Alonso G. Ogueda Oliva

alonso.ogueda@gmail.com | aoguedao.github.io

Curious applied mathematician eager for contributing to the community.
I am on a journey of becoming a bridge between theory, applications and coding.

Education

Ph.D in Mathematics, George Mason University | Fairfax, VA, United States | 2025 (Expected)
Research Areas: Scientific Machine Learning, in particular Physics-Informed Neural Networks

M.S. in Mathematics, Universidad Técnica Federico Santa María | Valparaíso, Chile | 2021
Thesis: An approach to Local Influence with massive data

Mathematical Engineering, Universidad Técnica Santa María | Valparaíso, Chile | 2018
Thesis: Influence diagnostics in ridge regression based on divergence functions

Experience

Graduate Research Assistant
Department of Mathematical Sciences, George Mason University | Fairfax, VA, United States | 2021 - Current
- ➢ NSF DMS 2232739: Machine learning for predicting dynamics of epidemiological models that incorporate human behavior.

Modeling and Statistics Intern
ReJoule| Remote| September-December 2024
- ➢ Machine learning algorithms to assess the state of health of electric vehicle batteries.

Graduate Teaching Assistant
Department of Mathematical Sciences, George Mason University | Fairfax, VA, United States | 2022
- ➢ Recitation for Calculus I and grading for Numerical Analysis.

Associated Researcher
An integrative framework for tsunami vertical-evacuation planning | Universidad Técnica Federico Santa María | Valparaíso, Chile | 2021 - Current
- ➢ Design, implementation and data analysis of an agent-based modeling for tsunami evacuation workflow using NetLogo and Python running on High Performance Computing.

Data Scientist
uPlanner | Valparaíso, Chile | 2017 - 2021
- ➢ Mathematical and statistical modeling, machine learning algorithms, data analysis, visualization, consulting and cloud computing in the context of EdTech.

Adjunct Instructor
Department of Mathematics, Universidad Técnica Federico Santa María | Valparaíso, Chile | 2019 - 2021
- ➢ Applied Math for Engineering: Programming, data visualization, machine learning and data science.
- ➢ Calculus I and Algebra for freshmen.

Associated Researcher
Tsunami risk and urban form: A proposal for the examination and improvement of Chilean cities suitability for timely and safe evacuations | Universidad Técnica Federico Santa María | Valparaíso, Chile | 2019- 2020
- ➢ Multivariable regression and feature importance analysis of tsunami evacuation simulations in order to understand the urban variables which could increase survival.

Awards and Accomplishment

Predoctoral Fellow | Institute for Digital InnovAtion, George Mason University | Fairfax, VA, United States | 2023 - 2025

Project: A New Data-Driven Machine Learning Framework to Predict Dynamics of Infectious Diseases Incorporating Human Behavior in Epidemiological Models

NSF Research Traineeship Fellow | Center for Adaptive Systems of Brain-Body Interactions, George Mason University | Fairfax, VA, United States | 2023 - 2024

CMAI Graduate Award for Excellence in Research| Department of Mathematical Science,, George Mason University | Fairfax, VA, United States | 2024

National Maximum Mathematics PSU (University Selection Test) Score | Ministry of Education, Chile | 2010

Certifications

Deep Learning Specialization | Deeplearning.AI | Coursera | 2020
Machine Learning for Business Professionals | Google Cloud | Coursera | 2020
Python for Everybody | University of Michigan | Coursera | 2020

Skills

Mathematical Modeling: Physics-Informed Neural Networks, Deep Learning, Neural Networks, Machine Learning, Artificial Intelligence, Differential Equations, Numerical Analysis, Statistical Analysis, Time Series, Model Explainability, Data Processing, Data Visualization, Data Science, Computational Thinking.
Advance-Proficiency Coding: Python (NumPy, Pandas, Scipy, Scikit-Learn, DeepXDE, Matplotlib, Seaborn, OSMNX, GeoPandas, SHAP, Streamlit), NetLogo, SLURM, Project Jupyter.
User-Proficiency Coding: Git, SQL, Linux, R, Docker, Microsoft Azure, Apache Airflow, Power BI, MLflow.
Languages Proficiencies: English (fluent) and Spanish (native)

Leadership

Officer |SIAM Student Chapter | George Mason University | 2022 - Current
Logistic Team Staff Member | "Vive Tus Parques" Program | INJUV| Valparaíso, Chile | 2015-2016
Scout | Association of Guides and Scouts of Chile, | Valparaiso, Chile | 2002 - 2014

