georgia Institute of Technology (Fellow)
3. Institute of Electrical and Electronics Engineers (Power and Energy Society, Circuits and Systems Society)
4. INFORMS (Optimization Society)
5. Tau Beta Pi Engineering Honor Society
6. Eta Kappa Nu Electrical and Computer Engineering Honor Society