Filipe Cabral

Personal data

Languages	Fluent: English, Native: Portuguese.
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Education

2019–2023	**Ph.D. in Operations Research**, *School of Industrial and Systems Engineering*, Georgia Institute of Technology.
2016–2018	**M.Sc. in Mathematics**, *Institute of Mathematics*, Federal University of Rio de Janeiro.
2013–2016	**M.Sc. in Mechanical Engineering**, *Institute for Graduate Studies and Research in Engineering*, Federal University of Rio de Janeiro.
2009–2013	**B.Sc. in Applied Mathematics**, *Institute of Mathematics*, Federal University of Rio de Janeiro.

Experience

2023-Present	**Operations Research and Advanced Analytics Consultant**, American Airlines, Dallas, Texas – United States.
2014–2019	**Power System Analyst**, Brazilian Power System Operator (ONS), Rio de Janeiro – Brazil.

- Development of decision under uncertainty models for power systems planning.
- Time series analysis applied to load forecasting, energy inflows, and wind generation.

2014–2016	**ONS-GaTech Technical Agreement**, Brazilian Power System Operator (ONS), Rio de Janeiro – Brazil.

Agreement led by Professor Alexander Shapiro to study minimum operational storage energy targets, CVaR parameters definition and marginal cost smoothing.

2017–2019	**ONS-UFRJ Technical Agreement**, Brazilian Power System Operator (ONS), Rio de Janeiro – Brazil.

Agreement led by Professor Bernardo da Costa to investigate ways to represent and evaluate the performance of non-convex operational planning constraints.

Research Interests

Stochastic Programming, Integer Programming, Convex Analysis, Reinforcement Learning.

Doctor of Philosophy in Operations Research

Title *Optimal Planning For Electrification Of Public Transit Systems and Infinite-Dimensional Linear Programming*

Advisor Dr. Andy Sun

Description We proposed the OPCF-EBF model to optimally plan the transition to an entirely electric bus fleet with long-term planning investment decisions and short-term stationary operation assessments. We conducted extensive computational studies of our NP-Hard model using real-world data from public transit systems in major U.S. cities and worldwide, revealing insights into optimal investment and operational strategies. We explored another dimension of the OPCF-EBF model with only one bus route and only depot BEBs, but an arbitrary number of battery states called a fleet-sizing problem. Under a simple non-preemptive charging strategy, the fleet-sizing problem is polynomially solvable. Our proof relies on a proximity result that quantifies the distance between the optimal solution of a Separable Convex Integer Program and its corresponding linear relaxation solution. We investigated more deeply the notion of a stationary optimization problem. We introduced a primal and dual framework for infinite-dimensional stationary linear programs based on a restriction to ℓ_∞ and ℓ_1 spaces of appropriate dimensions. We proposed an algebraic method to characterize extreme points for the class of Row-Finite Linear Programs.

Master of Science in Mathematics

Title *The Role of Extreme Points for Convex Hull Operations*

Advisor Dr. Bernardo Freitas Paulo da Costa

Description We presented in a unified way two results that lie in the core of two widely used algorithms for non-convex programming: the classical Balas's Theorem about the convex hull of a union of polyhedra, and the more recent "Blessing of Binary" theorem from Zou, Ahmed, and Sun. We also provided a corrected proof for an essential theorem in Generalized Disjunctive Programming (S. Ceria and J. Soares, 1999).

URL `http://fcabral3.github.io/files/Theses/fcabral_master_math.pdf`

Master of Science in Mechanical Engineering

Title *A Proposal of a Periodic Vector Autoregressive Multiplicative Model for Scenario Generation of Inflows Applicable to the Brazilian Power System Operation Planning* (in Portuguese)

Advisor Dr. Jose Herskovits Norman

Description We proposed a model with non-negative support that meets the linearity and stagewise independent requirements of the SDDP algorithm. The primary motivation was that negative scenarios generated by standard autoregressive additive error models induce infeasibilities in the operational planning stochastic programming model.

URL `http://fcabral3.github.io/files/Theses/fcabral_master_mechanical_eng.pdf`

Publications

2022 **F. Cabral, A. Sun**, Optimal Planning of Charging Facilities for the Electrification of Bus Fleets in Public Transit Systems, *Submitted:* `https://optimization-online.org/wp-content/uploads/2023/04/Optimal_Planning_for_the_Electrification_of_Bus_Fleets.pdf`.

