

María Fernanda González Ph.D.

Physicist · AI Scientist · Algorithm Designer · Deep-Tech Founder · Speaker

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RESEARCH MISSION — Use physics, mathematical modelling and complex-systems thinking to design fundamentally new Artificial Intelligence algorithms for real-world scientific, environmental, economic and financial systems.

SCIENTIFIC PROFILE

Physicist and AI scientist with nearly two decades of experience designing new computational and Artificial Intelligence solutions for complex systems. Since 2007, I have applied physics, mathematical modelling and computational methods to identify methodological limitations and formulate new algorithmic solutions across energy, healthcare, labour markets, Earth Observation, environmental science, natural capital and financial modelling. I combine fundamental scientific research, industrial algorithm design, doctoral and master's supervision, and technology entrepreneurship.

1 · Problem	2 · State of Art	3 · Physics/Math	4 · New Algorithm	5 · Validation	6 · Application
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CURRENT RESEARCH LINES

SEEA-AI · Natural Capital Unified model for quantifying natural capital through AI + Earth Observation. PhD co-supervision at Universitat Internacional de Catalunya (2022–Present).	Q-GAP · Financial Systems New physics-inspired AI framework for complex financial systems. Proprietary mathematical formulation. Empirically validated — Sharpe 1.067, p-values 0.002–0.039. Working Paper: Zenodo 2026.
AI + EO · Environmental Risk ML, Sentinel-2 and mining variables for mercury-related environmental risk estimation. Master's co-supervision at U. Nacional de Colombia (2026–Present).	AI + Complex Networks · Health Network-based modelling and AI for chronicity and multimorbidity. PhD co-supervision at Universitat de Lleida; thesis completed 2017.

SCIENTIFIC & ALGORITHMIC INNOVATION EXPERIENCE

Founder, CEO & Scientific Lead

PlanetAI Space / PlanetAI Nature Space · 2019–Present

- Scientific conception of AI + Earth Observation methodologies for environmental monitoring, natural-capital quantification and climate/environmental risk.
- Proprietary algorithms combining satellite data and AI for contamination detection, carbon, biodiversity, groundwater potential and risk mapping (floods, wildfire, deforestation, illegal mining).
- Carbon credits certification platform — standards for transparency, integrity and traceability of the carbon credit market.

Creator & Scientific Lead

Q-GAP — Quantum-Inspired González Adaptive Portfolio · 2025–Present

- New physics-inspired AI framework for analysing complex financial systems. Proprietary mathematical formulation and algorithmic architecture.
- Four-level independent validation: Sharpe 1.067 (Level 2), 1.037 (Level 4 fully walk-forward), max drawdown -19.42% — smallest of all strategies evaluated.
- Bootstrap p-values 0.002–0.039 vs all four classical benchmarks. Working Paper published Zenodo 2026.

Founder, CEO & Scientific Lead

InnoQuant / MOCA Platform · 2013–2020

- Designed large-scale matching, recommendation, prediction and anomaly-detection algorithms for labour markets, e-commerce, mobility, tourism and urban systems.
- Generated +€3.5M revenue and +€34M in new business across JobAnalytics, EnergyAnalytics, MOCA Platform and MOCA Digital City.

R&D; — Mathematical Models & AI Algorithms

Aplicaciones en Informática Avanzada / InnoQuant · 2007–2014

- Designed ML algorithms for consumption estimation, forecasting and anomaly detection on datasets of 20M+ natural gas supply points in Spain.
- Generated +€20M in new business (Gas Natural real-time estimator).

Predoctoral Researcher

University of Barcelona — Dept. of Physical Chemistry · 2003–2007

- PhD research on Bohmian mechanics, quantum tunnelling and resonances. Co-authored 5 peer-reviewed publications in Physical Review A, J. Physical Chemistry A, Theoretical Chemistry Accounts, J. Mathematical Chemistry.

ACADEMIC RESEARCH & SUPERVISION

PhD Co-Supervisor — *SEEA-AI: A Unified Model for Natural Capital Quantification through AI and Earth Observation.*

Universitat Internacional de Catalunya (UIC), Spain · 2022–Present

Master's Thesis Co-Supervisor — *Indirect estimation of mercury-related risk through ML, Sentinel-2 and mining-pressure variables.*

Universidad Nacional de Colombia · 2026–Present

PhD Co-Supervisor — *Chronicity and multimorbidity: a global network approach through network analysis.*

Universitat de Lleida, Spain · Completed 2017

SELECTED SCIENTIFIC PUBLICATIONS

- Space and Momentum Representation Analysis of Wave Packet Transmission in the Hartman Effect — **Physical Review A**, 78, 032102 (2008)
- Quantum Trajectories from a Discrete-Variable Representation Method — **Journal of Physical Chemistry A**, 111, 10226–10233 (2007)
- A Bohmian Total Potential View to Quantum Effects II: Decay of Temporarily Trapped States — **Theoretical Chemistry Accounts** (2009)
- Bofill Effective Potential, Bohm's Potential Plus Classical Potential: Analysis of Quantum Transmission — **Journal of Mathematical Chemistry**, 43, 350–364 (2008)
- Quantifying Colombian Blue Carbon Sinks from Coastal Mangroves — Earth Observation / ML research (2024)
- Q-GAP: Quantum-Inspired González Adaptive Portfolio — **Working Paper · Zenodo**, DOI 10.5281/zenodo.21321206 (2026)
- The End of Fragmented Intelligence: Essential AI, Ancestral Knowledge and Planetary Continuity — **Essay · Zenodo** (2025)

EDUCATION

PhD in Physics · University of Barcelona, Spain · 2003–2007

Master in Numerical Methods · CIMNE / Universitat Politècnica de Catalunya, Spain · 2001–2003

Oceanography · Escuela Naval de Cadetes Almirante Padilla, Colombia · 2000–2001

Degree in Physics · Universidad de los Andes, Colombia · 1994–1999

MBA – Learning to Grow · IESE Business School, Barcelona, Spain · 2011–2012

Moonshot Thinking for Entrepreneurs · ESADE Business School, Munich, Germany · 2022

International Visitor Leadership Program (IVLP) · U.S. Department of State, Washington D.C. · 2013

INTERNATIONAL AWARDS & RECOGNITION

WEF / UpLink Top Innovator · World Economic Forum	2025
Moonshot Thinking Award — Planet XXI · La Caixa · ESADE Business & Law School	2022
ILS Innovation Leaders Summit · Tokyo, Japan — Catalan & Japanese Governments	2021
K-Ground Global Startup Exchange · Seoul, South Korea — Korea Innovation Hub	2019
Gentry Women in Tech · San Francisco, USA	2018
International Visitor Leadership Program · U.S. Department of State	2013

LANGUAGES & CORE SKILLS

Languages: Spanish (native) · English (professional) · Catalan (professional)

Technical: Physics-inspired AI · Mathematical modelling · Algorithm design · Machine Learning · Earth Observation · Numerical methods · Complex networks · Quantum dynamics · Big Data · Python · MATLAB

LONG-TERM RESEARCH QUESTION — How can physics help us design fundamentally new Artificial Intelligence algorithms to understand complex systems?