

Gonzalo E. Constante Flores

Ph.D. in Electrical and Computer Engineering

Davidson School of Chemical Engineering
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Education

The Ohio State University

Ph.D. in Electrical and Computer Engineering

Jul 2018 – Dec 2022

Advisor: Antonio J. Conejo

Thesis: *Scheduling of Power Units via Relaxation and Decomposition*

M.Sc. in Electrical and Computer Engineering

Aug 2016 – Jul 2018

Advisor: Mahesh S. Illindala

Thesis: *Conservation Voltage Reduction of Active Distribution Systems with Networked Microgrids*

Escuela Politécnica Nacional, Quito, Ecuador

Diploma in Electrical Engineering (Honors)

Sep 2008 – Oct 2014

Advisor: Jesús Játiva

Final project: *Harmonic power flow using MATLAB (Spanish)*

Appointments

Purdue University

Postdoctoral Research Scholar

Jan 2023 – present

Advisor: Can Li

Research projects: *Machine learning for mixed-integer and global optimization.*

Argonne National Laboratory

Research Aide

May 2019 – Aug 2019

Supervisor: Dongbo Zhao

Research project: *Integration of plug-in electric vehicles in power systems.*

Escuela Politécnica Nacional, Quito, Ecuador

Instructor in the Department of Electrical Energy

Jun 2014 – Jul 2016

Responsibilities: *Teaching undergraduate courses, laboratory practices, and seminars.*

Research interests

- Analysis, planning, and operation of sustainable electric power systems
- Decomposition techniques of mathematical programming applied to energy systems
- Complementarity modeling in energy systems and energy markets
- Data-driven and machine-learning-aided optimization for operation of energy systems

Honors & Awards

Presidential Fellowship

2022

The Ohio State University

Outstanding Reviewer

2019

IEEE Transactions on Power Delivery

Fulbright Scholarship

Jul 2016 – May 2018

Fulbright Commission in Ecuador

Knowledge Generation Program Award

2014

Vice Presidency of Ecuador

Research experience

Graduate Research Associate

The Ohio State University, Columbus, OH, USA

Aug 2019 – present

- Develop a unit commitment model with AC network constraints based on a second-order conic relaxation of the power flow equations and an algorithm to achieve an AC feasible solution.
- Design an algorithm based on Benders decomposition to address the AC network-constrained unit commitment problem of large-scale power systems.
- Propose a risk-aware network-constrained unit commitment model and an algorithm based on decomposition techniques to address the solution of large-scale power grids.
- Formulate a unit commitment model considering the optimal behavior of the natural-gas market and a solution method for large-scale systems based on an outer approximation algorithm.
- Devise a solution method for the corrective security-constrained unit commitment problem for large-scale power systems using a hybrid decomposition and a Kron-based network reduction technique.

Research Aide

Argonne National Laboratory, Lemont, IL, USA

May 2019 – Aug 2019

- Develop a tool to visualize and analyze the behavior of distribution networks based on a component-based aggregate load model.
- Investigate the physical feasibility of engaging plug-in electric vehicles to support a power grid with increasing renewable energy.

Graduate Research Associate

The Ohio State University, Columbus, OH, USA

Aug 2016 – May 2019

- Develop analytic and algorithmic tools to analyze and mitigate the impact of cyberattacks on the power grid.
- Formulate a model of monitoring-control attacks with goals in the state estimation and/or the optimal power flow considering AC-based models.
- Assess the vulnerability of the state estimator in power grids and characterize vulnerable meters based on sensitivity analysis.
- Analyze the operation of networked microgrids in active distribution networks in the context of Volt/Var optimization.

Journal Publications

- [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] Xuan 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, Feng 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, Feng 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.

Submitted for Publication

- [S2] **G. Constante-Flores**, A. Conejo, F. Qiu, "Daily Scheduling of Generating Units With Natural-Gas Market Constraints", *European Journal of Operational Research*, In review.
- [S1] 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*, In review.

Conference Papers

- [C6] **G. E. Constante**, C. Moya, and J.K. Wang, "Semantic-Based Detection Architectures Against Monitoring-Control 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

Undergraduate Courses Instructor

Escuela Politécnica Nacional

Oct 2014 – Jul 2016

- IEE573 Electrical and Communication Installations
- Seminar on Power Quality
- Seminar on Introduction to Power Systems

Undergraduate Courses Instructor

Escuela Politécnica Nacional

Jan 2014 – Aug 2014

- IEE7B2 Electric Power Systems Laboratory
- IEE6O2 Introduction to Electric Power Systems Laboratory
- IEE8S3 Protective Relaying Laboratory
- IEE584 Electric Machinery Laboratory

Conference presentations

<i>Clemson University Power Systems Conference, Clemson, SC</i>	<i>Sep 2018</i>
Title: "Hierarchical Mechanism of Voltage Instability with Active Distribution Networks"	
<i>Transportation Electrification Conference and Expo (ITEC), Long Beach, CA</i>	<i>Jun 2018</i>
Title: "Visualizing the impact of PEV on power distribution grids"	
<i>IEEE/IAS 53rd I&CPS Technical Conference, Niagara Falls, ON</i>	<i>May 2017</i>
Title: "Data-driven probabilistic power flow analysis for a distribution system with Renewable Energy sources using Monte Carlo Simulation"	
<i>2015 IEEE Industry Applications Society Annual Meeting, Dallas, TX</i>	<i>Oct 2015</i>
Title: "A harmonic power flow program aimed at analyzing distortion effects caused by industrial customers"	

Invited Talks

<i>IEEE PES General Meeting 2022</i>	<i>July 2022</i>
Panel: Managing Uncertainty in Grid Operations, "A Grid that is Risk Aware for Clean Electricity"	
<i>IEEE PES General Meeting 2022</i>	<i>July 2022</i>
Panel: Frontier of Power System Optimization and Simulation, "AC Network-Constrained Unit Commitment via Relaxation and Decomposition"	
<i>INFORMS/ENRE Online Scientific Event Series, "AC Unit Commitment"</i>	<i>Mar 2021</i>

Professional activities

SOCIETY MEMBERSHIPS

<i>Institute for Electrical and Electronics Engineers (IEEE)</i>	<i>2014 – present</i>
Graduate Student Member: Power and Energy Society, Industry Applications Society	

TECHNICAL PAPERS REVIEW

Journals: IEEE Transactions on Industry Applications, IEEE Transactions on Power Delivery, 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

Skills

Julia/JuMP, MATLAB/Simulink, GAMS, DIgSILENT PowerFactory

Last update: July 2023