

Jessica Bavaresco

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Position

Feb 2025 – **Permanent research scientist (*Chargée de recherche*)**
current Quantum Information (QI) team, LIP6
CNRS & Sorbonne University
Paris, France

Education

Mar 2017 – **PhD in Physics** University of Vienna, Vienna, Austria
Jun 2021 Thesis: *Certifying complex quantum properties: High-dimensional entanglement and indefinite causal order*
Graduated with honors, on 21 June 2021.
Supervisor: Prof. Marcus Huber
Mar – Jun **Secondment** The University of Tokyo, Tokyo, Japan
2019 Supervisor: Prof. Mio Murao
Aug 2014 – **Master in Physics** Federal University of Minas Gerais, Belo Horizonte, Brazil
Aug 2016 Thesis: *When Bob cannot trust Alice: A semi-device-independent tale of quantum steering*
Supervisor: Prof. Marcelo Terra Cunha
Mar 2010 – **Bachelor in Physics** Federal University of Santa Catarina, Florianópolis, Brazil
July 2014 Jan – Dec **Bachelor exchange programme** Lafayette College, Easton-PA, USA
2012 Supervisor: Prof. Anthony D. Novaco

Previous positions

Oct 2023 – **Senior postdoctoral researcher (*Maître Assistante*)** – University of Geneva, **Switzerland**
Jan 2025 Supervisor: Prof. Nicolas Brunner
Funding: SNSF Swiss Postdoctoral Fellowship (Switzerland)
Jun 2022 – **Postdoctoral researcher** – University of Geneva, **Switzerland**
Sep 2023 Supervisor: Prof. Nicolas Brunner
Funding: NCCR SwissMAP (Switzerland)
Jul 2021 – **Postdoctoral researcher** – IQOQI Vienna, ÖAW, **Austria**
May 2022 Young Independent Research Group (YIRG)
Supervisors: Dr. Ämin Baumeler, Dr. Costantino Budroni, and Dr. Yelena Guryanova
Funding: FWF-Zukunftskolleg (Austria)
Mar – Jun **Visiting PhD student** – The University of Tokyo, **Japan**
2019 Supervisor: Prof. Mio Murao
Funding: FWF-START Prize (Austria)

Oct 2016 – **Praedoctoral researcher** – IQOQI Vienna, ÖAW, Austria
Jun 2021 Supervisor: Prof. Marcus Huber
Funding: FWF-START Prize (Austria)

Fellowships and grants

May 2024 **COST Action**
European Cooperation in Science & Technology (EU)
Secondary proposer of Action: *Relativistic Quantum Information (RQI)*

Jun 2023 **SNSF Swiss Postdoctoral Fellowship** (“Swiss MSCA”)
Swiss National Science Fund (Switzerland): 250k CHF ~ **260k EUR**
PI of Project: *Beyond Entangled Pairs: Quantum Correlations in Networks (BEPQCiN)*

Feb 2023 **MSCA Individual Postdoc Fellowship** (Global Fellowship)
Score: 96.2% – Top 8.77% of candidates
European Research Executive Agency (EU): **300k EUR**
PI of Project: *Beyond Entangled Pairs: Quantum Correlations in Networks (BEPQCiN)*

Oct 2017 **ESQ Discovery Grant**
Austrian Academy of Sciences (Austria): **15k EUR**
PI of Project: *Mutually unbiased bases – the notorious case of dimension 6.*
Research grant that supports innovative and high-risk projects.

Memberships in panels or boards

Conference committees

Feb – March 2025 **Programme Committee (PC) of QPL 2025** – 22nd International Conference on Quantum Physics and Logic.

Jun 2023 – current **Steering Committee (SC) of YQIS** – International Conference for Young Quantum Information Scientists.

Oct 2017 – Sep 2018 **Organizing Committee (OC) of YQIS-CoQuS 2018** – IV International Conference for Young Quantum Information Scientists and Summer School of the Vienna Doctoral Program in Complex Quantum Systems. Vienna, Austria.

Examination boards

Feb 2025 **Master’s thesis jury member** – Gustavo Balvedi Pimentel, “*Symmetries of non-contextuality inequalities and the statistical robustness of experimental implementations*”. Supervised by Prof. Bárbara Lopes Amaral, University of São Paulo (USP), Brazil.

Nov 2023 **PhD thesis jury member** – Timothée Hoffreumon, “*Characterization of Higher-order Quantum Processes: When projective methods recover a model of logic*”. Supervised by Prof. Ognyan Oreshkov, Université libre de Bruxelles, Belgium.