Invited Talks, Workshops and Panels

Invited Talks

1. **Data-driven machine learning framework to predict dynamics of infectious diseases incorporating human behavior |** Symposium on Biomathematics and Ecology Education and Research | Harvey Mudd College | Claremont, CA, United States | November 204
2. **Using Disease Informed Neural Networks to study influence of incorporating human interactions in mathematical epidemiological models for COVID-19** | 2024 WNAR Meeting | Colorado State University | Fort Collins, CO, United States | June 2024
3. **Application of Physics Informed Neural Networks for Predicting Disease Dynamics** | 2024 Spring Eastern Sectional Meeting | Howard University | Washington, DC, United States | April 2024
4. **Application of Physics Informed Neural Networks for Predicting Disease Dynamics** | Symposium on Biomathematics and Ecology Education and Research | Virginia Commonwealth University | Richmond, VA, United States | November 2023

5. **Application of Physics Informed Neural Networks to understand the influence of human behavior in epidemiological modeling** | 56 Congreso Nacional Sociedad Matemática Mexicana | Universidad Autónoma de San Luis Potosí | San Luis Potosí, Mexico | October 2023
6. **Application of machine learning to predict dynamics of epidemiological models that incorporate human behavior** |10th International Congress on Industrial and Applied Mathematics | Waseda University | Tokyo, Japan | August 2023
7. **Application of Machine Learning to Predict Dynamics of Epidemiological Models That Incorporate Human Behavior** | SIAM Conference on Applications of Dynamical Systems | SIAM| Portland, OR, United States | May 2023
8. **A review and application of Disease Informed neural networks for efficient parameter estimation** | Mathematical Biology Seminar | University of Maryland | College Park, MD, United States | March 2023
9. **A Review and Application of Disease Informed Neural Network** | Mathematics for Social Good, Workshop Celebrating Diversity - SIAM Annual Meeting | SIAM | Pittsburgh, PA, United States | July 2022
10. **A Review and Application of Disease Informed Neural Network** | PyDay Chile | Python Chile| Virtual | 2022
11. **An Approach to Local Influence with Massive Data** | 1st Workshop of Statistics: Graduate Contributions | SOCHE | Virtual | August 2020
12. **Influence Diagnostics in Ridge Regression based on Divergence Functions** | XLIV Jornada Nacional de Estadíscia | SOCHE | Valparaíso, Chile |October 2017

Workshops

13. **Neural Computing** | IX Workshop on Computational Data Analysis and Numerical Methods | University of Évora | Évora , Portugal | September 2024
14. **Machine Learning and Computing Intensive Modeling** | Symposium on Biomathematics and Ecology Education and Research | Virginia Commonwealth University | Richmond, VA, United States | November 2023
15. **Transforming institutional practices through equitable and inclusive data science education pathways, programs and practices** | Educating at the Intersection of Data Science and Social Justice | ICERM - Brown University | Providence, RI, United States | July 2023
16. **Workshop: Agent-Based Modeling applied to Urban Evacuation** | Universidad Austral de Chile | Valdivia, Chile | January 2023
17. **Computational models, tools and simulation for dynamics, prediction and control of infectious diseases** | VII Jornadas de Probabilidad y Procesos Estocásticos | Universidad Nacional de Colombia | Virtual | December 2022
18. **Foundations of Neural Computing and Applications** | VIII Workshop on Computational Data Analysis and Numerical Methods | Polytechnic Institute of Tomar | Virtual | October 2022

Panels

19. **STAR: Science for Transformative and Applied Research in MathBiology |** Symposium on Biomathematics and Ecology Education and Research | Harvey Mudd College | Claremont, CA, United States | November 204

Peer-reviewed Journal Publications

Published

1. León, J., Martínez, C., Inzunza, S., **Ogueda, A.** & Urrutia, A. (2024). *Improving Tsunami Risk Analysis by Integrating Spatial Resolution and the Population's Evacuation Capacities: A Case Study of Cartagena, Chile*. Int J Disaster Risk Sci.

