# **Gonzalo E. Constante Flores**

Postdoctoral Scholar

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### **Research interests**

- Analysis, modeling, optimization, and decision-making of electric energy systems
- Machine learning for power systems planning, day-ahead, and real-time operations.
- Algorithmic tools for solving large-scale optimization problems applied to power and energy systems.

## Education

<b>Ph.D. in Electrical and Computer Engineering</b> <i>The Ohio State University, Columbus, OH, USA</i> Advisor: Antonio J. Conejo Thesis: Scheduling of Power Units via Relaxation and Decomposition	Jul 2018 – Dec 2022
<ul> <li>M.Sc. in Electrical and Computer Engineering</li> <li>The Ohio State University, Columbus, OH, USA</li> <li>Advisor: Mahesh S. Illindala</li> <li>Thesis: Conservation Voltage Reduction of Active Distribution Systems with Netw</li> </ul>	Aug 2016 – Jul 2018 vorked Microgrids
<b>Diploma in Electrical Engineering</b> <i>Escuela Politécnica Nacional, Quito, Ecuador</i>	Sep 2008 – Oct 2014
Appointments	
<b>Postdoctoral Scholar</b> <i>Purdue University, West Lafayette, IN, USA</i> Advisor: Can Li	Jan 2023 – present
<b>Research Aide</b> <i>Argonne National Laboratory, Lemont, IL, USA</i> Supervisor: Dongbo Zhao and Feng Qiu	May 2019 – Aug 2019
<b>Lecturer</b> Escuela Politécnica Nacional, Quito, Ecuador	Jun 2014 – Jul 2016
Honors & Awards	
IEEE PES Outstanding Dissertation Award, Finalist IEEE Power and Energy Society	2024
<i>Presidential Fellowship</i> The Ohio State University	2022
<i>Outstanding Reviewer</i> IEEE Transactions on Power Delivery	2019
<i>Fulbright Scholarship</i> U.S. Department of State	Jul 2016 – May 2018
Knowledge Generation Program Award Vice Presidency of Ecuador	2014

## **Research and funding grants**

#### Awarded

Office of Naval Research	
Mathematical and Resource Optimization program	2024
Title: "Machine Learning Aided Global Optimization of AC Optimal Power Flow Problem"	
Awarded: \$348,076.	
Role: Collaborator	
Amazon Research Awards	
Sustainability program	2024
Title: "Design and Analysis of Sustainable Supply Chains Using Optimization and Large Language Models"	
Awarded: \$50,000 + \$40,000 in AWS cloud computing credits.	
Role: Collaborator	

## Publications

### **Peer-reviewed Journals**

- [J17] H. Chen, G. Constante-Flores, C. Li, "Diagnosing infeasible optimization problems using large language models," *INFOR: Information Systems and Operational Research*, In press.
- [J16] H. Chen, G. Constante-Flores, C. Li, "Physics-Informed Neural Networks with Hard Linear Equality Constraints," *Computers & Chemical Engineering*, In press.
- [J15] R. Lima, G. Constante-Flores, A. Conejo, O. Knio, "An effective hybrid decomposition approach to solve the network-constrained stochastic unit commitment problem in large scale power systems," EURO Journal on Computational Optimization, Feb. 2024.
- [J14] A. Ramanujam, G. Constante-Flores, C. Li, "Distributed manufacturing for electrified chemical processes in a microgrid," *AIChE Journal*, Oct. 2023.
- [J13] **G. Constante-Flores**, A. J. Conejo, F. Qiu, "Daily scheduling of generating units with natural-gas market constraints," *European Journal of Operational Research*, Aug. 2023.
- [J12] G. Constante-Flores, A. J. Conejo, "Security-constrained unit commitment: A decomposition approach embodying Kron reduction," *European Journal of Operational Research*, July 2023.
- [J11] X. Liu, A. J. Conejo, G. Constante-Flores, "Stochastic unit commitment: Model reduction via learning," Current Sustainable/Renewable Energy Reports, vol. 10, 2023.
- [J10] G. Constante-Flores, A. J. Conejo, R. Lima, "Stochastic unit commitment with weekly energy storage: A hybrid decomposition approach," International Journal of Electrical Power & Energy Systems, vol. 145, 2022.
- [J9] **G. Constante-Flores**, A. J. Conejo, S. Constante-Flores, "Solving certain complementarity problems in power markets via convex programming," *TOP*, 2022.
- [J8] G. Constante-Flores, A. J. Conejo, J.K. Wang, "Stealthy monitoring control attacks to disrupt power system operations," *Electric Power Systems Research*, vol. 203, 2022.
- [J7] G. Constante-Flores, A. J. Conejo, F. Qiu, "AC network-constrained unit commitment via relaxation and decomposition," *IEEE Transactions on Power Systems*, vol. 37, 2022.
- [J6] G. Constante-Flores, A. J. Conejo, F. Qiu, "AC network-constrained unit commitment via conic relaxation and convex programming," *International Journal of Electrical Power & Energy Systems*, vol. 134, 2022.