Supervision

PhD students

Jan 2025 – **Zoe Garcia del Toro.** *Higher-order quantum computing and indefinite causal order*, Sorbonne
current University, France. Co-supervised with Damian Markham.

Internship students

Jun – Oct **Fatemeh Moradi.** *Quantum correlations and semidefinite programming*, University of Geneva,
2023 Switzerland. Co-supervised with Pavel Sekastki and Nicolas Brunner.

Teaching

Feb 2025 – **Supervisor of M1 project,** *Entanglement certification*, Computer Science Master's in Quantum
current Information, Sorbonne University, France.

Feb – May **Teaching assistant,** *Méthodes Mathématiques pour Physiciens I* (Mathematical Methods for Physi-
2023 cists I), Physics Bachelor's course, University of Geneva, Switzerland.

Sep – Dec **Teaching assistant,** *Méthodes Mathématiques pour Physiciens I* (Mathematical Methods for Physi-
2022 cists I), Physics Bachelor's course, University of Geneva, Switzerland.

Publications and research output

All of my research articles can be found on [my arXiv page](#). A full list of publications is also available on [my Google Scholar page](#), which jointly counts over **780 citations** (March 2025).

Published

- [P1] Designing protocols for Bayesian quantum parameter estimation with higher-order operations
J. Bavaresco, P. Lipka-Bartosik, P. Sekatski, and M. Mehboudi
[Phys. Rev. Research 6, 023305 \(2024\)](#)
[arXiv:2311.01513 \[quant-ph\]](#)
- [P2] Semi-device-independent certification of indefinite causal order in a photonic quantum switch
H. Cao *, **J. Bavaresco** *, N.-N. Wang, L.A. Rozema, C. Zhang, Y.-F. Huang, B.-H. Liu, C.-F. Li, G.-C. Guo,
and P. Walther
*These authors contributed equally to this work.
[Optica 10, 561 \(2023\)](#)
[arXiv:2202.05346 \[quant-ph\] \(2022\)](#)
- [P3] Resource theory of causal connection
S. Milz, **J. Bavaresco**, and G. Chiribella
[Quantum 6, 788 \(2022\)](#)
[arXiv:2110.03233 \[quant-ph\]](#)
- [P4] Activation of genuine multipartite entanglement: Beyond the single-copy paradigm of entanglement charac-
terisation
H. Yamasaki, S. Morelli, M. Miethlinger, **J. Bavaresco**, N. Friis, and M. Huber
[Quantum 6, 695 \(2022\)](#)
[arXiv:2106.01372 \[quant-ph\]](#)

- [P5] Unitary channel discrimination beyond group structures: Advantages of sequential and indefinite-causal-order strategies
J. Bavaresco, M. Murao, and M. T. Quintino
[Journal of Mathematical Physics](#) **63**, 042203 (2022)
[arXiv:2105.13369 \[quant-ph\]](#) (2021)
- [P6] Strict hierarchy between parallel, sequential, and indefinite-causal-order strategies for channel discrimination
J. Bavaresco, M. Murao, and M. T. Quintino
[Physical Review Letters](#) **127**, 200504 (2021)
[arXiv:2011.08300 \[quant-ph\]](#)
- [P7] Verification of high-dimensional entanglement generated in quantum interference
Y. Chen, S. Ecker, **J. Bavaresco**, T. Scheidl, L. Chen, F. Steinlechner, M. Huber, and R. Ursin
[Physical Review A](#) **101**, 032302 (2020)
[arXiv:1910.07684 \[quant-ph\]](#)
- [P8] Semi-device-independent certification of indefinite causal order
J. Bavaresco, M. Araújo, Č. Brukner, and M. T. Quintino
[Quantum](#) **3**, 176 (2019)
[arXiv:1903.10526 \[quant-ph\]](#)
- [P9] Measurements in two bases are sufficient for certifying high-dimensional entanglement
J. Bavaresco, N. H. Valencia, C. Klöckl, M. Pivoluska, P. Erker, N. Friis, M. Malik, and M. Huber
[Nature Physics](#) **14**, 1032 (2018)
[arXiv:1709.07344 \[quant-ph\]](#)
- [P10] Simulations of submonolayer Xe on Pt(111): The case for a chaotic low temperature phase
A. D. Novaco and **J. Bavaresco**
[Journal of Chemical Physics](#) **148**, 144704 (2018)
[arXiv:1708.01493 \[cond-mat.mtrl-sci\]](#)
- [P11] Operational framework for quantum measurement simulability
L. Guerini, **J. Bavaresco**, M. Terra Cunha, and A. Acín
[Journal of Mathematical Physics](#) **58**, 092102 (2017)
[arXiv:1705.06343 \[quant-ph\]](#)
- [P12] Most incompatible measurements for robust steering tests
J. Bavaresco, M. T. Quintino, L. Guerini, T. O. Maciel, D. Cavalcanti, and M. Terra Cunha
[Physical Review A](#) **96**, 022110 (2017)
[arXiv:1704.02994 \[quant-ph\]](#)
- [P13] Distribution of high-dimensional entanglement via an intra-city free-space link
F. Steinlechner*, S. Ecker*, M. Fink, B. Liu, **J. Bavaresco**, M. Huber, T. Scheidl, and R. Ursin
*These authors contributed equally to this work.
[Nature Communications](#) **8**, 15971 (2017)
[arXiv:1612.00751 \[quant-ph\]](#)
- [P14] Incipient triple point for adsorbed xenon monolayers: Pt(111) versus graphite substrates
A. D. Novaco, L. W. Bruch, and **J. Bavaresco**
[Physical Review B](#) **91**, 161412(R) (2015)
[arXiv:1601.00700 \[cond-mat.mtrl-sci\]](#)

