

Ivan Rojkov

SNSF Postdoctoral Fellow · Yale Quantum Institute

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Personal

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Education

FEB 2021 - JUL 2025

PhD Physics, ETH Zürich

- PhD thesis: “*Steering quantum information into logical subspaces using dissipation*”
- Advisors: Prof. Jonathan Home, Dr. Florentin Reiter
- Committee: Prof. Liang Jiang (examiner), Prof. Eugene Demler (chair)

SEP 2019 - JAN 2021

MSc Physics, ETH Zürich

- MSc thesis: “*Bias in error-corrected quantum sensing*”
- Advisors: Prof. Jonathan Home, Dr. Florentin Reiter

SEP 2016 - JUL 2019

BSc Physics, EPFL

Research Experience

NOV 2025 - PRESENT

Postdoctoral fellow, Yale Quantum Institute, Yale University

- Advisors: Prof. Steven M. Girvin, Prof. Shruti Puri.

FEB 2021 - OCT 2025

Doctoral research assistant, Trapped Ion Quantum Information group, ETH Zürich

- Contributed to 9 research manuscripts, including 5 as first author.
- Supported 5 successful grant proposals for research projects and scientific event organization.
- Co-supervised 5 undergraduate students, with 3 projects leading to publications.
- Taught 8 semesters across 5 different courses.

OCT 2019 - NOV 2020

Research assistant, BachLab, University of Zürich

- Advisor: Prof. Dominik R. Bach
- Developed and maintained Matlab toolbox for the analysis of physiological signals [1 publication].
- Adapted and maintained the semi-automatic anonymization of data sets for open data repository.

JUL 2019

Research assistant, Oxide Interface Physics group, University of Geneva

- Advisors: Prof. Jean-Marc Triscone, Dr. Marios Hadjimichael, Dr. Adrien Waelchli
- Fabricated oxide heterostructures via PLD and tested their high- T_c superconductivity.

APR 2016 - SEP 2016 + SUMMERS 2017 & 2018

Research assistant, Alpha Magnetic Spectrometer (AMS-02), CERN

- Advisors: Prof. Samuel C. C. Ting, Dr. Michael H. Capell

Awards & Grants

2026	SPS Award 2026 , <i>Swiss Physical Society</i> Award in Quantum Science and Technology, sponsored by ID Quantique for <i>Nonlinear reservoir engineering for quantum information processing</i>	CHF 5'000
2025	Nominated for the ETH Medal , <i>ETH Zürich</i> Annual honor granted to the top 8% of all PhD theses at ETH Zurich.	
2025	Postdoc.Mobility , <i>Swiss National Science Foundation (SNSF)</i> Postdoctoral fellowship awarded for 24 months to work with Steve Girvin and Shruti Puri at Yale University [35% success rate, direct acceptance (top 12%)].	CHF 128'000
2025	Monte Verità Conference , <i>Congressi Stefano Francini</i> Grant obtained with Jonathan Home, Andreas Wallraff, Alexander Grimm, Joseph Rennes, Jonathan Conrad, and Alfredo Ricci Vázquez to organize the Monte Verità Quantum Codes (MVQC) conference 2026.	CHF 17'000
2022	ETH-EPFL Summer Schools grant , <i>EPFL & ETH Zürich</i> Lead applicant for the grant awarded with Stefano Barison, Alfredo Ricci Vázquez, David Schlegel, Gillenhaal Beck, and Moritz Fontboté-Schmidt to organize the Quantum Computing Hard- and Software summer school 2022.	CHF 20'000
2015	Prix de l'Université de Genève , <i>University of Geneva</i> Prix Marc Birkigt , <i>Collège de Genève</i> Awards received prior starting the BSc.	CHF 500 CHF 300

Selected Research Projects

Scalable dissipative QEC and algorithms [8, 9]: Demonstrated that trickle-down error correction, akin to a cooling process, exponentially reduces the number of correction operators and extends logical qubit lifetimes. Likewise, proved that targeted qubit resets within variational circuits can prevent barren plateaus.

