Guido F. M. G. de Carvalho, Ph.D. Candidate

guidofragamgc@gmail.com Guido Fraga

Summary

- Currently pursuing a dual Ph.D. through a cotutelle program between the Universidad de Granada - Spain, in Information and Communication Technologies, and Rio de Janeiro State University - Brazil, in Computational Modeling. Contributions include applications of Computational Modeling and Data Science methodologies, including machine learning, predictive analytics, and data-driven approaches, to solve practical problems in engineering and environmental sciences. Experience in developing interdisciplinary projects that integrate Optimization Methods, Artificial Intelligence and Data Analysis.

Education

2021 – 2025 **Ph.D., Rio de Janeiro State University** Computational Modeling.
Thesis title: *Formulation and Solution of Direct and Inverse Problems in Pollutant Transport in the Atmospheric Boundary Layer Using Physics-Informed Machine Learning.*
Field of Study: Application of data science and machine learning techniques to develop efficient predictive and analytical models for pollutant transport and source identification problems.

2023 – 2025 **Ph.D., Universidad de Granada** Information and Communication Technologies.
Thesis title: *Formulation and Solution of Direct and Inverse Problems in Pollutant Transport in the Atmospheric Boundary Layer Using Physics-Informed Machine Learning.*

2013 – 2019 **Mechanical Engineering, Rio de Janeiro State University**.
Emphasis: Computational modeling of heat transfer and transport phenomena.

Skills

Programming and Tools — Proficient in **Python**, **MATLAB**, and **SQL**; extensive experience with machine learning frameworks (e.g., PyTorch, TensorFlow), data analysis libraries (e.g., pandas, NumPy), and visualization tools (e.g., Matplotlib, Seaborn).

Machine Learning and Optimization — Expertise in **neural networks**, statistical learning, and predictive modeling for structured and unstructured data; adept at exploratory data analysis (EDA), feature engineering, and data pipeline development

Languages — Fluent in **English**; strong competencies in **Spanish**; proficient in **French**.

Miscellaneous — Skilled in consultation, training, and LaTeX typesetting and publishing; experienced in interdisciplinary collaboration on computational and machine learning projects.

Employment History

2021 – Present
Researcher, Rio de Janeiro State University.
Researcher in Computational Modeling and Information and Communication Technologies.
Responsibilities: Conducting research on atmospheric pollutant dispersion simulations, source identification, and inverse problems using neural networks, machine learning, and data analysis.

2017 – 2021
Physics Teacher, Pensi.
Provided academic support to high school and pre-university students in physics, ensuring a comprehensive understanding of complex topics and preparation for university entrance exams.

2016 – 2018
Physics Teacher, Rede Educativa UFF.
Taught physics in a social pre-university course aimed at helping low-income students gain admission to higher education institutions. Focused on foundational concepts and exam preparation strategies.

2014 – 2015
Commercial Director, Serra Jr. Engenharia.
Oversaw commercial operations for a junior engineering company. Managed client relationships, developed business strategies, and coordinated project execution.

2013 – 2016
Math Instructor, Kumon.
Guided students in mathematical concepts through the Kumon method, focusing on individualized learning, problem solving skills, and independent study habits.
Responsibilities: Assisted students of various ages and skill levels, monitored progress, provided personalized support, and created a positive learning environment to help students achieve academic excellence in mathematics.

Research Publications

1. G. F. M. G. de Carvalho, D. F. Corrêa, D. A. Pelta, D. C. Knupp, and A. J. S. Neto, "Mlp neural networks for accelerated pollution prediction in environmental monitoring systems," *HAIS 23 Special Issue of the Logic Journal of the IGPL*, 2025.
2. G. F. M. G. de Carvalho, R. Albani, J. P. de Lima Costa Salazar, A. J. da Silva Neto, D. Moreira, and D. Pelta, "Physics informed neural networks and k-epsilon model applied to source identification of atmospheric releases," *Proceedings of the International Conference on Inverse Problems in Engineering - ICIPE*, 2024, Geophysics, Final Paper, Accepted, Oral Presentation.
3. G. F. M. G. de Carvalho, R. Albani, M. H. S. Siqueira, V. S. Nogueira, D. F. Corrêa, and A. J. da Silva Neto, "Optimization methods to obtain unknown parameters in green roof energy balance modeling," *Proceedings of the Encontro Nacional de Modelagem Computacional e Encontro de Ciência e Tecnologia de Materiais - ENMC/ECTM*, 2024.
4. G. F. M. G. de Carvalho, R. Albani, M. H. S. Siqueira, A. J. da Silva Neto, and D. M. Moreira, "Computational fluid dynamics simulations of urban-like scenario including canopy cover," *Proceedings of the Encontro Nacional de Modelagem Computacional e Encontro de Ciência e Tecnologia de Materiais - ENMC/ECTM*, 2024.
5. G. F. Carvalho, D. F. Corrêa, D. A. Pelta, D. C. Knupp, and A. J. S. Neto, "Efficient simulation of pollutant dispersion using machine learning," *Lecture Notes in Computer Science*, pp. 372–383, 2023.

6 G. F. M. G. de Carvalho, A. S. Neto, D. Knupp, and D. Pelta, "Optimizing contaminant source identification with mlp neural network," *Proceedings of the 27th International Congress of Mechanical Engineering*, 2023.

7 D. Corrêa, G. F. Carvalho, D. A. Pelta, C. F. Toledo, and A. J. S. Neto, "On the prediction of anomalous contaminant diffusion," *Lecture Notes in Networks and Systems*, pp. 290–299, 2023.

8 G. F. M. G. de Carvalho, E. F. de Sousa, and A. J. da Silva Neto, "Formulação e solução de problemas diretos e inversos em meios porosos para o estudo de fluxo de seiva em plantas," *Anais do Encontro Nacional de Modelagem Computacional e Encontro de Ciência e Tecnologia de Materiais*, 2021.