

# Ivan Rojkov

PhD Student · Trapped Ion Quantum Information group

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## Personal

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ETH Zürich  
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## Education

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- FEB 2021 - PRESENT  
**PhD Physics**, *Eidgenössische Technische Hochschule Zürich (ETH Zürich)*
  - Advisors: Dr. Florentin REITER & Prof. Dr. Jonathan HOME
- SEP 2019 - DEC 2020  
**MSc Physics**, *Eidgenössische Technische Hochschule Zürich (ETH Zürich)*
  - MSc thesis: "Bias in error-corrected quantum sensing"
  - Advisors: Dr. Florentin REITER & Prof. Dr. Jonathan HOME
- SEP 2016 - JUL 2019  
**BSc Physics**, *École Polytechnique de Lausanne (EPFL)*

## Experience

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\* research; + professional

- FEB 2021 - PRESENT  
**Research assistant \***, *Trapped Ion Quantum Information group, ETH Zürich*
  - Advisors: Prof. Dr. Jonathan HOME, Dr. Florentin REITER
- OCT 2019 - NOV 2020  
**Research assistant \***, *BachLab, University of Zürich*
  - Advisor: Prof. Dr. Dominik R. BACH
- AUG 2014 - AUG 2019  
**Administrative assistant +**, *Osteopathic Permanence of Geneva*
- JUL 2019  
**Research assistant \***, *Trisconne group, Department of Quantum Matter Physics, University of Geneva*
  - Advisors: Prof. Dr. Jean-Marc TRISCONNE, Dr. Marios HADJIMICHAEL, Dr. Adrien WAELCHLI
- APR 2016 - SEP 2016 + SUMMERS 2017 & 2018  
**Research assistant \***, *Alpha Magnetic Spectrometer (AMS-02), CERN*
  - Advisors: Prof. Dr. Samuel TING, Dr. Michael CAPELL
- JUN 2015 - APR 2016  
**Swiss Military, Infantry +**, *Federal Department of Defence, Civil Protection and Sport*

## Awards & Grants

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2022	<b>ETH-EPFL Summer Schools grant</b> , <i>EPFL &amp; ETH Zürich</i> Lead applicant for the grant obtained in collaboration with Stefano BARI- SON, Alfredo RICCI VÁSQUEZ, David SCHLEGEL, Gillenhaal BECK, and Moritz FONTBOTÉ-SCHMIDT, securing funding to organize the Quantum Computing Hard- and Software summer school 2022.	CHF 20'000
2015	<b>Prix de l'Université de Genève</b> , <i>University of Geneva</i> <b>Prix Marc Birkigt</b> , <i>Collège de Genève</i> Awards received prior starting the BSc.	CHF 500 CHF 300

## Selected publications

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- IR, M. Simoni, E. Zapusek, F. Reiter, and J. Home, "Stabilization of cat-state manifolds using nonlinear reservoir engineering", arXiv:quant-ph/2407.18087 (2024)  
↪ New paradigm generalizing reservoir engineering and quantum system operation to nonlinear regimes.
- IR, P. M. Röggl, 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)  
↪ Physical distortion due to ideal operations can be corrected without altering the logical information.
- IR, D. Layden, P. Cappellaro, J. Home, and F. Reiter, "Bias in error-corrected quantum sensing", *Phys. Rev. Lett.* **128**, 140503 (2022)  
↪ Finite-speed quantum error correction biases signals obtained from error-corrected quantum sensors.

## Mentoring

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Spring 2024	<b>Frederik VAN DER BRUGGE</b> , <i>MSc Thesis</i> "Dissipatively stabilized cat qudits for analog quantum simulation" Co-supervised with F. Reiter and J. Home
Spring 2023	<b>Lorenzo FIORONI</b> , <i>MSc Thesis</i> "QMLA method for quantum Liouvillian learning" Co-supervised with F. Reiter and J. Home
Fall 2022	<b>Noah KAUFMANN</b> , <i>MSc Thesis</i> "Noise Characterization of Near-Term Quantum Devices" Co-supervised with F. Reiter and J. Home
Spring 2022	<b>Paul MOSER RÖGGLA</b> , <i>MSc Thesis</i> "Two qubit gates for Gottesmann-Kitaev-Preskill states" Co-supervised with F. Reiter and J. Home
Spring 2021	<b>Gerard AGUILAR TAPIA</b> , <i>Semester project</i> "Study of the efficiency of GKP codes to correct various oscillator error models" Co-supervised with F. Reiter and J. Home

## Teaching Experience

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Fall 2024	<b>Energy and Sustainability in the 21st Century</b> , <i>Teaching Assistant</i>	ETH Zürich
Spring 2024	<b>Physics Lab 1</b> , <i>Teaching Assistant</i>	ETH Zürich
Fall 2023	<b>Physics Lab 1</b> , <i>Teaching Assistant</i>	ETH Zürich
Spring 2023	<b>Quantum Information Processing I: Concepts</b> , <i>Teaching Assistant</i>	ETH Zürich
Fall 2022	<b>Physics Lab 1</b> , <i>Teaching Assistant</i>	ETH Zürich
Spring 2022	<b>Quantum Information Processing I: Concepts</b> , <i>Teaching Assistant</i>	ETH Zürich
Fall 2021	<b>Quantum Information Theory</b> , <i>Teaching Assistant</i>	ETH Zürich

## Academic services

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- Peer Review

*\* primary reviewer; + joint reviews with F. Reiter*

Physical Review Letters<sup>+</sup>, Physical Review X<sup>\*</sup>, PRX Quantum<sup>+</sup>, Physical Review A<sup>\*</sup>

- Grant Contributions

Contributed to several grant proposals including "Implementations and Applications of Bosonic Codes" (SNSF project funding).

