

# Daniel Stilck França

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**Work address** LIP, ENS de Lyon  
46 Allée d'Italie, 69364  
Lyon, France

**Email** dsfranca@protonmail.com  
**Web page** <https://danielstilckfranca.eu/>

## Personal Profile

Born on the 13<sup>th</sup> of December 1991 in São Paulo, Brazil.  
Brazilian and German citizen.

## Education

- 2015-2018** Dr. rer. nat. - Technical University of Munich, Germany  
*Thesis* Irreversibility in Quantum Information Theory  
*Supervisor* Prof. Michael M. Wolf
- 2014-2015** M.Sc. in Mathematics (with honors) - Technical University of Munich, Germany
- 2011-2013** B. Sc. (with honors) - Technical University of Munich, Germany  
*Major* Mathematics  
*Minor* Physics
- 2010-2011** Studies of Applied Mathematics - University of São Paulo, Brazil

## Research Interests

- Quantum Information theory, quantum algorithms and mathematical physics.

## Employment History

- 04.2022-** LIP, Department of Computer Science, École Normale Supérieure de Lyon  
*Inria Starting Faculty Position*  
The Inria Starting Faculty Position is an unlimited-term contract position associated with a teaching service in an Inria partner higher education institution. It is similar in spirit to an Assistant Professorship. I am a member of the QInfo team
- 03.2022-** Zapata Quantum Computing  
*Consulting and research on quantum algorithms*  
Zapata is a US-based quantum startup. I am working with them on the development of quantum algorithms that have lower requirements on quantum hardware.
- 09.2018** QMATH, Department of Mathematical Sciences, University of Copenhagen  
**03.2022** *Postdoc*  
Postdoc at the QMATH research center under the supervision of Prof. Matthias Christandl.
- 2013** Technical University of Munich, Germany  
**2018** *Teaching Assistant*  
Teaching assistant for different lectures given by the Mathematical Physics Department at the Technical University of Munich.

## Publications and Preprints

**Summary:** 14 publications, 10 of them in first quarter journals according to Scimago. One conference proceeding. 6 preprints currently under review.

You may find preprints of all my publications on the arXiv and a list of my publications at Google Scholar.

- E. Onorati, C. Rouze, D. Stilck França, J. Watson  
Efficient learning of ground and thermal states within phases of matter  
*preprint*, arXiv:2301.12946, (2023).
- O. Fawzi, A. Oufkir, D. Stilck França  
Lower Bounds on Learning Pauli Channels  
*preprint*, arXiv:2301.09192, (2023).
- G. Wang, D. Stilck França, R. Zhang, S. Zhu, P. D. Johnson.  
Quantum algorithm for ground state energy estimation using circuit depth with exponentially improved dependence on precision  
*preprint*, arXiv:2209.06811v1, (2022).
- Y. Quek, D. Stilck França, S. Khatri, J. Jakob Meyer, J. Eisert.  
Exponentially tighter bounds on limitations of quantum error mitigation  
*preprint*, arXiv:2210.11505v1, (2022).
- D. Stilck França, L. A. Markovich, V. V. Dobrovitski, A. H. Werner, J. Borregaard.  
Efficient and robust estimation of many-qubit Hamiltonians  
*preprint*, arXiv:2205.09567v1, (2022).
- G. De Palma, Milad Marvian, C. Rouzé, D. Stilck França.  
Limitations of variational quantum algorithms: a quantum optimal transport approach  
*PRX Quantum*, Vol 4., (2022).
- C. Hirche, C. Rouzé, D. Stilck França.  
Quantum Differential Privacy: An Information Theory Perspective  
*preprint*, arXiv:2202.10717v1, accepted at IEEE Transactions in Information Theory, (2022).
- C. Hirche, C. Rouzé, D. Stilck França.  
On contraction coefficients, partial orders and approximation of capacities for quantum channels  
*Quantum*, Quantum 6, 753, (2022).
- D. Stilck França, R. Garcia-Patron  
A game of quantum advantage: linking verification and simulation  
*Quantum*, Quantum 6, 753, (2022).
- D. Stilck França, R. Garcia-Patron  
Limitations of optimization algorithms on noisy quantum devices  
*Nature Physics*, Vol. 17, No. 11, (2021).
- C. Rouzé, D. Stilck França.  
Learning quantum many-body systems from a few copies  
*preprint*, arXiv:2107.03333v2, submitted to PRX Quantum, (2021).
- F. G. S. L. Brandão, R. Kueng, D. Stilck França  
Fast and robust quantum state tomography from few basis measurements  
*16th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC2021)*, nan, (2021).
- J. Borregaard., M. Christandl, D. Stilck França  
Noise-robust exploration of quantum matter on near-term quantum devices.  
*npj Quantum Information*, 7, 45, (2021).
- D. Stilck França, S. Strelchuk, M. Studzinski  
Efficient benchmarking and classical simulation of quantum processes in the Weyl basis  
*Physical Review Letters*, Vol. 126, No. 21, (2020).

