

# ARMANDO I. MANCILLA BUSTOS

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## Professional Profile

Physics graduate with strong experience in stochastic modeling, high-performance computing, scientific programming, and data analysis. Proven ability to communicate, collaborate and build predictive models using Python and Fortran. Seeking a data analyst/scientist or a research-focused role where I can leverage analytical and coding skills to solve real-world problems.

## Experience

### Research assistant.

(08/2024 - 05/2025)

Universidad de Guadalajara | Guadalajara, Mexico.

Thesis Research Project. Supervised by Dr. Thomas Gorin and Dr. Soham Biswas.

#### *Annihilating Random Walks:*

- Built a parallelized high-performance Fortran simulation for broad stochastic systems of above 1,000 interacting particles, reducing execution time up to 50%.
- Reduced extensive data results by 80% with Python/Jupyter, while keeping key characteristics, significantly accelerating post-processing.
- Examined and visualized large time (>100,000 steps) behavior and proposed an empirical formula to predict concentration decay for cases with similar diffusion.

### Intern.

(02/2024 - 06/2024)

Universidad de Guadalajara | Guadalajara, Mexico.

Professional Practices. Educational Tool developed under the supervision of Dr. Thomas Gorin.

#### *Simulations of Thermodynamic Systems:*

- Improved previous codes to simulate multiple cases at a time. Collected 4 different Monte Carlo algorithms into a single SciLab (MATLAB open-source alternative) program allowing users to adjust system parameters with a console-based User Interface (UI).
- Optimized algorithmic efficiency to handle thermodynamic systems with more than 100 particles, balancing real-time performance and accuracy.
- Included results visualization to allow for intuitive interpretation of non-ideal systems. Produced teacher-focused documentation with use cases and theory summaries.

### Research assistant.

(12/2022 - 06/2023)

Universidad de Guadalajara | Guadalajara, Mexico.

PRO-SNI Scholarship. Supervised by Dr. Thomas Gorin and Dr. Soham Biswas.

#### *Memory and Resetting Effects on the Random Walks:*

- Modeled stochastic systems with over 100,000 realizations, for random walkers with probability-dependent resetting/memory, using parallelized high-performance Fortran programs.
- Investigated characteristic statistical properties for each case to identify critical thresholds between diffusive/subdiffusive dynamics and defined differential models to predict system behavior.
- Visualized data and model solutions (distributions, variance, kurtosis) in Python/Jupyter.

## Research Assistant.

(05/2021 - 09/2021)

Universidad de Guadalajara | Guadalajara, Mexico.

PRO-SNI Scholarship. Supervised by Dr. Thomas Gorin.

*Epidemic Models for Immunity and Social Distancing:*

- Extended a time-dependent epidemic model to study COVID-19 waves in Mexico (Python/Pandas), processing CONACYT-provided national and state data (2 years of records).
- Led data cleaning, developing an algorithm to automate the process for any individual dataset, addressing specific issues in data collection, targeting up to 95% of anomalies.
- Analyzed the epidemic time-series to identify infection waves. Collaborated closely with Dr. Gorin to produce a mathematical model describing the growth and decay behavior of infections.
- Evaluated output parameters to create a dynamic estimate of the reproductive number while illustrating the impacts of real-world phases and government decisions (lockdown timing, immunity, and the effectiveness of public policy).

## Education

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### Bachelor's Degree in Physics.

(08/2018 - 10/2025)

Universidad de Guadalajara. Guadalajara, Mexico.

Expected October 2025 | Thesis in progress

## Academic Presentations

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### Meeting on Complex Systems and Stochastic Processes.

(07/2024)

Poster | Random walks with Relocation and Memory Dynamics.

Guadalajara, Jalisco, Mexico. July 2024.

## Skills

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*Languages:* English (Fluent), Spanish (Native)

*Technical:* Python (Pandas, NumPy), Fortran (OMP), MATLAB (Mid), SQL (Basic querying skills)

*Data Tools:* Jupyter Notebook, Matplotlib, Git, LaTeX (Overleaf), Power Bi (Self-Learning)

*Concepts:* Monte Carlo Algorithms, Stochastic Modeling, Time-Series Analysis, Statistical Physics

*Extra:* HTML, CSS, JavaScript (Basic) (Self-taught to build my Portfolio)

**Portfolio:** [armmancilla.github.io](https://armmancilla.github.io) | GitHub: [armmancilla](https://github.com/armmancilla) | Includes additional information about all the projects listed here, as well as details about some smaller projects.