Nonlinear reservoir engineering [5, 6]: Introduced a new paradigm for reservoir engineering in strongly nonlinear regimes, enabling the stabilization of bosonic Schrödinger-cat codes and autonomous error correction. Collaborated on the experimental realization of these schemes in a trapped-ion system operated outside the Lamb–Dicke regime.

Logical gate on approximate codes [11]: Quantified errors in logical two-GKP-qubit gates arising from approximate codewords and showed their correction using QEC without altering much the logical information.

Bias in error-corrected sensing [13]: Proved that finite-speed quantum error correction biases the outputs of quantum sensors, challenging the widely adopted assumption of infinitely fast correction.

Supervision

Spring 2025	Sergey Ermakov , <i>Semester project (co-supervision with L. Fiononi)</i> “Quantifying and decomposing entanglement using SWAP tests”
Spring 2024	Frederik van der Brugge , <i>MSc Thesis</i> “Dissipatively stabilized cat qudits for analog quantum simulation”
Spring 2023	Lorenzo Fiononi , <i>MSc Thesis</i> “QMLA method for quantum Liouvillian learning”
Fall 2022	Noah Kaufmann , <i>MSc Thesis - ETH Medal [top 2.5%]</i> “Noise Characterization of Near-Term Quantum Devices”
Spring 2022	Paul Moser Röggl , <i>MSc Thesis</i> “Two qubit gates for Gottesmann-Kitaev-Preskill states”
Spring 2021	Gerard Aguilar Tapia , <i>Semester project</i> “Study of the efficiency of GKP codes to correct various oscillator error models”

Teaching Experience

Spring 2025	Energy and Sustainability in the 21st Century (II) , Teaching Assistant	ETH Zürich
Fall 2024	Energy and Sustainability in the 21st Century (I) , Teaching Assistant	ETH Zürich
Spring 2024	Physics Lab 1 , Teaching Assistant	ETH Zürich
Fall 2023	Physics Lab 1 , Teaching Assistant	ETH Zürich
Spring 2023	Quantum Information Processing I: Concepts , Teaching Assistant	ETH Zürich
Fall 2022	Physics Lab 1 , Teaching Assistant	ETH Zürich
Spring 2022	Quantum Information Processing I: Concepts , Teaching Assistant	ETH Zürich
Fall 2021	Quantum Information Theory , Teaching Assistant	ETH Zürich

Teaching Workshop Certificates

Nov 2025	GenAI in Teaching and Learning , Teaching Booster Workshop, ETH Zürich
Jun 2014	Conflict Prevention and Management, Educational Approaches, Tools for Fostering Inclusion, Legal Responsibility and Physical Protection , CEMEA Geneva

Academic Services

Peer Review & Grant Contributions

- Contributed to the peer review of ~ 25 manuscripts for *Phys. Rev. Lett.*, *Phys. Rev. X*, *PRX Quantum*, *Phys. Rev. A*, *Phys. Rev. Research*, *Phys. Rev. Applied*, *Npj Quantum Inf*, *Annalen der Physik*.
- Contributed to five grant proposals including “Implementations and Applications of Bosonic Codes” (SNSF Project Funding) and “Interacting error-correction codes in Penning trap arrays” (SNSF Advanced Grant).

Community Engagement

Apr 2026	Monte Verità Quantum Codes (MVQC) , Co-organizer Organization in progress.
2024-2025	Ion Trapping Online Seminar (ITOS) , Co-organizer
Jun 2022	Quantum Computing Hard- and Software summer school 2022 , Lead organizer Led the organization of the summer school, including program design, venue logistics, speaker invitations, budget management, outreach, and coordination with sponsors.
2020-2022	Quantum Engineering Commission (QEC) , Board member Organized the weekly journal club (Quantum Paper Club) for the association of students interested in quantum engineering.
2018-2019	International Physicists' Tournament , Member of Swiss Team Prepared and presented solutions to open-ended physics problems at an international BSc-level competition, ranking 5th among 20 teams.

