

Jessica Bavaresco

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Position

Oct 2023 – **SNSF Postdoctoral Fellow** (*Maître Assistante*)
current Quantum Theory Group, Department of Applied Physics (GAP)
University of Geneva, Switzerland
Supervisor: Prof. Nicolas Brunner, co-supervisor: Dr. Cyril Branciard (CNRS, Grenoble, France)
Funding: SNSF Swiss Postdoctoral Fellowship

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

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. Amin 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)

Student research

- Aug 2014 – Jul 2016 **CAPES master’s research student** – Federal University of Minas Gerais, **Brazil**
Supervisor: Prof. Marcelo Terra Cunha (Quantum Information Theory)
Funding: CAPES Federal Master’s research stipend (Brazil)
- Aug 2013 – Jul 2014 **PIBIC undergrad research student** – Federal University of Santa Catarina, **Brazil**
Supervisor: Prof. Eduardo Duzzioni (Quantum Information Theory)
Funding: CNPq Federal Bachelor research stipend (Brazil)
- May – Dec 2012 **Excel Scholar research student** – Lafayette College, **USA**
Supervisor: Prof. Anthony D. Novaco (Condensed Matter Theory)
Funding: Excel Scholar program, Lafayette College (USA)
- Aug 2010 – Dec 2011 **PIBIC undergrad research student** – Federal University of Santa Catarina, **Brazil**
Supervisor: Prof. Abílio Mateus Jr (Astrophysics)
Funding: CNPq Federal Bachelor research stipend (Brazil)

Fellowships and grants

I have been awarded a total of around **630k EUR** in research grants and fellowships throughout my career:

- 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, awarded in the first year of my PhD.
- Jun 2014 **Federal Master’s Research Stipend**
CAPES (Brazil): 36k BRL ~ **11k EUR**
Two-year research stipend awarded through the selection process of UFMG, Brazil
- Sep 2011 **Science Without Borders Grant**
CAPES (Brazil): ca. 100k BRL ~ **44k EUR**
Excellence-based fully funded one-year bachelor scholarship at Lafayette College, USA.

Memberships in panels or boards

- Nov 2023 **PhD thesis jury member** of the thesis of Timothée Hoffreumon, entitled “*Characterization of Higher-order Quantum Processes: When projective methods recover a model of logic*” supervised by Prof. Ognian Oreshkov at the Université libre de Bruxelles, Belgium.
- Jun 2023 – current **Steering Committee** of YQIS – International Conference Young Quantum Information Scientists.

Organization activities

- Mar 2023 – current **Organizer of the weekly seminars** of the Quantum Theory Group of the University of Geneva, Geneva, Switzerland.
- Sep 2018 **Local organization committee** 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.
- Aug 2015 **Assistant to the local organization committee** of V Paraty Quantum Information School and Workshop. Paraty, Brazil.

Supervision

- Jun – Oct 2023 **Internship co-supervisor** of Fatemeh Moradi at the University of Geneva, Switzerland.

Teaching

- Feb – May 2023 **Teaching assistant**, *Méthodes Mathématiques pour Physiciens I* (Mathematical Methods for Physicists I), Bachelor's course, University of Geneva, Switzerland.
- Sep – Dec 2022 **Teaching assistant**, *Méthodes Mathématiques pour Physiciens I* (Mathematical Methods for Physicists I), Bachelor's course, University of Geneva, Switzerland.

Publications and research output

A full list of publications is also available in [my Google Scholar page](#), which jointly counts over **590 citations** (Feb 2024). All research articles can be found in [my arXiv page](#).

Published

- [P1] 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
Semi-device-independent certification of indefinite causal order in a photonic quantum switch
[Optica](#) **10**, 561 (2023) [arXiv:2202.05346 \[quant-ph\]](#) (2022)
^{*}These authors contributed equally to this work.
- [P2] S. Milz, **J. Bavaresco**, and G. Chiribella
Resource theory of causal connection
[Quantum](#) **6**, 788 (2022)
[arXiv:2110.03233 \[quant-ph\]](#)
- [P3] H. Yamasaki, S. Morelli, M. Miethlinger, **J. Bavaresco**, N. Friis, and M. Huber
Activation of genuine multipartite entanglement: Beyond the single-copy paradigm of entanglement characterisation
[Quantum](#) **6**, 695 (2022)
[arXiv:2106.01372 \[quant-ph\]](#)

