Ivan Rojkov

SNSF Postdoctoral Fellow · Yale Quantum Institute

ivan.rojkov@yale.edu | irojkov-ph.github.io | Google Scholar

Personal

Ivan Rojkov
Email : ivan.rojkov@yale.edu
Website : irojkov-ph.github.io
ORCID: 0000-0001-7164-0265

Yale University
Yale Quantum Institute
17 Hillhouse Ave. (Suite 417-A)
06511 New Haven, CT

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-$\mathrm{T_c}$ 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

2025 **Nominated for the ETH Medal**, *ETH Zürich*
Annual honor granted to the top 8% of all PhD theses at ETH Zurich.

2025 **Postdoc.Mobility**, *Swiss National Science Foundation (SNSF)* *CHF 128'000*
Postdoctoral fellowship awarded for 24 months to work with Steve Girvin and Shruti Puri at Yale University [35% success rate, direct acceptance (top 12%)].

2025 **Monte Verità Conference**, *Congressi Stefano Franscini* *CHF 17'000*
Grant obtained with Jonathan Home, Andreas Wallraff, Alexander Grimm, Joseph Rennes, Jonathan Conrad, and Alfredo Ricci Vásquez to organize the Monte Verità Quantum Codes (MVQC) conference 2026.

2022 **ETH-EPFL Summer Schools grant**, *EPFL & ETH Zürich* *CHF 20'000*
Lead applicant for the grant awarded with Stefano Barison, Alfredo Ricci Vásquez, David Schlegel, Gillenhaal Beck, and Moritz Fontboté-Schmidt to organize the Quantum Computing Hard- and Software summer school 2022.

2015 **Prix de l'Université de Genève**, *University of Geneva* *CHF 500*
Prix Marc Birkigt, *Collège de Genève* *CHF 300*
Awards received prior starting the BSc.

Selected Research Projects

Scalable dissipative QEC and algorithms [4, 5]: 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 [1, 2]: 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 [7]: 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 [9]: 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**, *Semester project (co-supervision with L. Fioroni)*
"*Quantifying and decomposing entanglement using SWAP tests*"

Spring 2024 **Frederik van der Brugge**, *MSc Thesis*
"*Dissipatively stabilized cat qudits for analog quantum simulation*"

Spring 2023 **Lorenzo Fioroni**, *MSc Thesis*
"*QMLA method for quantum Liouvillian learning*"

Fall 2022 **Noah Kaufmann**, *MSc Thesis - ETH Medal* [*top 2.5%*]
"*Noise Characterization of Near-Term Quantum Devices*"

Spring 2022 **Paul Moser Röggla**, *MSc Thesis*
"*Two qubit gates for Gottesmann-Kitaev-Preskill states*"

Spring 2021 **Gerard Aguilar Tapia**, *Semester project*
"*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*

Publications

[1] **I. Rojkov**, M. Simoni, E. Zapusek, F. Reiter, and J. Home, "*Stabilization of Cat-State Manifolds Using Nonlinear Reservoir Engineering*", Phys. Rev. X **16**, 011056 (2026).

[2] M. Simoni, **I. Rojkov**, M. Mazzanti, W. Adamczyk, A. Ferk, P. Hrmo, S. Jain, T. Sägesser, D. Kienzler, and J. Home, "*Non-linear cooling and control of a mechanical quantum harmonic oscillator*", arXiv:quant-ph/2509.05734 (2025).

[3] L. Fioroni, **I. Rojkov**, and F. Reiter, "*Learning-agent-based approach to the characterization of open quantum systems*", Phys. Rev. Applied **24**, 034011 (2025).

[4] E. Zapusek, **I. Rojkov**, and F. Reiter, "*Scaling Quantum Algorithms via Dissipation: Avoiding Barren Plateaus*", arXiv:quant-ph/2507.02043 (2025).

[5] **I. Rojkov**, E. Zapusek, and F. Reiter, "*Scalable dissipative quantum error correction for discrete-variable codes*", arXiv:quant-ph/2507.12534 (2025).

[6] N. Kaufmann, **I. Rojkov**, and F. Reiter, "*Characterization of coherent errors in gate layers with robustness to Pauli noise*", Phys. Rev. Appl. **23**, 034014 (2025).

[7] **I. Rojkov**, P. M. Röggla, 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).

[8] A. Abivardi, C. W. Korn, **I. Rojkov**, 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).

[9] **I. Rojkov**, D. Layden, P. Cappellaro, J. Home, and F. Reiter, "*Bias in Error-Corrected Quantum Sensing*", Phys. Rev. Lett. **128**, 140503 (2022).

[10] M. Malinowski, C. Zhang, V. Negnevitsky, **I. Rojkov**, 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).

Presentations

Invited Talks

"*Dissipation in quantum error correction and algorithms*" featuring Refs. [4, 5]

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. [1, 2]

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	**QuICS**, *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	**iQuISE 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. [7]

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

"***Bias in Error-Corrected Quantum Sensing***" featuring Ref. [9]

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

Contributed Presentations

** oral presentation; + poster presentation*

"***Scaling quantum algorithms via dissipation: avoiding barren plateaus***" featuring Ref. [4]

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

"***Stabilization of cat-state manifolds using nonlinear reservoir engineering***" featuring Refs. [1, 2]

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. [6]

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

"***Bias in Error-Corrected Quantum Sensing***" featuring Ref. [9]

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*