Languages

Computer	Julia, Python, Mathematica, MatLab, C++11, C, Bash, Ruby, HTML, CSS,
Human	English (fluent), French (first), Russian (first), German (B2),

Professional Experience

○ AUG 2014 - AUG 2019

Administrative assistant, Osteopathic Permanence of Geneva

- Administration: Managed appointments, patient reception, calendars, and correspondence.
- Accounting: Oversaw supplies, invoicing, and payments.



JUN 2015 - APR 2016

Swiss Military, Infantry (Long service), Federal Department of Defence, Civil Protection and Sport

Presentations

Invited Talks

“Dissipation in quantum error correction and algorithms” featuring Refs. [8, 9]

Dec 2025 Applied Quantum Algorithm institute, Leiden University (host: Jordi Tura)
Dec 2025 Quantum Paper Club, ETH Zürich (host: Quantum Engineering Commission)

“Stabilization of cat-state manifolds using nonlinear reservoir engineering” featuring Refs. [5, 6]

Dec 2025 QUANTIC, Inria Paris (host: Philippe Campagne-Ibarcq)
Sep 2024 AWS Center for Quantum Computing, Caltech (host: Connor Hann)
Aug 2024 Pritzker School of Molecular Engineering, University of Chicago (host: Liang Jiang)
Aug 2024 QulCS, University of Maryland (host: Victor V. Albert)
Aug 2024 Thompson Lab, Princeton University (host: Jeff Thompson)
Aug 2024 Yale Quantum Institute, Yale University (hosts: Steve Girvin & Shruti Puri)
Aug 2024 Lukin group, Harvard University (host: Johannes Borregaard)
Aug 2024 iQulSE seminar, Massachusetts Institute of Technology (host: Paolla Cappellaro)
Nov 2023 Lunch seminar, ETH Zürich (host: Quantum Center)

“Quantum Computers with Trapped Ions”

Mar 2024 Collège Sismondi, Highschools of Geneva (host: Julien Ponard)

“Multi-Qubit Gates for Bosonic Logical Qubits” featuring Ref. [11]

Feb 2024 Quantum Paper Club, ETH Zürich (host: Quantum Engineering Commission)

“Bias in Error-Corrected Quantum Sensing” featuring Ref. [13]

Jan 2022 Hammerer's group, Leibniz Universität Hannover (host: Klemens Hammerer)

Contributed Presentations

* oral presentation; + poster presentation

“CZ gate for g-f qubits with a “skip-gate” error model”

Jun 2026 Quantum Error Correction 2026 ⁺, Santa Barbara, USA

“Scaling quantum algorithms via dissipation: avoiding barren plateaus” featuring Ref. [8]

Mar 2026 Global Physics Summit (March Meeting) 2026 ^{*}, Denver, USA

“Stabilization of cat-state manifolds using nonlinear reservoir engineering” featuring Refs. [5, 6]

Mar 2025 Global Physics Summit (March Meeting) 2025 ^{*}, Anaheim, USA
Jan 2024 Swiss Quantum Days ⁺, Villars-sur-Ollon, CH
Jun 2023 Bolder Boulder Quantum Workshop (BBQ) ⁺, Boulder, USA

“Characterization and mitigation of coherent errors of near-term quantum devices” featuring Ref. [10]

Jan 2023 Coping with Errors in QC Systems (778. WE-Heraeus-Seminar) ⁺, Bad Honnef, DE

“Bias in Error-Corrected Quantum Sensing” featuring Ref. [13]

Jul 2022	Quantum Communication, Measurement and Computing (QCMC) ⁺ , Lisbon, PT
Jun 2022	Quantum Computing Hard- and Software (QCHS) ⁺ , Lausanne, CH
Jun 2022	QSIT – Quantum Science and Technology Junior meeting [*] , Flumserberg, CH
Nov 2021	European Quantum Technologies Conference (EQTC) ⁺ , Online
Jun 2021	Quantum Computing Hard- and Software (QCHS) ⁺ , Online
May 2021	Division of Atomic, Molecular and Optical Physics (DAMOP) [*] , Online

