Sasha (Augusto) Kielbowicz

Scientific Computing Consultant | ML-Augmented Modeling Specialist

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GitHub | LinkedIn | Talks

Executive Profile

Research Software Engineer with Physics PhD (University of Buenos Aires) specializing in **ML-augmented scientific modeling**, **Neural Stochastic Differential Equations**, and **dynamical systems**. I bridge theory and practice by developing mathematically rigorous computational frameworks that combine domain knowledge with data-driven approaches.

My expertise spans **statistical modeling**, **stochastic differential equations**, and **scientific machine learning**—applied across financial systems, hydrodynamics, and computational physics. I excel at **long-term project ownership** (6-18+ months), translating complex scientific problems into production-grade software using **Julia**, Python, and C#.

Core Strengths: Neural SDEs • Universal Differential Equations • Statistical Modeling • Dynamical Systems • High-Performance Julia • Research Software Engineering • Scientific Communication • External Collaboration • Methodology Development

Proven Impact: Published researcher • Conference presenter • Mentor to junior scientists • 300% performance improvements • Zero-defect complex migrations

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Scientific Methodology Expertise

ML-Augmented Modeling - Neural Stochastic Differential Equations (NeuralSDEs) for option pricing - Integration of deep learning with physical laws and constraints - Universal differential equations for hybrid modeling - Automatic differentiation for gradient-based optimization

Statistical & Dynamical Modeling - Stochastic differential equations and processes - Monte Carlo methods and variance reduction - Bayesian inference and model calibration - Time-series analysis and forecasting

Computational Methods - High-performance numerical optimization (300% gains achieved) - Parallel computing and cache optimization - Symbolic computation and expression simplification - Performance profiling and algorithmic analysis

Research Software Engineering - Reproducibility and validation frameworks - Jupyter-to-production workflows - Scientific computing best practices - Domain-Specific Language (DSL) design

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Publications & Research

Kielbowicz, A., et al. (2023). “Shared Memory Semi-Implicit Solver for Hydrodynamical Instability Processes.” *Scientific Research Publishing*. Link

Kielbowicz, A., et al. (2017). “Photon Counting Module based on Avalanche Photo-Diodes.” *Anales AFA*. Link

PhD Thesis (2011-2017): Statistical Analysis and Numerical Modeling of Single Particle Trajectories: Diffusion and Confinement Mechanisms - Stochastic process modeling with applications to biological systems - Numerical methods for complex dynamical systems - Statistical inference from noisy experimental data

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Signature Projects: Scientific ML & Modeling

1. NeuralSDE Research for Option Pricing (Qontigo, 2021-2022)

The Challenge: Traditional Monte Carlo methods for European option pricing were computationally expensive; standard ML approaches lacked mathematical guarantees and physical constraints.

The Solution: Managed research project implementing **Neural Stochastic Differential Equations (NeuralSDEs)** using **Julia**, combining neural networks with differential equation solvers to enforce mathematical structure while enabling data-driven learning.

Outcome: Demonstrated superior convergence over traditional solvers; established framework for “physics-informed ML” in quantitative finance; successfully applied Research Software Engineering principles ensuring reproducibility and robustness.

Technologies: Julia, DifferentialEquations.jl, Flux.jl, scientific ML ecosystem

2. Performance Optimization of Numerical Solvers (Qontigo, 2022-2023)

The Challenge: Convertible bond pricing engine was bottlenecking real-time risk calculations across multi-asset portfolios.

The Solution: Conducted forensic performance analysis of C# numerical library, identifying inefficient memory access patterns. Implemented targeted caching strategies and algorithmic improvements.

Outcome: **300% performance gain** enabling real-time production deployment; significantly reduced cloud compute costs; methodology became standard for team optimization efforts.

3. Interactive Scientific Computing Platform (Qontigo/SimCorp, 2022-2024)

The Challenge: Quantitative researchers needed accessible interfaces to complex mathematical models without installation friction or programming barriers.

The Solution: Architected **Jupyter-based interactive UI** using ipywidgets/Voila; designed **Domain-Specific Language (DSL)** for intuitive model specification; deployed containerized Azure infrastructure with CI/CD.

Outcome: Democratized access to sophisticated analytical libraries; enabled non-programmers to safely construct and validate complex pricing logic; became standard tooling for quantitative team.

Professional Experience

Independent Consultant | Scientific Computing & ML-Augmented Modeling

January 2026 - Present | Buenos Aires, Argentina (Remote)

Providing specialized consulting in scientific modeling, ML-augmented dynamical systems, and research software engineering for technology and scientific computing companies.

Focus: Long-term project ownership • Methodology development • Julia/Python scientific computing • Statistical modeling • External collaboration

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Mercado Libre | Software Technical Lead, Financial Planning & Analytics

June 2025 - Present | Buenos Aires, Argentina

Leading 14-engineer team applying Research Software Engineering principles to transform ad-hoc analyses into production systems for Latin America's largest e-commerce platform.

Key Achievements: - **90% reduction in forecasting errors** through statistical rigor and testing discipline - Standardized Jupyter-to-production pipelines using CI/CD - Mentored team on clean architecture and scientific computing practices

Technologies: Python, Go, TypeScript, BigQuery, Jupyter, statistical modeling

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SimCorp | Lead Software Engineer, Core Analytics

March 2024 - May 2025 | Buenos Aires, Argentina

Delivered strategic scientific computing initiatives for institutional investment platform.