- A. Capel, C. Rouzé, D. Stilck França.  
The modified logarithmic Sobolev inequality for quantum spin systems: classical and commuting nearest neighbour interactions  
*preprint*, arXiv:2009.11817v1, accepted to *Communications in Mathematical Physics*, (2020).
- A. Bluhm, M. Christandl, F. Gesmundo, F. Ravn Klausen, L. Mancinska, V. Steffan, D. Stilck França, A.H. Werner.  
SARS-CoV-2 transmission chains from genetic data: a Danish case study  
*PlosOne*, PLOS ONE, 15(10), (2020).
- M. Christandl, F. Gesmundo, D. Stilck França, A. H. Werner  
Optimization at the boundary of the tensor network variety  
*Physical Review B*, Vol. 103, No. 19, (2020).
- E.P. Hanson, C. Rouze, and D. Stilck França  
Eventually Entanglement Breaking Markovian Dynamics: Structure and Characteristic Times  
*Annales Henri Poincaré*, 21, no. 5, (2020).
- F. G. S. L. Brandao, R. Kueng, D. Stilck França  
Faster quantum and classical SDP approximations for quadratic binary optimization.  
*Quantum*, Quantum 6, 625, (2019).
- I. Bardet, M. Junge, N. LaRacuenta, C. RouzÃ©, D. Stilck França  
Group transference techniques for the estimation of the decoherence times and capacities of quantum Markov semigroups.  
*IEEE Transactions on Information Theory*, Vol. 67, No. 5, (2021), (2019).
- A. Bluhm, and D. Stilck França  
Dimensionality reduction of SDPs through sketching  
*Linear Algebra and Its Applications*, 563, 461, (2019).
- D. Stilck França, and A.K. Hashagen  
Approximate randomized benchmarking for finite groups.  
*Journal of Physics A: Mathematical and Theoretical*, 51(39), 39530, (2018).
- D. Stilck França  
Perfect Sampling for Quantum Gibbs States.  
*Quantum Information and Computation*, 18(5), (2018).
- A.Müller-Hermes and D. Stilck França  
Sandwiched Renyi Convergence for Quantum Evolutions.  
*Quantum*, 2, 55, (2018).
- A.Müller-Hermes ,D. Stilck França, M.M.Wolf  
Entropy-production of Doubly-Stochastic Quantum Channels  
*Journal of Mathematical Physics* , 57, 022203, (2016).
- A.Müller-Hermes ,D. Stilck França, M.M.Wolf  
Relative entropy convergence for depolarizing channels,  
*Journal of Mathematical Physics* , 57, 022202, (2016).

## International network and relations

I am happy to count with a wide and rich network of collaborators spread over at least 15 countries and 30+ institutions. See Fig. 1 for a map with the location of all my collaborators in the last five years. You can find an interactive version of the map here. My connections are the strongest with academic groups in Europe, where I actively collaborate with the majority of top groups. But I also enjoy active collaborations with first-rate American academic institutions. In addition, I have strong ties to quantum industry in North America. I work as a consultant for Zapata, a quantum startup based in the US and Canada, and work with collaborators at AWS. More recently, I started collaborating with quantum industry in Europe, as I have a joint PhD student with IBM France and I am involved in a grant with the leading French startup Pasqal. The same grant involves other major European industrial partners, such as Airbus.



Figure 1: geographical location of my collaborators. [Click here for an interactive version.](#)

I am a prolific international speaker. See Fig. 2 for a map of places I gave talks and here for an interactive map. I was invited to speak in several high-profile institutions throughout the world. In the last two years, I gave international talks almost monthly. I am a valued member of the quantum community. I have served as a referee to most top journals and conferences in the field. And this is regardless of whether they have a more mathematical (such as Communications in Mathematical Physics), computer science (STOC) or theoretical physics (Physical Review Letters) taste. Furthermore, I have served in the PC of some of the major conferences in the field.