Publications

- [1] M. Simoni, **I. Rojko**v, and J. Home, “Modulation theory formulation of atomic light-matter interaction”, arXiv:quant-ph/2606.30427 (2026).
- [2] E. Karacan, I. N. M. Le, M. D’Anna, J. Carasquilla, C. B. Mendl, and **I. Rojko**v, “Near-Optimal Quantum Time Evolution Circuits via Provably Convergent Compression”, arXiv:quant-ph/2605.17067 (2026).
- [3] M. Fontboté-Schmidt, J. Metzner, F. Berterottière, **I. Rojko**v, A. Ferk, M. Stadler, B. Dönmez, R. Berner, S. Welte, D. Kienzler, and J. Home, “Error Correction of Beamsplitter-Generated Entangled GKP States”, arXiv:quant-ph/2605.08009 (2026).
- [4] D. Baur, T. Behrle, **I. Rojko**v, J. Jeske, S. Yelin, J. Home, and F. Reiter, “Quantum theory for phonon lasing and non-classical state generation in mixed-species and single trapped ions”, arXiv:quant-ph/2604.18295 (2026).
- [5] **I. Rojko**v, M. Simoni, E. Zapusek, F. Reiter, and J. Home, “Stabilization of Cat-State Manifolds Using Non-linear Reservoir Engineering”, Phys. Rev. X **16**, 011056 (2026).
- [6] M. Simoni, **I. Rojko**v, M. Mazzanti, W. Adamczyk, A. Ferk, P. Hrmo, S. Jain, T. Sägerser, D. Kienzler, and J. Home, “Non-linear cooling and control of a mechanical quantum harmonic oscillator”, arXiv:quant-ph/2509.05734 (2025).
- [7] L. Fioroni, **I. Rojko**v, and F. Reiter, “Learning-agent-based approach to the characterization of open quantum systems”, Phys. Rev. Applied **24**, 034011 (2025).
- [8] E. Zapusek, **I. Rojko**v, and F. Reiter, “Scaling Quantum Algorithms via Dissipation: Avoiding Barren Plateaus”, arXiv:quant-ph/2507.02043 (2025).
- [9] **I. Rojko**v, E. Zapusek, and F. Reiter, “Scalable dissipative quantum error correction for discrete-variable codes”, arXiv:quant-ph/2507.12534 (2025).
- [10] N. Kaufmann, **I. Rojko**v, and F. Reiter, “Characterization of coherent errors in gate layers with robustness to Pauli noise”, Phys. Rev. Appl. **23**, 034014 (2025).
- [11] **I. Rojko**v, P. M. Rögglä, M. Wagener, M. Fontboté-Schmidt, S. Welte, J. Home, and F. Reiter, “Two-Qubit Operations for Finite-Energy Gottesman-Kitaev-Preskill Encodings”, Phys. Rev. Lett. **133**, 100601 (2024).
- [12] A. Abivardi, C. W. Korn, **I. Rojko**v, S. Gerster, R. Hurlemann, and D. R. Bach, “Acceleration of inferred neural responses to oddball targets in an individual with bilateral amygdala lesion compared to healthy controls”, Sci. Rep. **13**, 14550 (2023).
- [13] **I. Rojko**v, D. Layden, P. Cappellaro, J. Home, and F. Reiter, “Bias in Error-Corrected Quantum Sensing”, Phys. Rev. Lett. **128**, 140503 (2022).
- [14] M. Malinowski, C. Zhang, V. Negnevitsky, **I. Rojko**v, F. Reiter, T.-L. Nguyen, M. Stadler, D. Kienzler, K. K. Mehta, and J. P. Home, “Generation of a Maximally Entangled State Using Collective Optical Pumping”, Phys. Rev. Lett. **128**, 080503 (2022).