- [J5] **G. Constante-Flores**, A. J. Conejo, and J.K. Wang, "Sensitivity-based vulnerability assessment of state estimation," *Journal of Modern Power Systems and Clean Energy*, 2021.
- [J4] A. J. Conejo, S. Chen, and G. Constante, "Operations and long-term expansion planning of natural-gas and power systems: A market perspective," *Proceedings of the IEEE*, 2020.
- [J3] J.K. Wang, G. Constante, C. Moya, and J. Hong, "A semantic analysis framework for protecting the power grid against monitoring-control attacks," *IET Cyber-Physical Systems: Theory & Applications*, 2020.
- [J2] G. Constante, J. Abillama, M. Illindala, "Conservation voltage reduction of networked microgrids", IET Generation, Transmission, & Distribution, 2019.
- [J1] G. Constante, M. Illindala, "Data-driven probabilistic power flow analysis for a distribution system with renewable energy sources using Monte Carlo simulation," *IEEE Transactions on Industry Applications*, vol. 55, no. 1, Jan. 2019.

#### JOURNALS SUBMITTED FOR PUBLICATION

- [S2] G. Constante-Flores, C. Li, "A Quadratically-Constrained Convex Approximation for the AC Optimal Power Flow."
- [S1] A. Mollaali, G. Zufferey, G. Constante-Flores, C. Moya, C. Li, G. Lin, "Post-fault Voltage Trajectory Interval Prediction via Operator Learning with Coverage Guarantees."

#### **JOURNALS UNDER PREPARATION**

- [U3] H. Chen, **G. Constante-Flores**, K. Mantri, S. Kompalli, A. Ahluwalia, C. Li, "OptiChat: Bridging Optimization Models and Decision-Makers Using Large Language Models."
- [U2] G. Constante-Flores, K. Solano, C. Li, "Learning-Assisted Stability-Constrained Optimal Power Flow."
- [U1] G. Constante-Flores, A. Anrrango, C. Li, "Decision-Focused Learning for Security-Constrained Optimal Power Flow."

#### **PEER-REVIEWED CONFERENCE PROCEEDINGS**

- [C7] G. E. Constante-Flores, A. Quisaguano, A. J. Conejo and C. Li, "AC-Network-Informed DC Optimal Power Flow for Electricity Markets", in 58th Hawaii International Conference on System Sciences (HICSS), Jan. 6-10th, 2025.
- [C6] G. E. Constante, C. Moya, and J.K. Wang, "Semantic-based detection architectures against monitoringcontrol attacks in power grids", in 2019 IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm), 2019.
- [C5] C. Staiger, B. Sim, G. E. Constante, J.K. Wang, "Predicting the impact of increasing plug-in electric vehicle loading on bulk transmission systems", in 2019 IEEE Power Energy Society General Meeting (PESGM), 2019.
- [C4] G. E. Constante, J.K. Wang, "Hierarchical mechanism of voltage instability with active distribution networks", in 2018 Clemson University Power Conference, Clemson, SC, Sept. 4-7th, 2018.
- [C3] G. E. Constante, M. Illindala, "Data-driven probabilistic power flow analysis for a distribution system with Renewable Energy sources using Monte Carlo simulation", *IEEE/IAS 53rd Industrial and Commercial Power Systems Technical Conference (I&CPS)*, Niagara Falls, ON, May 7-11th, 2017.
- [C2] F. Quilumba, G. E. Constante, J. Játiva, Wei-Jen Lee, "Distributed energy resources placement in distribution networks considering proximity to voltage collapse", 2015 IEEE Industry Applications Society Annual Meeting, Dallas, TX, Oct. 18-22nd, 2015.

[C1] G. E. Constante, G. Cabrera, F. Quilumba, J. Játiva, Wei-Jen Lee, "A harmonic power flow program aimed at analyzing distortion effects caused by industrial customers", 2015 IEEE Industry Applications Society Annual Meeting, Dallas, TX, Oct. 18-22nd, 2015.

