Javier A. Vélez

PhD · Spintronics · Nonlinear Dynamics · Neuromorphic Computing

UPV/EHU & DIPC (San Sebastián). Research on magnetic textures (domain walls, skyrmions), chaos theory, and neuromorphic computing. Expert in analytical modeling and numerical simulation (Fortran, Mathematica, Python), with results consistently validated through analytical, atomistic, and micromagnetic approaches.

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SUMMARY

Physicist and researcher specialized in functional materials and information technologies, with experience in designing and simulating complex magnetic systems. Throughout my career I have blended analytical thinking with creativity to tackle challenging problems and turn them into concrete solutions, from theoretical modeling to computational validation. I adapt quickly to new work environments and enjoy collaborating with multidisciplinary teams. I am proficient with the major operating systems, Linux, macOS, and Windows, and a range of scientific programming tools, which lets me move smoothly across different technological contexts. Beyond the technical side, I value communication, empathy, and the ability to connect with people, qualities I consider essential to drive innovation and achieve results that bring together science, technology, and human collaboration.

SKILLS

Fortran (advanced) · Mathematica (advanced) · Python · Large Language Models & Multimodal AI · Data Analysis & Complex Systems Modeling · Neuromorphic Computing · High-Performance Computing · Linux · macOS · Windows · LaTeX · Problem-Solving · Adaptability · Team Collaboration

EXPERIENCE

Predoctoral Researcher · Donostia International Physics Center (DIPC)

Modeling · Simulation · Publications

Feb 2022 - May 2023 · May 2024 - May 2025

Theoretical-computational work in spintronics and magnetic textures; development of continuum models for antiferromagnetic domain walls and validation with numerical simulations. In 2025, publication in *npj Spintronics* and consolidation of research lines in magnetism and chaos.

Predoctoral Researcher · Universidad del País Vasco (UPV/EHU)

Nonlinearity · Numerical Simulation · HPC

May 2023 - May 2024

EDUCATION

PhD in Physics of Nanostructures and Advanced Materials

UPV/EHU · 2022-2025 · San Sebastián
DIPC · Spintronics · Chaos
Thesis defended (2025)

MSc in Physics

Universidad de Sucre (Colombia) · 2019

BSc in Physics

Universidad de Córdoba (Colombia) · 2015

Advanced numerical simulations and analytical methods in nonlinear magnetization dynamics, including stability analysis, bifurcations, and chaos characterization.

Assistant Researcher · Mathematical Modeling Laboratory, (IAI/UTA)

Fortran · Simulation · Chaos · Data Analysis

2019 - 2021 · Arica, Chile

Development of Fortran simulations for dynamical systems (Runge-Kutta and explicit schemes) and data analysis across diverse problems, viscoelastic convection in porous media, ferroconvection, nonlinear magnetization, dissipative structures, and epidemiological analysis (COVID-19). Reproducible workflows (LaTeX) and collaboration with multidisciplinary teams.

TEACHING (SELECTED)

Physics I-III (Mechanics, Electromagnetism, Oscillations & Waves) · CECAR

Introduction to Physics, Biophysics, Acoustics · University of Sucre

LANGUAGES

Spanish — Native

English — Intermediate

PUBLICATIONS (2019-2025)

Chaotic Proliferation of Relativistic Domain Walls for Reservoir Computing. npj Spintronics **3**, 14 (2025). DOI: 10.1038/s44306-025-00079-y

Characterization of quasi-periodic dynamics of a magnetic nanoparticle. Commun. Nonlinear Sci. Numer. Simul. **149**, 108942 (2025). DOI: 10.1016/j.cnsns.2025.108942

Skyrmion Hall effect and shape deformation of current-driven bilayer skyrmions in synthetic antiferromagnets. Phys. Rev. B **112**, 184402 (2025). DOI: 10.1103/PhysRevB.112.184402

Chinchorro culture: An analysis from the learning perspective. Social Sciences & Humanities Open **11**, 101309 (2025). DOI: 10.1016/j.ssaho.2025.101309

Complexity measurements for the thermal convection in a viscoelastic fluid saturated porous medium. Results in Physics **52**, 106737 (2023). DOI: 10.1016/j.rinp.2023.106737

Lattice structure dependence of laser-induced ultrafast magnetization switching in ferrimagnets. Appl. Phys. Lett. **123**, 112402 (2023). DOI: 10.1063/5.0169387

Influence of higher-order modes on ferroconvection. Chaos **32**, 083129 (2022). DOI: 10.1063/5.0097398

Skyrmion Dynamics in a Double-Disk Geometry under an Electric Current. Nanomaterials **12**, 3086 (2022). DOI: 10.3390/nano12183086

Skyrmion Dynamics in a Double-Disk Geometry under an Electric Current: Part Two. Nanomaterials **12**, 3793 (2022). DOI: 10.3390/nano12213793

Dissipative structures in a parametrically driven dissipative lattice: Chimera, localized disorder, continuous-wave, and staggered states. Chaos, Solitons and Fractals **146**, 110880 (2021). DOI: 10.1016/j.chaos.2021.110880

A quasi-periodic route to chaos in a parametrically driven nonlinear medium. Chaos, Solitons & Fractals **151**, 111089 (2021). DOI: 10.1016/j.chaos.2021.111089

Study of type-III intermittency in the Landau-Lifshitz-Gilbert equation. Physica Scripta **96**, 12 (2021). DOI: 10.1088/1402-4896/ac198e

Dynamic quarantine: a comparative analysis of the Chilean public health response to COVID-19. Epidemiology & Infection **148** (2020). DOI: 10.1017/S0950268820002678

Periodicity characterization of the nonlinear magnetization dynamics. Chaos **30**, 093112 (2020). DOI: 10.1063/5.0006018

Chaotic convection in an Oldroyd viscoelastic fluid in saturated porous medium with feedback control. Chaos **30**, 073109 (2020). DOI: 10.1063/5.0002846

Study of dynamic behaviors in a spin valve system modeled by the Landau-Lifshitz-Slonczewski equation. Journal of Magnetics **24**, 402 (2019). DOI: 10.4283/jmag.2019.24.3.402