- [P4] **J. Bavaresco**, M. Murao, and M. T. Quintino
Unitary channel discrimination beyond group structures: Advantages of sequential and indefinite-causal-order strategies
Journal of Mathematical Physics **63**, 042203 (2022)
[arXiv:2105.13369 \[quant-ph\] \(2021\)](#)
- [P5] **J. Bavaresco**, M. Murao, and M. T. Quintino
Strict hierarchy between parallel, sequential, and indefinite-causal-order strategies for channel discrimination
Physical Review Letters **127**, 200504 (2021)
[arXiv:2011.08300 \[quant-ph\]](#)
- [P6] Y. Chen, S. Ecker, **J. Bavaresco**, T. Scheidl, L. Chen, F. Steinlechner, M. Huber, and R. Ursin
Verification of high-dimensional entanglement generated in quantum interference
Physical Review A **101**, 032302 (2020)
[arXiv:1910.07684 \[quant-ph\]](#)
- [P7] **J. Bavaresco**, M. Araújo, Č. Brukner, and M. T. Quintino
Semi-device-independent certification of indefinite causal order
Quantum **3**, 176 (2019)
[arXiv:1903.10526 \[quant-ph\]](#)
- [P8] **J. Bavaresco**, N. H. Valencia, C. Klöckl, M. Pivoluska, P. Erker, N. Friis, M. Malik, and M. Huber
Measurements in two bases are sufficient for certifying high-dimensional entanglement
Nature Physics **14**, 1032 (2018)
[arXiv:1709.07344 \[quant-ph\]](#)
- [P9] A. D. Novaco and **J. Bavaresco**
Simulations of submonolayer Xe on Pt(111): The case for a chaotic low temperature phase
Journal of Chemical Physics **148**, 144704 (2018)
[arXiv:1708.01493 \[cond-mat.mtrl-sci\]](#)
- [P10] L. Guerini, **J. Bavaresco**, M. Terra Cunha, and A. Acín
Operational framework for quantum measurement simulability
Journal of Mathematical Physics **58**, 092102 (2017)
[arXiv:1705.06343 \[quant-ph\]](#)
- [P11] **J. Bavaresco**, M. T. Quintino, L. Guerini, T. O. Maciel, D. Cavalcanti, and M. Terra Cunha
Most incompatible measurements for robust steering tests
Physical Review A **96**, 022110 (2017)
[arXiv:1704.02994 \[quant-ph\]](#)
- [P12] F. Steinlechner, S. Ecker, M. Fink, B. Liu, **J. Bavaresco**, M. Huber, T. Scheidl, and R. Ursin
Distribution of high-dimensional entanglement via an intra-city free-space link
Nature Communications **8**, 15971 (2017)
[arXiv:1612.00751 \[quant-ph\]](#)
- [P13] A. D. Novaco, L. W. Bruch, and **J. Bavaresco**
Incipient triple point for adsorbed xenon monolayers: Pt(111) versus graphite substrates
Physical Review B **91**, 161412(R) (2015)
[arXiv:1601.00700 \[cond-mat.mtrl-sci\]](#)

Pre-print

- [P14] **J. Bavaresco**, P. Lipka-Bartosik, P. Sekatski, and M. Mehboudi
Designing protocols for Bayesian quantum parameter estimation with higher-order operations
[arXiv:2311.01513](https://arxiv.org/abs/2311.01513) [quant-ph]

Theses

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

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

- Sep 2022 **Quantum Intelligence Workshop 2022**. Birr, Ireland.
“Resource theory of causal connection”
- Mar 2020 **TOOT 2020** – Workshop on The Order Of Things. Obergurgl, Austria.
Conference cancelled due to COVID-19. Later realized as a small workshop in 2023 in Pisa, Italy.
“Correlations from boxworld processes”

Contributed Talks in International Conferences

- 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”*
- Aug 2023 **AQIS 2023 – 23rd Asian Quantum Information Science Conference**. Seoul, South Korea.
(Abstract submitted by Jessica Bavaresco; talk presented by Hayata Yamasaki)
“Activation of genuine multipartite entanglement: Beyond the single-copy paradigm of entanglement characterisation”
- 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 2019 **AQIS 2019 – 19th Asian Quantum Information Science Conference**. Seoul, South Korea.
(Abstract submitted by Jessica Bavaresco; unable to attend – talk presented by Marco Túlio Quintino)
“Semi-device-independent certification of indefinite causal order”

- Nov 2018 **Q-turn 2018** – Changing Paradigms in Quantum Science. Florianópolis, Brazil.
(Abstract submitted by Jessica Bavaresco; unable to attend – talk presented by Matej Pivoluska)
“Measurements in two basis are sufficient for certifying high-dimensional entanglement”
- 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”

Contributed talks in national conferences

- Feb 2024 **Swiss Quantum Days 2024**. Villars-sur-Ollon, Switzerland.
“Higher-order quantum operations and the emergence of indefinite causality”
- Oct 2017 **38. SFB Meeting**. Vienna, Austria.
“Measurements in two basis are sufficient for certifying high-dimensional entanglement”

Invited Seminars

- 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 *“What do you mean by random? Randomness, Quantum Mechanics, and Bell Non-locality”*. The University of Tokyo, Japan.

- Jul 2018 Press releases concerning our result about high-dimensional entanglement (publication [P8] 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 and skills

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

Languages: Portuguese (native), English (fluent), French (intermediary), German (intermediary), Japanese (beginner).

Programming and software skills: MATLAB (with expertise on semidefinite programming), Mathematica, Fortran.