Figure 2: geographical location of my recent talks. [Click here for an interactive version.](#)

I am currently organizing high-profile international events. I am the main organizer of an upcoming prestigious BIRS workshop in Banff, Canada. Furthermore, I recently secured funds to organize a joint workshop between our research group and that of Prof. Tomamichel through the Merlion programme.

## Selected Contributions to Workshops and Conferences

**Summary:** the most prestigious conferences in theoretical quantum computation and information are QIP and TQC. They both have acceptance rates between 20-25%, which are comparable to conferences like NeurIPS, FOCS or STOC. My work was featured in 6 QIP and 8 TQC talks since 2019, putting me comfortably amongst the researchers with the highest number of accepted talks in the last years. I will also be an invited speaker at TQC 2023, which is considered an honor in the field. I am frequently invited to talk at various workshops, seminars and conferences.

- 2023-07 *Limitations of noisy quantum circuits*, TQC 2023, **Aveiro University**, Invited talk, Aveiro, Portugal.
- \*2023-02 *Exponentially tighter bounds on error mitigation*, QIP 2023, **Ghent University**, Contributed talk, Ghent, Belgium.
- 2023-02 *Limitations of VQAs: a quantum optimal transport approach*, QIP 2023, **Ghent University**, Contributed talk, Ghent, Belgium.
- 2022-12 *Exponentially tighter bounds on limitations of quantum error mitigation*, Quantum computing seminar, **University of Edinburgh**, Invited talk, Edinburgh, Scotland.
- 2022-11 *Concentration properties of shallow quantum circuits and applications to variational quantum algorithms*, Journées Informatique Quantique 2022, **Sorbonne University**, Invited talk, Paris, France.

- 2022-09 *Mixing properties of tensor network states*, AGATES kickoff workshop, **Banach Center**, Invited talk, Warsaw, Poland.
- 2022-08 *Limitations of noisy quantum algorithms*, Gemini Quantum Center Seminar, **University of Oslo**, Invited Talk, Oslo, Norway.
- \*2022-07 *Quantum Differential Privacy: An Information Theory Perspective*, TQC 2022, **University of Illinois Urbana-Champaign**, Contributed Talk, Urbana-Champaign, United States.
- 2022-07 *Efficient and robust estimation of many-qubit Hamiltonians*, TQC 2022, **University of Illinois Urbana-Champaign**, Contributed Talk, Urbana-Champaign, United States.
- 2022-06 *Limitations of noisy quantum annealers*, Adiabatic Quantum Computing Conference 2022, **ICTP**, Invited Talk, Trieste, Italy.
- 2022-06 *Tomography of many-body quantum states from a few copies through optimal transport*, Quantum Information Theory and Mathematical Physics 2022, **Budapest University of Technology and Economics**, Invited Talk, Budapest, Hungary.
- 2022-05 *Limitations of variational quantum algorithms: a quantum optimal transport approach*, Workshop Quantum Information and the Frontiers of Quantum Theory, **ENS Lyon**, Invited talk, Lyon, France.
- \*2022-03 *A refinement of Pinsker's inequality and applications to state tomography*, QIP 2022, **Caltech**, Contributed talk, Pasadena, United States.
- 2021-10 *Limitations of optimization on noisy quantum devices*, Informs Annual Meeting 2021, **Informs**, Invited talk, Anaheim, United States.
- 2021-09 *Limitations of optimization on noisy quantum devices*, Beyond IID in Information Theory 9, **National Taiwan University**, Invited talk, Taipei, Taiwan.
- 2021-09 *A game of quantum advantage: linking verification and simulation*, Second Kyoto Workshop on Quantum Information, Computation, and Foundation, **Yukawa Institute for Theoretical Physics**, Invited talk, Kyoto, Japan.
- \*2021-08 *The modified logarithmic Sobolev inequality for quantum spin systems*, International Congress of Mathematical Physics 2021, **University of Geneva**, Contributed talk, Geneva, Switzerland.
- 2021-08 *Fast and robust quantum state tomography from few basis measurements*, International Congress of Mathematical Physics 2021, **University of Geneva**, Contributed talk, Geneva, Switzerland.
- 2021-07 *Fast and robust quantum state tomography from few basis measurements*, TQC 2021, **University of Latvia**, Contributed talk, Riga, Latvia.
- 2021-07 *Efficient learning of quantum extensive observables*, TQC 2021, **University of Latvia**, Contributed talk, Riga, Latvia.
- 2021-07 *A game of quantum advantage: linking verification and simulation*, TQC 2021, **University of Latvia**, Contributed talk, Riga, Latvia.
- \*2021-07 *Optimization at the boundary of the tensor network variety*, TQC 2021, **University of Latvia**, Contributed talk, Riga, Latvia.
- 2021-06 *Eventually entanglement breaking Markovian dynamics: Structure and characteristic times*, Munich-Toulouse Workshop, **University of Toulouse**, Invited talk, Toulouse, France.
- 2021-05 *Learning quantum many-body systems from a few copies*, Seminar talk, **ENS Lyon**, Invited talk, Lyon, France.
- 2021-05 *A game of quantum advantage: linking verification and simulation*, Seminar talk, **Heinrich Heine University Duesseldorf**, Invited talk, Duesseldorf, Germany.
- 2021-03 *Limitations of optimization algorithms on noisy quantum devices*, Seminar talk, **Sorbonne University**, Invited talk, Paris, France.

