

Daniel Stilck França

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Personal Profile

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

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. I am a member of the QInfo team
- 03.2022-07.2023** Zapata Quantum Computing
Consulting and research on quantum algorithms
Zapata is a US-based startup. I was working with them on the development of quantum algorithms that have lower requirements on quantum hardware.
- 09.2018-03.2022** QMATH, Department of Mathematical Sciences, University of Copenhagen
Postdoc
Postdoc at the QMATH research center under the supervision of Prof. Matthias Christandl.
- 2013-2018** Technical University of Munich, Germany
Teaching Assistant
Teaching assistant for different lectures given by the Mathematical Physics Department at the Technical University of Munich.

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

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- 04.2022-** LIP, Department of Computer Science, École Normale Supérieure de Lyon
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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
08.2023 *Consulting and research on quantum algorithms*
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- 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: 21 publications, 17 of them in first-quarter journals according to Scimago. One conference proceeding. 11 preprints currently under review.

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

- D. Stilck França, L. A. Markovich, V. V. Dobrovitski, A. H. Werner, J. Borregaard.
Efficient and robust estimation of many-qubit Hamiltonians
Nature Communications, Vol 15, 311, (2024).
- Dylan Harley, Ishaun Datta, Frederik Ravn Klausen, Andreas Bluhm, Daniel Stilck França, Albert Werner, Matthias Christandl
Going Beyond Gadgets: The Importance of Scalability for Analogue Quantum Simulators
preprint, arxiv:2306.13739v2, (2023).
- Cambyse Rouzé, Daniel Stilck França
Efficient learning of the structure and parameters of local Pauli noise channels
preprint, arxiv:2307.02959v1, (2023).
- Johannes Jakob Meyer, Sumeet Khatri, Daniel Stilck França, Jens Eisert, Philippe Faist
Quantum metrology in the finite-sample regime
preprint, arxiv:2307.06370v1, (2023).
- Matthias Caro, Tom Gur, Cambyse Rouzé, Daniel Stilck França, Sathyawageeswar Subramanian
Information-theoretic generalization bounds for learning from quantum data
preprint, arxiv:2311.05529v1, (2023).
- Emilio Onorati, Cambyse Rouzé, Daniel Stilck França, James D. Watson
Provably Efficient Learning of Phases of Matter via Dissipative Evolutions
preprint, arxiv:2311.07506v1, (2023).
- G Wang, D Stilck França, G Rendon, PD Johnson
Faster ground state energy estimation on early fault-tolerant quantum computers via rejection sampling
preprint, arXiv:2304.09827, (2023).

- 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
Quantum, Vol 7, (2023).
- C. Hirche, C. Rouzé, D. Stilck França.
Quantum Differential Privacy: An Information Theory Perspective
IEEE Transactions in Information Theory, vol. 69, no. 9, (2023).
- C. Hirche, C. Rouzé, D. Stilck França.
On contraction coefficients, partial orders and approximation of capacities for quantum channels
Quantum, Quantum 6, 753, (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).
- 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).
- D. Stilck França, R. Garcia-Patron
A game of quantum advantage: linking verification and simulation
Quantum, Quantum 6, 753, (2022).
- 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).
- C. Rouzé, D. Stilck França.
Learning quantum many-body systems from a few copies
preprint, arXiv:2107.03333v2, submitted to *Quantum*, (2021).
- D. Stilck França, R. Garcia-Patron
Limitations of optimization algorithms on noisy quantum devices
Nature Physics, Vol. 17, No. 11, (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).
- 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
PlusOne, PLOS ONE, 15(10), (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).
- 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).

- 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).
- 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).
- A. Bluhm, and D. Stilck França
Dimensionality reduction of SDPs through sketching
Linear Algebra and Its Applications, 563, 461, (2019).
- 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).
- 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).

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 has featured in 9 QIP and 9 TQC talks since 2019. Furthermore, I was an invited speaker at TQC 2023, a distinction in the field. An asterisk indicates that the talk was delivered by one of my co-authors. I am frequently invited to talk at various workshops, seminars and conferences.