2. Baca, A., González, D., **Ogueda-Oliva, A.**, Matto, H. & Seshaiyer, P. (2024). *Mathematical Modeling, Analysis and Simulation of Patient Detox Journey*. CODEE Journal, 18, Article 4.
3. Sitalo, D., **Ogueda-Oliva, A.** & Seshaiyer, P. (2024). *Data-Driven Mathematical Modeling and Simulation of Migration Dynamics During the Russian-Ukrainian War*. Spora: A Journal of Biomathematics, 10, 83–90.
4. Aguirre, P., León, J., González-Mathiesen, C., Román, R., Penas, M., and **Ogueda, A.** (2024). *Modelling the vulnerability of urban settings to wildland–urban interface fires in Chile*. Natural Hazards and Earth System Sciences., 24, 1521–1537.
5. **Ogueda-Oliva, A.**, & Seshaiyer, P. (2024). *Literate programming for motivating and teaching neural network-based approaches to solve differential equations*. International Journal of Mathematical Education in Science and Technology, 55(2), 509-542.
6. Ghosh, S., **Ogueda-Oliva, A.**, Ghosh, A., Banerjee, M., & Seshaiyer, P. (2023). *Understanding the implications of under-reporting, vaccine efficiency and social behavior on the post-pandemic spread using physics informed neural networks: A case study of China*. Plos one, 18(11).
7. **Ogueda-Oliva, A.**, Martinez, E., Arunachalam, V., & Seshaiyer, P. (2023). *Machine Learning for Predicting the Dynamics of Infectious Diseases during Travel through Physics Informed Neural Networks*. Journal of Machine Learning for Modeling and Computing. 4(3), pp. 17-35
8. León, J., Gubler, A., Catalán, P., Correa, M., Castañeda, J., Beninati, G., & **Ogueda, A.** (2023). *Assessing potential tsunami vertical-evacuation practices: A study of four cases in Chile using virtual reality and GIS*. International Journal of Disaster Risk Reduction, 104098.
9. León, J., **Ogueda, A.**, Gubler, A., Catalán, P., Correa, M., Castañeda, J., & Beninati, G. (2023). *Increasing resilience to catastrophic near-field tsunamis: systems for capturing, modelling, and assessing vertical evacuation practices*. Natural Hazards, 1-27.
10. León, J., Gubler, A., & **Ogueda, A.** (2022). *Modelling geographical and built-environment attributes as predictors of human vulnerability during tsunami evacuations: a multi-case-study and paths to improvement*. Natural Hazards and Earth System Sciences, 22(9), 2857-2878.
11. Leon, J., Vicuna, M., **Ogueda, A.**, Guzman, S., Gubler, A., & Mokrani, C. (2021). *From urban form analysis to metrics for enhancing tsunami evacuation: Lessons from twelve Chilean cities*. International Journal of Disaster Risk Reduction, 58, 102215.

Submitted

1. **Ogueda-Oliva, A.**, Osorio, F. *Entropy-based influence diagnostics for ridge regression.*
2. León, J., **Ogueda-Oliva A.**, Hurtado, L., Gubler, A. & Zamora, N. *An integrated framework for analyzing horizontal and vertical tsunami evacuation. A case study of Iquique, Chile.*

In-Preparation

1. **Ogueda-Oliva, A.**, Morales-Morales, J., Caiseda, C. & Seshaiyer, P.Enhancing pedagogical practices through data in the age of AI to engage the next generation in Mathematical Biology.
2. **Ogueda-Oliva, A.**, Levy, B. & Seshaiyer, P. *Understanding neighborhood mobility impact into COVID-19 using temporal network analysis.*

Co-Mentoring

Aspiring Scientists Summer Internship Program | George Mason University | 2024

- ➢ Gannavaram, A. *"Application of Physics-Informed Neural Networks to Asthma Epidemiology"*
- ➢ Ascoli, J. *"Mathematical modeling, analysis and simulation of the spread of smoking in the United States using Optimal Control"*
- ➢ Aubry-Romero, N. *"Modeling, Analysis and Prediction of COVID-19 dynamics with interacting subpopulations and human behavior using Physics-Informed Neural Networks"*
- ➢ Singh, R. *"Using Physics-Informed Neural Networks to Model the Dynamics of the Opioid Epidemic"*

- ➢ Hutter, S. *"Mathematical Modeling and Physics Informed Neural Network approaches for studying the environmental impact of data centers on a county level"*
- ➢ Kisselev, P. *"Improving infectious disease predictions through the use of metapopulation SIR modeling and graph convolutional neural networks"*

SIAM-Simons Undergraduate Summer Research Program | George Mason University | 2023

- ➢ Baca, A. & González, D. *"Program MASTER: Modeling, Analysis and Simulation for the grand challenges through innovative Training, Education and Research"*.

Aspiring Scientists Summer Internship Program | George Mason University | 2023

- ➢ Ravishankar, S. *"Analyzing High School Student Mental Health using SEITR Compartmental Model of Epidemiology"*.
- ➢ Kanakamedala, A. & Ganesh, V. *"Studying the Influence of Income Differences and Credit History on Racial Disparities in the Mortgage Market using Machine Learning"*.
- ➢ Msechu, N. *"Understanding the spread of racism through mathematical modeling, analysis and simulation"*.

Aspiring Scientists Summer Internship Program | George Mason University | 2022

- ➢ Linares, B. "*A Mathematical Model for Understanding and Predicting Dynamics of Depression as an Epidemic"*