- Organizations

Jun 2022      **Quantum Computing Hard- and Software summer school 2022**, *Lead organizer*

2020-2022      **Quantum Engineering Commission (QEC)**, *Board member*  
In charge of the weekly journal club (Quantum Paper Club) at the QEC (association of students interested in quantum engineering).

2018-2019      **International Physicists' Tournament**, *Member of Swiss Team*

- Professional Memberships

American Physical Society

## Languages

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

## Publication list

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IR, M. Simoni, E. Zapusek, F. Reiter, and J. Home, "Stabilization of cat-state manifolds using nonlinear reservoir engineering", arXiv:quant-ph/2407.18087 (2024)

IR, P. M. Röggl, 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)

A. Abivardi, C. W. Korn, IR, S. Gerster, R. Hurlmann, 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)

N. Kaufmann, IR, and F. Reiter, "Characterization of coherent errors in noisy quantum devices", arXiv:quant-ph/2307.08741 (2023)

M. Malinowski, C. Zhang, V. Negnevitsky, IR, 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)

IR, D. Layden, P. Cappellaro, J. Home, and F. Reiter, "Bias in error-corrected quantum sensing", Phys. Rev. Lett. **128**, 140503 (2022)

## Presentations

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### Invited Talks

Sep 2024      **AWS Center for Quantum Computing, California Institute of Technology**  
Host: Dr. Connor HANN; "Stabilization of cat-state manifolds using nonlinear reservoir engineering", IR

- Aug 2024 **Pritzker School of Molecular Engineering, University of Chicago**  
Host: Prof. Dr. Liang JIANG; “Stabilization of cat-state manifolds using nonlinear reservoir engineering”, IR
- Aug 2024 **Joint Center for Quantum Information and Computer Science, University of Maryland**  
Host: Prof. Dr. Victor V. ALBERT; “Stabilization of cat-state manifolds using nonlinear reservoir engineering”, IR
- Aug 2024 **Thompson Lab, Princeton University**  
Host: Prof. Dr. Jeff THOMPSON; “Stabilization of cat-state manifolds using nonlinear reservoir engineering”, IR
- Aug 2024 **Yale Quantum Institute, Yale University**  
Hosts: Prof. Dr. Steven GIRVIN & Prof. Dr. Shruti PURI; “Stabilization of cat-state manifolds using nonlinear reservoir engineering”, IR
- Aug 2024 **Lukin group - Quantum Optics Laboratory, Harvard University**  
Host: Dr. Johannes BORREGAARD; “Stabilization of cat-state manifolds using nonlinear reservoir engineering”, IR
- Aug 2024 **iQULSE seminar, Massachusetts Institute of Technology**  
Host: Prof. Dr. Paolla CAPPELLARO; “Stabilization of cat-state manifolds using nonlinear reservoir engineering”, IR
- Mar 2024 **Collège Sismondi, Highschools of Geneva**  
Host: Dr. Julien PONARD; “Quantum Computers with Trapped Ions”, IR
- Feb 2024 **Quantum Paper Club, ETH Zürich**  
Host: Quantum Engineering Commission; “Multi-Qubit Gates for Bosonic Logical Qubits”, IR
- Nov 2023 **Lunch seminar, ETH Zürich**  
Host: Quantum Center; “Stabilisation of cat-state manifolds using nonlinear interactions”, IR and Matteo SIMONI
- Jan 2022 **Hammerer's group, Leibniz Universität Hannover**  
Host: Prof. Dr. Klemens HAMMERER; “Bias in Error-Corrected Quantum Sensing”, IR

## Contributed Presentations

\* oral presentation; + poster presentation

- Jan 2024 **Swiss Quantum Days +, Villars-sur-Ollon, CH**  
“Stabilisation of cat-state manifolds using nonlinear interactions”
- Jun 2023 **Bolder Boulder Quantum Workshop (BBQ) +, Boulder, USA**  
“Dissipative stabilization of rotational symmetric codes”
- Jan 2023 **Coping with Errors in Scalable Quantum Computing Systems (778. WE-Heraeus-Seminar) +, Bad Honnef, DE**  
“Characterization and mitigation of coherent errors of near-term quantum devices”
- Jul 2022 **Quantum Communication, Measurement and Computing (QCMC) +, Lisbon, PT**  
“Bias in Error-Corrected Quantum Sensing”
- Jun 2022 **Quantum Computing Hard- and Software (QCHS) +, Lausanne, CH**  
“Bias in Error-Corrected Quantum Sensing”
- Jun 2022 **QSIT - Quantum Science and Technology Junior meeting \*, Flumserberg, CH**  
“Bias in Error-Corrected Quantum Sensing”
- Nov 2021 **European Quantum Technologies Conference (EQTC) +, Online**  
“Bias in Error-Corrected Quantum Sensing”
- Jun 2021 **Quantum Computing Hard- and Software (QCHS) +, Online**  
“Bias in Error-Corrected Quantum Sensing”

May 2021 **Division of Atomic, Molecular and Optical Physics (DAMOP) \***, *Online*  
“Bias in Error-Corrected Quantum Sensing”