GIACOMO ROSILHO DE SOUZA

Applied Mathematician (PhD) | Researcher | Simulation Engineer

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Summary

Applied mathematician expert in **physic-based simulations**, **numerical methods, mathematical models**, **stochastic processes,** and **optimization**. Model-based design of numerical strategies. Implement and test algorithms in **Python, C++,** and **MATLAB**. Exceptional **communication** skills acquired through presenting at international conferences and collaborations. Independent researcher. Author of several papers in top-tier journals, full list.

Selected Achievements

C++ Multi-scale Stochastic Differential Equations

Designed and implemented fast **Monte Carlo** integration methods achieving speed-up factors of 10.

C++ Discontinuous Finite Elements

Optimized nonlinear **finite element** simulation code, achieving speed-up of 5.

Python Parallel computing

Developed and implemented the first **parallel-in-time** solver. Tested accuracy and stability on **HPC** machines on over 1000 processors.

Skills

Simulation Engineering:

Numerical methods · Numerical integration · Runge-Kutta methods · Exponential methods · Finite elements · Finite differences · Stabilization methods · Numerical linear algebra · High-performance computing · Boundary element methods · Parallel computing · Nonlinear multi-grid methods · Large-scale simulations · Mixed-precision methods · Tau-leap methods · Monte Carlo simulations · Optimization methods · Spectral deferred corrections

Mathematics: Dynamic systems · Differential equations · Calculus · Linear algebra · Stochastic calculus · Optimization · Probability · Statistics

Software Engineering: Python · C++ · MATLAB · Git · CMake · Linux/Unix · Docker · Conda

Data Analysis and libraries: Pandas · SQL · NumPy · Seaborn · Matplotlib · Scikit-learn · Dash · Machine learning · JAX · Flax

Managerial: Public speaking · Led report writing · Scientific writing · LaTeX · Supervision of talents · Communication

Experience

USI - Università della Svizzera italiana — Lugano, Switzerland

Simulation Engineer — 11/2021 - 12/2024

- Contributed to 2 **European** high-performance computing (HPC) **projects. Collaborated** with **remote** teams.
- Developed **parallel** and **multi-scale** solvers for large complex systems of nonlinear **PDE**s, reducing computational time by 50% on 1000 processors (Python).
- Research on stabilized **optimization** methods (Python).
- **Code optimization** for numerical solvers (Python/C++).
- Lecturer, rated 9/10 by MSc students. Supervisor for 3 MSc thesis students.

EPFL - Swiss Federal Technology Institute of Lausanne — Lausanne, Switzerland

Research Scientist — 06/2020 - 08/2021

- Research in **stochastic** differential equations and **mixed-precision** methods for GPUs, improving computational efficiency by 75% (C++).
- Lecturer for the MSc course "Numerical integration of dynamical systems".

PhD Student — 09/2015 - 05/2020

- Enhanced **stochastic** differential equations solvers and **finite element** methods, achieving speed-up factors of 10 (C++).
- **Supervisor** for 5 BSc and MSc students in research projects.

CSCS - Swiss National Supercomputing Centre — Lugano, Switzerland

Computational scientist intern — 09/2013 - 01/2014

Migrated an astrophysics simulation code from CPUs to GPUs (Fortran).

- **Code optimization**, algorithms, and data structures, achieving a 10x speed-up.
- Results presented at international conferences.

Selected Publication

Submitted SIAM Journal on Scientific Computing — doi.org/10.48550/arXiv.2405.19994

High-order parallel-in-time method for the monodomain equation in cardiac electrophysiology

Parallel-in-time method inspired from iterative **numerical linear algebra** techniques such as **multigrid** methods and the **nonlinear** full approximation scheme (**FAS**).

Certifications

IBM Data Science Professional Certificate — data analysis, data cleaning, data visualization, dashboards, supervised/unsupervised machine learning, data science libraries.

Education

EPFL

PhD in Applied Mathematics 09/2015 - 05/2020

EPFL

MSc in Mathematical Engineering | GPA: **5.75** / 6 09/2012 - 06/2014

EPFL

BSc in Mathematics | GPA: **5.45** / 6 09/2009 - 06/2012

Honors and Awards

Prize in Numerical Analysis

Received international Butcher Prize for excellent **communication skills** and **research quality**.

Teaching award at EPFL, 2 times

Prize for excellent quality and commitment in teaching, for **detailed** course material and delivering **clear** lectures to students.

Languages

English Fluent

French Fluent

Italian Native

Portuguese Native

Spanish Fluent

Interests

Fermentation

Soy sauce, miso, beer, cheese, kefir, tempeh, kvass, ...

DIY

Building furniture for home, forging, gardening.

Find me online

LinkedIn
linkedin.com/in/grosilho

Personal website
grosilho.ch

GitHub
github.com/grosilho

Google Scholar
scholar.google.com/citations?user=88Aul6QAAAAJ&hl=en&oi=ao