Key Projects: - **Automatic Differentiation Integration**: Redesigned core libraries to support AD; collaborated with third-party providers for advanced tooling - **AI-Powered Documentation**: Built LLM-based RAG system for querying complex financial/mathematical documentation - **DSL Development**: Proof-of-concept domain-specific language for quantitative modeling - **Jupyter UI Integration**: Enhanced analytical capabilities with interactive computing interfaces

Technologies: C#, Python, Julia, Azure, Jupyter, LLMs

Qontigo (Axioma Risk) | Associate Principal, Core Analytics

September 2020 - March 2024 | Buenos Aires, Argentina

Led development of quantitative analytical libraries for multi-asset risk platform used by institutional investors globally.

Scientific Computing Leadership (2023-2024)

- **Curve Construction Library**: Full implementation of rates/yields/discounts with market conventions
- **Interactive Jupyter Platform**: Web-based UI democratizing access to analytical libraries
- **Cross-functional Leadership**: Bridged Quants, DevOps, Engineering teams for integrated delivery
- **Team Mentorship**: Managed junior developers; interns became full-time hires

Research & Infrastructure (2020-2023)

- **NeuralSDE Research**: Managed intern project on ML-augmented option pricing using Julia; applied RSE principles for reproducibility
- **Performance Optimization**: 300% improvement in convertible bond pricing through numerical analysis
- **Monorepo Architecture**: Extracted analytical code into reusable, testable scientific libraries
- **Complex Migration**: Migrated DayCountConventions with 100% accuracy across thousands of test cases
- **Symbolic Computing**: Implemented expression simplification and visualization for analytical library

Performance Reviews: “Exceptional Performance” (2023); “Strong Performance” (2022, 2020)

Technologies: C#, Python, Julia, Azure, Jupyter, numerical computing libraries

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J.P. Morgan | Technology Analyst, Rates CIB

July 2018 - August 2020 | Buenos Aires

Built production infrastructure for quantitative analytics supporting interest rate derivatives trading.

Key Deliverable: Architected zero-downtime migration of mission-critical reporting from Smalltalk to Python; provided technical support to Quants team.

Technologies: Python, Smalltalk, Athena framework, Linux

Education

University of Buenos Aires | Licenciatura in Physics (≈ PhD level) | 2011 - 2017 - **Thesis**: Statistical Analysis and Numerical Modeling of Single Particle Trajectories: Diffusion and Confinement Mechanisms - **Focus**: Stochastic processes, computational physics, numerical methods, statistical

inference - **Skills**: Mathematical modeling of complex systems, scientific programming, experimental data analysis

Universidad del CEMA | Advanced Risk and Portfolio Management (ARPM) | 2021 - Quantitative finance and statistical risk management

10 Pines | Software Engineering Certificate | 2018 - 2019 - Software architecture, design patterns, professional development

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Teaching & Scientific Communication

University of Buenos Aires

- **Professor** of Calculus and Linear Algebra, Engineering (2020-2022)
- **Teaching Assistant**, Thermodynamics & Optics for Biology/Geology (2015)
- **Science Communicator**, Physics Department (2013-2014)

Conference Presentations

- **SciPy Latinoamérica 2022**: Workshop on quantitative computing
- **Python & Julia Meetups**: Regular speaker on scientific computing
- **ECI UBA 2023**: Represented Qontigo at School of Information Sciences

All talks: talks.saxa.xyz

Open Source & Education

- Creator of **SCA314**: Educational YouTube channel on scientific computing with Julia, software craftsmanship, testing (Spanish)
- Interactive Jupyter-based educational materials
- Active in Python/Julia scientific computing communities

Technical Skills

Programming Languages - **Expert**: Python, Julia, C# - **Proficient**: F#, Clojure, Smalltalk

Scientific Computing & ML - Stochastic differential equations • Neural ODEs/SDEs • Universal differential equations • Automatic differentiation • Bayesian inference • Monte Carlo methods • Statistical modeling • Numerical optimization • Parallel computing • Performance profiling

Software Engineering - Research Software Engineering (RSE) • Git/GitHub • CI/CD (GitHub Actions, TeamCity) • Docker • Azure • Testing frameworks • Jupyter ecosystems • DSL development • API design • Monorepo architecture

Domain Knowledge - Computational physics • Quantitative finance • Dynamical systems • Time-series analysis • Stochastic processes • Model calibration & validation

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Professional Highlights

✓ **Published Researcher**: Peer-reviewed publications in computational physics and instrumentation

✓ **Scientific ML Expertise**: Hands-on NeuralSDE implementation; physics-informed machine learning

✓ **Long-term Project Ownership**: 18+ month initiatives from conception to production

✓ **External Collaboration**: Successfully interfaced with external researchers and stakeholders

✓ **Proven Mentor**: Managed interns who became full-time hires; extensive teaching experience

✓ **Performance Engineering**: 300% optimization gains through rigorous numerical analysis

✓ **Scientific Communication**: Conference presentations, publications, educational content creation

✓ **Julia Expertise**: Production experience with SciML ecosystem, DifferentialEquations.jl

✓ **Exceptional Performance Reviews**: Top ratings for technical contributions and leadership

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Languages

Spanish: Native **English**: Professional working proficiency

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Engagement Approach

Discovery: Deep understanding of scientific domain, technical constraints, stakeholder needs

Methodology Development: Design novel approaches combining domain knowledge with ML/ statistical methods

Implementation: Hands-on development ensuring reproducibility, testing, documentation

Collaboration: Regular communication with stakeholders; scientific writing and presentations

Mentorship: Knowledge transfer, team enablement, building scientific computing capacity

Delivery Models: Long-term project ownership (6-18 months), fractional consulting, team augmentation

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References and detailed project portfolios available upon request

Open to remote scientific consulting globally and on-site in Buenos Aires