

# SIMONE ROMITI

simone.romiti.1994@gmail.com | [Website](#) | [GitHub](#) | [LinkedIn](#) | [ORCID](#)

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Theoretical physicist specialized in lattice gauge theories and lattice QCD predictions, with 8+ years of experience in high-performance computing, large-scale numerical simulations, and machine learning. Proven track record of designing algorithms that delivered order-of-magnitude performance gains, building open-source scientific software used in peer-reviewed research, and leading collaborative projects across international research institutions.

## TECHNICAL SKILLS

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**Programming Languages** - C, C++, Python, Bash, R

**HPC & Systems** - CUDA, MPI, OpenMP, SLURM, EasyBuild, GNU/Linux

**ML & Data** - PINNs, VAEs, Diffusion Models, Bayesian Statistics, Markov Chain Monte Carlo, Nested Sampling

**Libraries & Frameworks** - PyTorch, NumPy, SciPy, Pandas, Matplotlib, Plotly, Streamlit, SymPy, Jupyter

**DevOps & Tools** - Git, GitHub Actions, CI/CD, Docker, L<sup>A</sup>T<sub>E</sub>X, Quarto, Markdown

**Spoken Languages** - Italian (native), English (fluent), German (basic)

## WORK EXPERIENCE

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### University of Bern

*Postdoctoral Research Scientist*

Apr 2024 – Present

Bern, Switzerland

- **Reduced memory complexity from exponential to polynomial** by designing a novel algorithm using Physics-Informed Neural Networks (PINNs) in PyTorch
- **Achieved sub-permille numerical precision** as lead developer for a high-accuracy scientific computation pipeline
- **Improved algorithm scaling from  $O(N^6)$  to  $O(N \log N)$**  through a novel mathematical reformulation using FFTs and convolutions
- **Built and maintained open-source simulation libraries** (Python/C++) adopted across multiple research groups and directly enabling peer-reviewed publications
- **Mentored 3 PhD students** on software engineering practices, numerical methods, and project delivery

### University of Bonn

*Postdoctoral Research Scientist*

Nov 2021 – Mar 2024

Bonn, Germany

- **Optimized GPU kernels (CUDA)**, achieving a  $\sim 1.5\times$  throughput improvement via auto-tuning of Multigrid solver parameters on HPC clusters
- **Designed and ran large-scale distributed simulations** (MPI/OpenMP) on international computing centers
- **Developed a novel numerical method** achieving machine-precision exactness for a class of operator algebra constraints
- **Integrated Monte Carlo simulations with quantum computing workflows**, delivering end-to-end prototype pipelines bridging classical HPC and quantum backends
- **Mentored 3 graduate students** and delivered tutorial sessions for undergraduate computing courses

## SELECTED PUBLICATIONS

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- [SU\(N\) lattice gauge theories with Physics-Informed Neural Networks](#)
- [The anomalous magnetic moment of the muon in the Standard Model: an update](#)

- Strange and charm quark contributions to the muon anomalous magnetic moment in lattice QCD with twisted-mass fermions
- Towards determining the (2+1)-dimensional Quantum Electrodynamics running coupling with Monte Carlo and quantum computing methods
- Digitizing lattice gauge theories in the magnetic basis: reducing the breaking of the fundamental commutation relations

## EDUCATION

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*Roma Tre University* Rome, Italy  
**PhD in Physics** (Dissertation April 2022) Nov. 2018 – Oct. 2021

- Thesis: *Non-perturbative aspects of gauge theories on the lattice: algorithms, simulations and quantum computing*
- Focus: Monte Carlo methods, HPC simulations, Isospin Breaking effects in lattice QCD
- Ranked **1st** in national competitive admission exam

*Roma Tre University* Rome, Italy  
**M.S. in Physics** Oct. 2016 – Oct. 2018

- GPA: 29.85/30, graduated with highest honours

*Roma Tre University* Rome, Italy  
**B.S. in Physics** Oct. 2013 – Jul. 2016

- GPA: 28.84/30, graduated with highest honours | Merit Scholarship recipient

## LEADERSHIP & ACHIEVEMENTS

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**Principal Investigator** – 0.24M GPU node-hours compute grant CSCS ALPS | 2025  
**Workshop Organizer** – HPC & Quantum Computing workshop ECT\* | 2025  
**Invited Speaker** – Scientific seminars at CERN and ECT\* 2025 – 2026  
**Visiting Research Grant** – Open round 2026/1 fund TU Wien | 2026