2020 **S. Ahmed, F. Cabral, B. da Costa**, Stochastic Lipschitz Dynamic Programming, *Mathematical Programming, 2020:* `https://link.springer.com/article/10.1007/s10107-020-01569-z`.

Proceedings

2018 **F. Cabral, B. da Costa, J. da Costa**, Use of Disjunctive Constraints To Represent Risk Aversion Policies, *Conference Paper*, SEPOPE 2018, Recife–Brazil: `http://fcabral3.github.io/files/Proceedings/XIV-SEPOPE-Paper.pdf`.

Technical Reports

2019 **B. da Costa, I. de Freitas, R. Klausner, F. Cabral, J da Costa, D. Penna**, Aceleração de Convergência para problemas de Otimização estocástica multiestágio (in Portuguese), *Technical Report*: `http://fcabral3.github.io/files/Technical_Reports/ONS-2019.pdf`.

2017 **F. Cabral, B. da Costa**, Nested Distance for Stagewise Independent Process, *Manuscript in ArXiv*: `https://arxiv.org/abs/1711.10633`.

2016 **A. Shapiro, L. Ding, F. Cabral, J. da Costa**, Marginal cost smoothing, *Technical Report*: `http://fcabral3.github.io/files/Technical_Reports/ONS-2016.pdf`.

2015 **A. Shapiro, F. Cabral, J. da Costa**, Guidelines for choosing parameters λ and α for the AVaR risk averse approach, *Technical Report*: `http://fcabral3.github.io/files/Technical_Reports/ONS-2015.pdf`.

2014 **A. Shapiro, F. Cabral, J. da Costa**, Investigation of the AVaR and minimum storage energy target levels approach, *Technical Report*: `http://fcabral3.github.io/files/Technical_Reports/ONS-2014.pdf`.

Presentations

INFORMS-2022 **F. Cabral**, A Notion of Basic Feasible Solution for Infinite Horizon Programs, Indianapolis–United States.

INFORMS-2021 **F. Cabral, A. Sun**, Optimal Planning of Charging Facilities for the Electrification of Bus Fleets in Public Transit Systems, Anaheim–United States.

ILAS-2019 **F. Cabral, S. Ahmed, B. da Costa**, The Stochastic Lipschitz Dynamic Programming (SLDP) algorithm, Rio de Janeiro–Brazil.

ISMP-2018 **F. Cabral, B. da Costa, J. da Costa**, The Role of Extreme Points for Convex Hull Operations, Bordeaux–France.

ISMP-2018	**B. da Costa, F. Cabral, J. da Costa**, Using Disjunctive Programming to Represent Risk Aversion Policies, Bordeaux–France.
SEPOPE-2018	**F. Cabral, B. da Costa, J. da Costa**, Use of Disjunctive Constraints to Represent Risk Aversion Policies, Recife–Brazil.

Invited talks

2018	The Role of Extreme Points for Convex Hull Operations, Institute of Pure and Applied Mathematics (IMPA), Rio de Janeiro–Brazil
2018	The Role of Extreme Points for Convex Hull Operations, Faculty of Mathematics, Technical University of Munich (TUM), Munich–Germany.
2016	Research Status for Technical Cooperation between ONS and ISyE/GaTech Technical Agreement, ONS/ISyE Gatech Workshop, Rio de Janeiro–Brazil.

Conferences and Workshops

2018	Symposium of Specialists in Electric Operational and Expansion Planning - SEPOPE 2018, Recife–Brazil.
2018	International Symposium on Mathematical Programming - ISMP 2018, Bordeaux–France.
2016	International Congress on Stochastic Programming - ICSP 2016, Buzios–Brazil.
2016	Stochastic Variational Analysis - SVAN 2016, Rio de Janeiro–Brazil.
2013	Research in Optimization and Statistics, EMAp/FGV, Rio de Janeiro–Brazil.
2012	International Conference on Engineering Optimization - EngOpt 2012, Rio de Janeiro–Brazil.

Teaching Experience

2020	Teaching assistant – Engineering Optimization, ISyE-Gatech.
2019	Teaching assistant – Supply Chain Modeling: Logistics, ISyE-Gatech.
2018	Instructor – 30 hours Statistics seminar, ONS.
2017	Teaching assistant – 40 hours course of Gaussian Process, ONS.
2012	Teaching assistant – 40 hours course of Calculus II, DMA-UFRJ.

Computer skills

Python, Julia, R, MatLab, Bash, Unix, Git, LaTeX