- 2021-02 *Limitations of optimization algorithms on noisy quantum devices*, QuICS Seminar, **QUICS/University of Maryland**, Invited talk, College Park, United States.
- 2021-02 *Limitations of optimization algorithms on noisy quantum devices*, QIP 2021, **Munich Quantum Center**, Contributed talk, Munich, Germany.
- \*2021-02 *On the entropic convergence of quantum Gibbs samplers*, QIP 2021, **Munich Quantum Center**, Contributed talk, Munich, Germany.
- \*2020-11 *The modified logarithmic Sobolev inequality for quantum spin systems: classical and commuting nearest neighbours interactions*, Beyond IID Conference, **Stanford University**, Contributed Talk, Online event.
- 2020-10 *Fast and robust quantum state tomography from few basis measurements*, Quantum Information Theory Seminar, **University College London**, Invited talk, London, United Kingdom.
- 2020-06 *Faster quantum and classical SDP approximations for quadratic binary optimization*, Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC), **University of Latvia**, Contributed talk, Riga, Latvia.
- 2020-04 *Faster quantum and classical SDP approximations for quadratic binary optimization*, Quantum Information Seminar, **Technical University Munich**, Invited talk, Munich, Germany.
- 2019-10 *Faster quantum and classical SDP approximations for quadratic binary optimization*, Quantum innovators workshop, **University of Waterloo**, Invited talk, Waterloo, Canada.
- \*2019-07 *On entanglement breaking times for quantum Markovian evolutions*, Beyond IID Conference, **University of Technology Sydney**, Contributed talk, Sydney, Australia.
- \*2019-07 *Group transference techniques for the estimation of the decoherence times and capacities of quantum Markov semigroups.*, Beyond IID Conference, **University of Technology Sydney**, Contributed talk, Sydney, Australia.
- 2019-05 *Weak simulation and benchmarking of sparse quantum circuits*, IQIM Seminar, **California Institute of Technology**, Invited talk, Pasadena, United States.
- 2019-05 *Noise-robust exploration of quantum matter on near-term quantum devices*, Seminar talk, **Niels Bohr Institute**, Invited talk, Copenhagen, Denmark.
- 2019-01 *Functional inequalities via group transference techniques and application to estimation of decoherence times and capacities*, Conference on Quantum Information Processing (QIP), **University of Colorado**, Contributed talk, Boulder, United States.
- 2018-12 *Faster quantum and classical SDP approximations for quadratic binary optimization*, Quantum Information Seminar, **Massachusetts Institute of Technology**, Invited talk, Cambridge, United States.
- 2018-05 *Hypercontractivity of quantum dynamical semigroups*, Workshop on quantum functional inequalities, **University of Toulouse**, Invited talk, Toulouse, France.
- 2018-05 *Approximate Randomized Benchmarking for Finite Groups*, Quantum Information Theory Seminar, **Cambridge University**, Invited talk, Cambridge, United Kingdom.
- 2017-10 *Dimensionality reduction of SDPs through sketching*, Workshop on Probabilistic techniques and Quantum Information Theory, **Institut Henri Poincaré**, Invited Talk, Paris, France.
- 2017-10 *Perfect Sampling of quantum Gibbs states*, International Conference for quantum information scientists, **Max Planck Institute of Light**, Contributed talk, Erlangen, Germany.
- 2016-05 *Hypercontractivity and convergence in Renyi Divergences for quantum Semigroups*, First meeting of the MISTEQ project, **University of Toulouse**, Invited talk, Toulouse, France.
- 2015-06 *Logarithmic Sobolev Inequalities for Entropy Production*, 12th Central European Quantum Information Processing Workshop, **Masaryk University**, Contributed talk, Telč, Czech Republic.

