IVÁN DARÍO PEÑA CAMARGO

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SUMMARY

Applied mathematician and MSc graduate with strong foundations in numerical analysis, optimization, and computational modeling. Experienced in solving inverse problems, implementing mathematical algorithms in multiple programming languages, and analyzing complex systems across biological, engineering, epidemiological, and population domains. Skilled in working with real and synthetic datasets, performing statistical analysis, validating models, and translating results into actionable insights. Motivated by rigorous problem-solving, continuous learning, and applying mathematical and data-driven methods to support decision-making and innovation.

EDUCATION

- **Master of Science with a Focus in Applied Mathematics** — **Aug 2021 - Aug 2024**
  Centro de Investigación en Matemáticas, A.C. (CIMAT) — *Guanajuato, Guanajuato, México*
- **Mathematician** — **Feb 2014 - Dec 2019**
  Universidad Nacional de Colombia, sede Manizales. (UNAL) — *Manizales, Caldas, Colombia*

PROJECTS

Inverse Problem Solving via Bayesian Paradigm - Uncertainty Quantification Project **Sep - Nov 2024**

- Explored an alternative strategy to the variational method proposed in the master thesis, applying a Bayesian approach based on Markov chain MonteCarlo (MCMC) sampling to solve inverse problems.

Gradient by the Adjoint Method and Parameter Estimation in Systems of ODEs - Master's thesis Aug 2023 - Aug 2024

- Formulated the parameter estimation problem as a constrained optimization problem, given a set of real or synthetic data/observations for a specific variable. Following a variational approach, the gradient was computed using the adjoint system method. The optimization problem was solved using Python minimization algorithms, which were thoroughly tested and applied to population, epidemiological, engineering, and glucose-insulin regulation models.

Inverse Problem Solving via Regularization Methods – PDEs and Inverse Problems Project **Apr - Jun 2023**

- Implemented Total Variation (TV) regularization and Landweber iteration for solving inverse problems involving the 1D heat equation using noisy final-time data. Developed Python algorithms based on gradient descent and fixed-point iteration, incorporating the Morozov discrepancy principle for regularization parameter selection. Based the implementations on key references (Curtis R. Vogel; Kaipio & Somersalo). Compared both methods against Tikhonov regularization. Demonstrated strong skills in numerical PDEs, inverse problems, and algorithmic analysis.

Comparison of Optimization Algorithms – Optimization Project **Apr - Jun 2022**

- Implemented and compared the Fletcher-Reeves Conjugate Gradient method and a Trust Region algorithm proposed by Gonglin Yuan & Zengxin Wei using Python. Evaluated both algorithms across benchmark functions (Sphere, Schwefel, Griewank, Rastrigin, Wood, and Branin) using metrics such as runtime, iteration count, function value at optimum, and gradient norm. Demonstrated strong analytical and programming skills through algorithmic performance assessment and robustness evaluation across multimodal and non-convex landscapes.

Projectile Simulation using Runge-Kutta Methods – Numerical Analysis Project **Sep - Nov 2021**

- Simulated projectile motion based on the historical Paris cannon, analyzing ideal (no air resistance) and real (with air friction) models. Used Python to implement the fourth-order Runge-Kutta method for numerically solving nonlinear differential equations. Investigated the effect of varying firing angles on trajectory symmetry and range, validating results through comparison between theoretical and physical behaviors. Demonstrated practical application of numerical methods in real-world physics modeling.

EXPERIENCE

Professor's Assistant **Feb 2018 - Nov 2019**

Universidad Nacional de Colombia, sede Manizales. (UNAL) *Manizales, Caldas, Colombia*

- Academic support in subjects with high repetition rates (linear algebra, differential, integral and vector calculus, and discrete mathematics) to strengthen the academic performance of undergraduate students.
- Provided one-on-one academic support to students in high-failure courses, improving class pass rates by 15%.
- Helped design and grade problem sets; assisted with tutorial sessions and exam prep.

HARD SKILLS

Programming:

- Python (*Advanced*) (IDEs: Codility, Google Colab, HackerRank, Jupyter, PyCharm & Spyder) Libraries: Emcee, Math, Matplotlib, NumPy, Pandas, Scikit-Learn, SciPy & SimPy.
- Matlab (*Intermediate*) Libraries: MatCont.
- R (*Intermediate*)
- SQL (Intermediate) (Google Cloud BigQuery) (MySQL) (IDE: HackerRank & MySQL Workbench)
- Machine Learning (Basic) (Keras) Libraries: TensorFlow.
- Power BI (Learning)

Computing:

- LaTex (*Advanced*) (Jupyter Notebook & Overleaf)
- Microsoft Office (*Advanced*) (Excel, Power-Point & Word)

Languages:

- Spanish (Native)
- English (B2+)

CERTIFICATIONS

- Intro to Machine Learning - Kaggle (Sep 2025)
- Advanced SQL - Kaggle (Sep 2025)
- Intro to SQL - Kaggle (Aug 2025)
- R - Universidad Nacional de Colombia, sede Manizales (Dec 2018)
- Matlab - Universidad Nacional de Colombia, sede Manizales (Dec 2018)
- Python - Universidad Nacional de Colombia, sede Manizales (Dec 2018)

SOFT SKILLS

Problem-solving, logical thinking, adaptability, multidisciplinary collaboration & responsibility.