## Teaching

Escuela Politécnica Nacional	
Lecturer	Oct 2014 – Jul 2016
<ul> <li>IEE573 Electrical and Communication Installations</li> </ul>	
<ul> <li>Seminar on Power Quality</li> </ul>	
<ul> <li>Seminar on Power Systems Modeling and Analysis</li> </ul>	
<ul> <li>IEE7B2 Power Systems Laboratory</li> </ul>	
<ul> <li>IEE6O2 Introduction to Power Systems Laboratory</li> </ul>	
<ul> <li>IEE584 Electric Machinery Laboratory</li> </ul>	
Undergraduate Teaching Assistant	Jan 2014 – Aug 2014
○ IEE7B2 Electric Power Systems Laboratory	
<ul> <li>IEE6O2 Introduction to Power Systems Laboratory</li> </ul>	
○ IEE8S3 Protective Relaying Laboratory	
<ul> <li>IEE584 Electric Machinery Laboratory</li> </ul>	
<ul> <li>Recitations: Power Systems Analysis, Power Systems Operations, and Power Systems Stabili</li> </ul>	ity
Mentoring	
Purdue University	2023 – present
<ul> <li>Asha Ramanujam - Ph.D. student</li> </ul>	

2018 - 2022

- Hao Chen Ph.D. student
- André Quisaguano Undergraduate student
- $\,\circ\,$  Anderson Anrrango Undergraduate student
- Gabriel Zufferey Undergraduate student

#### The Ohio State University

- Peimeng Guan Undergraduate student (Now a Ph.D. student at Georgia Tech)
- Zachary O'Toole M.Sc. student
- Jorge Ramírez Ph.D. student
- 0 Xuan Liu Ph.D. student

## **Conference presentations**

INFORMS Annual Meeting, Seattle, WA, USA "AC-Network-Informed DC Optimal Power Flow for Electricity Markets"	Oct 2024
AIChE Annual Meeting, San Diego, CA, USA "Physics-Informed Neural Networks with Hard Linear Equality Constraints" "GPU Accelerated Approximation Algorithm for Multi-Parametric Linear Programming" "Diagnosing Infeasible Optimization Problems Using Large Language Models"	Oct 2024
IEEE PES General Meeting, Seattle, WA, USA "Scheduling of Generating Units via Relaxation and Decomposition"	Jul 2024
International Conference on Stochastic Programming (ICSP), Davis, CA, USA "Security-constrained unit commitment problem via a hybrid decomposition technique with Kron reduction"	Jul 2023
Clemson University Power Systems Conference, Clemson, SC, USA "Hierarchical mechanism of voltage instability with active distribution networks"	Sep 2018
Transportation Electrification Conference and Expo (ITEC), Long Beach, CA, USA	Jun 2018

"Visualizing the impact of PEV on power distribution grids" IEEE/IAS 53rd I&CPS Technical Conference, Niagara Falls, ON, Canada "Data-driven probabilistic power flow analysis for a distribution system with renewable energy sources using MCS"

## **Invited Talks**

INFORMS Annual Meeting, Phoenix, AZ, USA	Oct 2023
"Learning Convex Approximations for the AC-OPF with Zero-Injection Feasibility Guarantees"	
IEEE PES General Meeting 2022, Denver, CO, USA	July 2022
Panel: Frontier of Power System Optimization and Simulation,	
"AC Network-Constrained Unit Commitment via Relaxation and Decomposition"	
Panel: Managing Uncertainty in Grid Operations,	
"A Grid that is Risk Aware for Clean Electricity"	
INFORMS/ENRE Online Scientific Event Series	Mar 2021
"AC Unit Commitment"	

## **Professional activities**

### Selection Committee

*Fulbright Commission in Ecuador* 2020 – 2022 Interview the candidates on STEM programs and evaluate their grant application, letters of reference, essays, and transcripts.

### **Technical Papers Review** (> 50)

*Journals*: Nature Communications, IEEE Transactions on Smart Grid, IEEE Transactions on Power Systems, IEEE Transactions on Industry Applications, IEEE Transactions on Power Delivery, IEEE Transactions on Sustainable Energy, IEEE Control Systems Letters, IEEE Power Engineering Letters, Applied Energy, International Journal of Power & Energy Systems, IEEE Transactions on Sustainable Energy, Optimization and Engineering

*Conferences*: IEEE PES General Meeting, Clemson University Power Systems Conference, Power Systems Computation Conference

### **CONFERENCE ORGANIZATION**

Session Chair, INFORMS Annual Meeting, 2024

### Society Memberships

Institute for Electrical and Electronics Engineers (IEEE)	2014 – present
Graduate Student Member: Power and Energy Society, Industry Applications Society	
INFORMS	2023 – present
Member: Energy, Natural Resources, and the Environment	

## Skills

Programming languages: Python, Julia, MATLAB

Algebraic modeling languages for optimization: JuMP, Pyomo, GAMS

Sofware: MATLAB/Simulink, DIgSILENT PowerFactory

Last update: October 13, 2024