Note that the most prestigious conferences in quantum information and computation are TQC and QIP. An asterisk indicates that the talk was delivered by one of my co-authors.

## Language Skills

Portuguese (native), German (native), English (full professional proficiency), French(intermediate proficiency).

## Community work

**Program committee member of:** QTURN 2020, Quantum Computing Theory in Practice 2022, Beyond IID 2022, TQC 2023.

**Organizer of:**

- BIRS workshop: 5-day workshop with 40+ participants on Fundamental Limitations to Quantum Computation in March 2024 at Banff, Canada. Main organizer.
- Merlion workshop: 5-day workshop in Singapore between QInfo and the research group of Prof. Tomamichel in June 2023 in Singapore. Main organizer with Christoph Hirche.
- SIAM AG 21 Minisymposia on Tensor Networks and Geometry. Involved in all aspects of the organization.

**Referee for:** Annales Henri Poincaré, Communications in Mathematical Physics, IEEE Transactions on Information Theory, Journal of Mathematical Physics, Journal of Physics A: Mathematical and Theoretical, PRX Quantum, Quantum, ACM Transactions on Quantum Computing, ACM Transactions on Quantum Computing, Physical Review Letters, STOC, New Journal of Physics.

## Awards, Grants and Scholarships

<b>2023</b>	Hybrid HPC Quantum Initiative, French PEPR. (336k Euros, coordinator of 3000k Euros work package).
<b>2023</b>	Equality (Efficient QUantum ALgorithms for IndusTrY), Horizon Europe grant. (250k Euros).
<b>2018</b>	Journal of Physics A: Mathematical and Theoretical' Reviewer of 2018
<b>2011-2016</b>	Full DAAD (German Foreign Exchange Service) Scholarship
<b>2016</b>	Hurwitz Society Prize for exceptional Master Thesis

## Outreach

**Popular science articles featuring my work:**

- Physics World: Conquering the challenge of quantum optimization.
- Nature computational science research highlight: Analyzing noise for quantum advantage.
- MIT Horizon: The challenges and disadvantages of quantum computing. (paywalled)

**Popular science talks and industry outreach:**

- Lyon Informatics Federation: talk on "Quantum computing in the near term: challenges and opportunities". February 2023.
- Copenhagen Digital Summit 2021: presentation and panel discussion on the prospects of quantum computing. November 2021.
- byFounders VC: presentation on the lay of the land of quantum computing. April 2022.
- Novozymes: 1-day workshop for the AI team on the basics of quantum computing. December 2020.

**Youtube Channel:** monthly interview at Canal Resistentes (in Portuguese, 25000 subscribers).

**Social media:** I have an active Twitter account that I use to talk about my work. I also post updates to my website.

## Research Visits

**01.2022-03.2022** Free University Berlin, group of Prof. Dr. Jens Eisert .

**02.2018-04.2018** California Institute of Technology, group of Prof. Dr. Fernando Brandão .

## PhD Students

**10.2022-** Emily Beatty. Co-supervised with Guillaume Aubrun.

**02.2023-** Victor Martinez. Co-supervised with Omar Fawzi and co-financed by IBM.

## Teaching experience

- *Quantum computer science*, Lecturer, ENS Lyon, 2022.
- *Introduction to Quantum Computing*, Lecturer, University of Copenhagen, 2021, good/excellent evaluation: 80%.
- *Introduction to Quantum Computing*, Lecturer, University of Copenhagen, 2020, good/excellent evaluation: 75%.
- *Introduction to Latex*, Lecturer, University of Copenhagen, 2019,
- Teaching Assistant at various courses at Technical University Munich, such as Analysis 1,2,3 and 4 for Physicists, Mathematical Modelling and Markov Chains.

## References

- Prof. Michael M. Wolf, [wolf@ma.tum.de](mailto:wolf@ma.tum.de)
- Prof. Fernando Brandão, [fbrandao@caltech.edu](mailto:fbrandao@caltech.edu)
- Prof. Matthias Christandl, [christandl@math.ku.dk](mailto:christandl@math.ku.dk)

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