

Felipe Montealegre Mora, PhD

Data Science | Machine Learning | Statistical Modeling

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PROFESSIONAL SUMMARY

PhD data scientist with 8+ years building statistical and machine learning models that drive real decisions, from problem framing through deployment to stakeholder adoption. Depth across Bayesian inference, reinforcement learning, deep learning, optimization, and model deployment. Track record of turning ambiguous domain questions into quantitative frameworks and delivering results decision-makers act on. 14+ peer-reviewed publications. Bilingual English/Spanish, US Central time.

CORE COMPETENCIES

Statistical Modeling & Inference: Bayesian inference and hierarchical models (Rnimble), probabilistic estimation from noisy observational data, uncertainty quantification, experimental design

Machine Learning: Deep learning (PyTorch), reinforcement learning (RLlib, Stable Baselines), supervised learning (scikit-learn), classification and regression, clustering and dimensionality reduction (PCA), hyperparameter optimization (optuna), time-series analysis (Darts)

Optimization & Algorithms: Convex optimization (cvxpy), Bayesian optimization (scikit-optimize), graph and network algorithms (NetworkX), runtime and memory complexity analysis

Languages & Analysis: Python (expert), R (advanced), SQL

Delivery & Engineering: ETL pipelines, distributed computing (ray, PySpark), model deployment, Docker, Git, CI/CD (GitHub Actions), cloud workflows (AWS S3, Athena, SageMaker), Terraform

Communication: Visualization (pandas, seaborn, Plotly), technical writing, stakeholder translation, teaching and mentoring

AI-Assisted Development: Claude Code, Copilot CLI

PROFESSIONAL EXPERIENCE

Universidad de Costa Rica, San Pedro, Costa Rica.

Professor of computational physics

August 2025 - Present

- Designed and taught ML and AI curricula (optimization, classification, regression) and graph algorithms (Goemans-Williamson, perfect matching, max-flow) at undergraduate and graduate levels.
- Mentored students on applied modeling projects, setting technical direction and reviewing work.

University of California at Berkeley, USA.

Postdoctoral researcher at Schmidt Center for Data Science & the Environment.

September 2024 - July 2025

- Built statistical models producing accurate wildlife population estimates from noisy, incomplete observational data, quantifying uncertainty so stakeholders could weigh decisions under risk.
- Worked directly with non-technical domain stakeholders to translate management questions into quantitative frameworks, then delivered results in forms they could act on.
- Developed and maintained production software for AI-enhanced wildlife and fishery management, owning the full path from data ingestion through modeling to delivered outputs.
- Delivered a desktop application for a stakeholder's cluster environment, giving domain experts a graphical interface for image classification, including ETL from raw source data into analysis-ready form.

Postdoctoral researcher at the Boettiger Lab.

September 2022 - August 2024

- Led a team developing reinforcement learning methods for adaptive ecosystem management — sequential decision-making under deep uncertainty, from reward specification through training to policy evaluation.
- Designed and ran large-scale simulation studies evaluating policy performance across scenario ensembles, using distributed pipelines on cluster infrastructure.
- Packaged methods as reusable tooling for the wider research community.

SELECTED PROJECT

Cloud Data Platform: NYC Taxi & Limousine Trip Data (AWS)

End-to-end analytics and ML pipeline over a multi-billion-row public dataset.

- Designed a partitioned data layout on S3 and built SQL transformation workflows in Amazon Athena, tuning partitioning and file layout for query performance and cost.
- Built demand and fare forecasting models in SageMaker, with feature engineering and training workflows driven from Python.

Code repository: <https://github.com/felimomo/AWS-ML-taxi-nyc/tree/main>

RESEARCH & PUBLICATIONS

Author of 14+ peer-reviewed articles spanning deep learning, data science, quantitative ecology, and quantum computing. Presenter at multiple international conferences. Research mentor for 10+ students; mentor and judge at Costa Rica's first quantum hackathon. Highlights:

- Montealegre-Mora, et al. "Using machine learning to inform harvest control rule design in complex fishery settings." (2025) *Fish and Fisheries*.
- Connor, Montealegre-Mora, et al. "Indigenous Knowledge and Community-Derived Counts Produce Robust Wildlife Population Estimates: Roosevelt Elk in Karuk Aboriginal Territory." (2025) *Ecology and Evolution*.
- Montealegre-Mora, et al. "Pretty darn good control: when are approximate solutions better than approximate models." (2023) *Bulletin of Mathematical Biology*.

EDUCATION

University of Cologne, Germany.

PhD in Quantum Computing (Theoretical Physics & Computer Science, *magna cum laude*). Jan. 2018 - Mar. 2022.

MSc. in Physics (With coursework on computational complexity & network algorithms). Oct. 2015 - Dec. 2017.

University of Costa Rica, San José, Costa Rica. BSc. in physics. Mar. 2010 - Jun. 2015.

LANGUAGES

Spanish (native); **English** (bilingual); **German** (Intermediate)