- *2024-01 *Quantum metrology in the finite-sample regime*, QIP 2024, **Taipei International Convention Center**, Contributed talk, Taipei, Taiwan.
- *2024-01 *Efficient learning of ground and thermal states within phases of matter*, QIP 2024, **Taipei International Convention Center**, Contributed talk, Taipei, Taiwan.
- *2024-01 *Going Beyond Gadgets: The Importance of Scalability for Analogue Quantum Simulators*, QIP 2024, **Taipei International Convention Center**, Contributed talk, Taipei, Taiwan.
- 2023-12 *Learning quantum many-body states*, International Workshop on Frontiers in Quantum Information, **Yes**, Invited talk, Haikou, China.
- 2023-10 *Efficient learning of ground and thermal states within phases of matter*, Quantum Information Seminar, **University of the Basque Country**, Invited talk, Bilbao, Spain.

- 2023-10 *Efficient learning of ground and thermal states within phases of matter*, QuantAlps Days, **University of Grenoble**, Invited talk, Grenoble, France.
- 2023-08 *Efficient learning of ground and thermal states within phases of matter*, Chinese Physical Society Fall Meeting, **Ningxia University**, Invited talk, Ningxia, China.
- 2023-08 *Limitations imposed by noise on near-term quantum algorithms for optimization*, Paraty Quantum, **Universidade Federal do Rio de Janeiro**, Contributed talk, Paraty, Brazil.
- 2023-07 *Efficient learning of ground and thermal states within phases of matter*, Quantum computing seminar, **University of Edinburgh**, Invited talk, Edinburgh, Scotland.
- 2023-07 *Limitations of noisy quantum circuits*, TQC 2023, **Aveiro University**, Invited talk, Aveiro, Portugal.
- 2023-07 *Efficient learning of ground and thermal states within phases of matter*, TQC 2023, **Aveiro University**, Contributed talk, Aveiro, Portugal.
- 2023-07 *Quantum algorithm for ground state energy estimation using circuit depth with exponentially improved dependence on precision*, PsiQuantum Algorithms Seminar, **PsiQuantum**, Invited talk, Palo Alto, United States.
- 2023-06 *Quantum Concentration inequalities*, ILAS 2023, **Ilas**, Invited speaker, Madrid, Spain.
- 2023-06 *Efficient learning of ground and thermal states within phases of matter*, Lyon-Singapore Quantum Information Meeting, **National University of Singapore**, Invited talk, Singapore, Singapore.
- 2023-05 *Quantum Concentration inequalities*, Quantum trajectories workshop, **Universite Paul Sabatier**, Invited speaker, Toulouse, France.
- 2023-04 *Quantum algorithm for ground state energy estimation using circuit depth with exponentially improved dependence on precision*, QCTIP, **Riverlane**, Contributed talk, Cambridge, United Kingdom.
- 2023-03 *Limitations imposed by noise on near-term quantum algorithms for optimization*, QRC Seminar series, **Technology Innovation Institute**, Invited talk, Abu Dhabi, United Arab Emirates.
- *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 *Efficient learning of quantum extensive observables*, TQC 2021, **University of Latvia**, Contributed talk, Riga, Latvia.
- 2021-07 *Fast and robust quantum state tomography from few basis measurements*, 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 *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.
- *2019-07 *On entanglement breaking times for quantum Markovian evolutions*, 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.

Language Skills

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

Community work

Program committee chair of: QCTIP 24

Program committee member of: QTURN 2020, QCTIP22, Beyond IID 2022, TQC 2023, QIP 2024.

Organizer of: Workshop on Fundamental limitations to quantum computation. Main organizer, to be held March 2024.

Lyon-Singapore Quantum Information Meeting Co-organizer, June 2023.

SIAM AG 21 Minisymposia on Tensor Networks and Geometry. Involved in all aspects of the organization, July 2021.

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.

Awards, Grants and Scholarships

2023 TouQan (Towards a useful quantum advantage), QuantEra 2023. (300k Euros).
2023 Hybrid HPC Quantum Initiative, French PEPR. (336k Euros, coordinator of 3000k Euros work package).
2023 Equality (Efficient QUantum ALgorithms for IndusTrY), Horizon Europe grant. (250k Euros).
2018 Journal of Physics A: Mathematical and Theoretical' Reviewer of 2018
2011-2016 Full DAAD (German Foreign Exchange Service) Scholarship
2016 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: limitations of quantum computing. (paywalled)

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

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.

03.2023- Victor Martinez. Co-supervised with Omar Fawzi.

Postdocs

11.2023- Ngoc Hoang Anh MAI.

Teaching experience

- *Quantum computer science*, Lecturer, ENS Lyon, 2022-23 and 2023-2024, evaluated as "very good/almost perfect".
- *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. From 2015-2018.