Pre-prints

- [P15] Indefinite causal order in boxworld theories
J. Bavaresco, Ä. Baumeler, Y. Guryanova, and Costantino Budroni
[arXiv:2411.00951 \[quant-ph\]](#)
- [P16] Can the quantum switch be deterministically simulated?
J. Bavaresco, S. Yoshida, T. Otake, H. Kristjánsson, P. Taranto, M. Murao, and M.T. Quintino
[arXiv:2409.18202 \[quant-ph\]](#)
- [P17] Exponential separation in quantum query complexity of the quantum switch with respect to simulations with standard quantum circuits
H. Kristjánsson*, T. Otake*, S. Yoshida*, P. Taranto, **J. Bavaresco**, M.T. Quintino, and M. Murao
*These authors contributed equally to this work.
[arXiv:2409.18420 \[quant-ph\]](#)

Theses

- [T1] **J. Bavaresco**. Certifying complex quantum properties: High-dimensional entanglement and indefinite causal order. [Doctoral Thesis, Universität Wien \(2021\)](#). Available also on [my website](#).
- [T2] **J. Bavaresco**. When Bob cannot trust Alice: A semi-device-independent tale of quantum steering. [Master's Thesis, Universidade Federal de Minas Gerais \(2016\)](#). Available also on [my website](#).

Code repositories

- [R1] **J. Bavaresco**, <https://github.com/jessicabavaresco>.
Open-access code repository, containing code pertaining to the research that led to different publications listed above.

■ Talks in conferences, workshops, and academic visits

Invited Talks in International Conferences

- Nov 2024 **INAQT Workshop 2024**. Vienna, Austria.
“*Indefinite causal order in boxworld theories*”
- Sep 2024 **Causalworlds 2024**. Waterloo, Canada.
“*Can the quantum switch be deterministically simulated?*”
- Sep 2024 **Foundations of Quantum Computing 2024**. London, UK.
“*Can the quantum switch be deterministically simulated?*”
- Sep 2022 **Quantum Intelligence Workshop 2022**. Birr, Ireland.
“*Resource theory of causal connection*”

Contributed Talks in International Conferences

- Feb 2024 **QUMINOS** – Quantum metrology in interacting and open systems. Les Diablerets, Switzerland.
“*Unitary channel discrimination beyond group structures: Advantages of sequential and indefinite-causal-order strategies*”
- Aug 2023 **AQIS 2023** – 23rd Asian Quantum Information Science Conference. Seoul, South Korea.
Long talk (single track): “*Unitary channel discrimination beyond group structures: Advantages of sequential and indefinite-causal-order strategies*”

- Apr 2021 **YQIS 2021 – VI Int. Conference for Young Quantum Information Scientists.** Michigan, USA.
“Strict hierarchy between parallel, sequential, and indefinite-causal-order strategies for channel discrimination”
- Jun 2020 **TQC 2020 – 15th Conf. on the Theory of Quantum Comput., Commun. and Crypt.** Riga, Latvia.
“Semi-device-independent certification of indefinite causal order”
- Aug 2018 **Modern Topics on Quantum Information Science.** Natal, Brazil.
“Measurements in two basis are sufficient for certifying high-dimensional entanglement”
- Apr 2018 **CQIS 2018 – Int. Conference for Challenges in Quantum Information Science.** Tokyo, Japan.
“Measurements in two basis are sufficient for certifying high-dimensional entanglement”

Invited Talks in Local Conferences

- Jan 2025 **TaQC Meeting.** Grenoble, France
“Indefinite causal order in boxworld theories”
- May 2024 **Cryptography in a Quantum World – Paris Rally, 2024.** Paris, France.
“Higher-order operations approach to channel discrimination”
- Feb 2024 **Swiss Quantum Days 2024.** Villars-sur-Ollon, Switzerland.
“Higher-order quantum operations and the emergence of indefinite causality”
- Mar 2023 **TOOT 2020 – Workshop on The Order Of Things.** Obergurgl, Austria.
 International conference canceled. Realized as a small meeting in 2023 in Pisa, Italy.
“Correlations from boxworld processes”
- Oct 2017 **38. SFB Meeting.** Vienna, Austria.
“Measurements in two basis are sufficient for certifying high-dimensional entanglement”

Invited Seminars

- Dec 2024 **The University of Tokyo – Group of Prof. Mio Murao.** Tokyo, Japan.
- Dec 2024 **Hong Kong University (HKU) – Group of Prof. Giulio Chiribella.** Hong Kong.
- Nov 2024 **Université Grenoble Alps (UGA) – Group of Dr. Cyril Branciaris.** Grenoble, France.
- Oct 2024 **Trinity College Dublin – Group of Prof. Felix Binder.** Dublin, Ireland.
- Oct 2024 **Technical University of Vienna (TU Wien) – Group of Dr. Nicolai Friis.** Vienna, Austria.
- Oct 2024 **IQOQI Vienna – Group of Prof. Časlav Brukner.** Vienna, Austria.
- Jun 2024 **University of Pisa – Group of Prof. Costantino Budroni.** Pisa, Italy.
- Nov 2023 **University of Bristol – Group of Prof. Paul Skrzypczyk.** Bristol, UK.
- Nov 2023 **Free University of Brussels (ULB) – Group of Dr. Ognian Oreshkov.** Brussels, Belgium.
- Oct 2023 **University of Warsaw – Group of Prof. Rafal Demkowicz-Dobrzanski.** Warsaw, Poland.
- Oct 2023 **Nanyang Technological University (NTU) – Group of Prof. Mile Gu.** Singapore.
- Oct 2023 **Université Grenoble Alpes (UGA) – Group of Dr. Cyril Branciard (CNRS).** Grenoble, France
- Dec 2022 **The University of Tokyo – Group of Prof. Mio Murao.** Tokyo, Japan.

Nov 2021	Ulm University – Group of Prof. Martin Plenio. Ulm, Germany.
Nov 2021	National University of Singapore (NUS) – Group of Prof. Valerio Scarani. Singapore.
May 2021	Autonomous University of Barcelona (UAB) – Group of Prof. Andreas Winter. Barcelona, Spain.
Mar 2021	Chapman University – Group of Prof. Matthew Leifer. Orange, USA.
Jun 2020	S. University of Campinas (UNICAMP) – Group of Prof. Marcelo Terra Cunha. Campinas, Brazil.
Oct 2018	University of Vienna — Group of Prof. Anton Zeilinger. Vienna, Austria
Apr 2018	University of Nagoya – Group of Prof. Francesco Buscemi. Nagoya, Japan.
Apr 2018	The University of Tokyo – Group of Prof. Mio Murao. Tokyo, Japan.
Aug 2017	F. University of Minas Gerais (UFMG) – Group of Prof. Pablo Saldanha. Belo Horizonte, Brazil.
Feb 2017	ICFO – Group of Prof. Antonio Acín. Castelldefels (Barcelona), Spain.

Outreach Activities

Oct 2019	Member of discussion panel and Q&A session with non-STEM students of the course on Methods of Science and Practice in Physics. University of Vienna, Austria.
May 2019	Teaching assistant on one-time lecture to first-year non-physics bachelor students of the course on Quantum Technologies, titled “ <i>What do you mean by random? Randomness, Quantum Mechanics, and Bell Non-locality</i> ”. The University of Tokyo, Japan.
Jul 2018	Press releases concerning our result about high-dimensional entanglement (publication [P9] J. Bavaresco et al., Nature Physics 14, 1032 (2018)) to the general public at Der Standard (Austria) , ORF (Austria) , Salzburger Nachrichten (Austria) , Phys.org (UK) , Catalunya Vanguardista (Spain) , and Innovations Report (Germany) .
May 2018	Invited speaker for an informal talk about quantum physics at a dinner for women interested in STEM topics and living in Vienna, organized by the group “Woman of Vienna STEM”. Vienna, Austria.

Other activities

Referrals: Reviewer for the journals Physical Review Letters, PRX Quantum, Physical Review A, New Journal of Physics, Quantum Journal, Quantum Information Processing, European Physics Journal Plus, and the conferences TQC 2022, TQC 2024, QIP 2024, QIP 2025, and Causalworlds 2024.