Felix Leditzky

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Employment

from Dec 2019	**Postdoctoral Fellow** Institute for Quantum Computing, University of Waterloo Perimeter Institute for Theoretical Physics Advisors: Debbie Leung (IQC) and Beni Yoshida (PI)
Nov 2016 – Nov 2019	**Postdoctoral Research Associate** JILA, University of Colorado Boulder Advisor: Graeme Smith

Education

Oct 2013 – Oct 2016	**PhD**, University of Cambridge Supervised by Nilanjana Datta Thesis: "Relative entropies and their use in quantum information theory" (available online at arXiv:1611.08802)
Oct 2006 – Apr 2013	**Diploma in Physics** (Mag. rer. nat.), University of Vienna Supervised by Harald Grosse (graduated with distinction) Thesis: "Deformed $\mathbb{R}^3$ as a physical framework for quantum mechanical problems" (available online at http://othes.univie.ac.at/26831/)
Oct 2006 – Feb 2012	**Diploma in Mathematics** (Mag. rer. nat.), University of Vienna Supervised by Joachim Mahnkopf (graduated with distinction) Thesis: "Principal indecomposable modules for the Alternating group on five symbols in modular characteristic" (available online at http://othes.univie.ac.at/19235/)

Grants, Awards & Scholarships

Aug 2018	National Science Foundation Grant CCF 1834515 (Principal Investigator) Covering travel support for workshop *Rocky Mountain Summit on Quantum Information* in the amount of $10,000.
May 2018	AI Grant (together with Johannes Bausch)

	Project: "Search for new quantum error correction codes using neural networks", in the amount of $2,500 plus $20,000 GPU credits.
Apr 2015	Smith-Knight and Rayleigh-Knight Prize Essay title: "Source coding for a mixed source: determination of second order asymptotics"
Oct 2013 – Sep 2016	Maintenance grant, Department of Pure Mathematics and Mathematical Statistics, University of Cambridge EPSRC grant covering College and University fees
Jan 2009	Performance scholarship, University of Vienna
Jan 2008	Performance scholarship, University of Vienna

Teaching experience

Nov 2016 – Nov 2019	Substitute lectures in Quantum Information & Quantum Computation graduate level course, ~35 students, lectured by Graeme Smith
Nov 2016 – Nov 2019	Substitute lectures in Thermodynamics & Statistical Mechanics undergraduate level course, ~50 students, lectured by Graeme Smith
Oct 2015 – Dec 2015	Example classes on Quantum Information Theory graduate level course, ~30 students, lectured by William Matthews
Oct 2014 – Dec 2014	Example classes on Quantum Information Theory graduate level course, ~30 students, lectured by William Matthews
Oct 2013 – Dec 2013	Example classes on Quantum Information Theory graduate level course, ~30 students, lectured by Nilanjana Datta

Research interests

Quantum information theory, in particular mathematical and computational aspects

- additivity problems in quantum information theory, quantum channels and their capacities, quantum Shannon theory, mathematics of relative entropies, strong converse theorems, second order asymptotics
- multipartite entanglement, neural networks and tensor networks ansätze for many-body quantum states, symmetries and representation theory, group theory
- semidefinite programming, convex optimization theory, machine learning techniques, global optimization techniques

Publications & preprints

[14] J. Bausch and F. Leditzky. "Error Thresholds for Arbitrary Pauli Noise". *arXiv preprint* (2019). Accepted as a talk at QIP 2020. arXiv: 1910.00471 [quant-ph]

[13] M. Christandl, F. Leditzky, C. Majenz, G. Smith, F. Speelman, and M. Walter. "Asymptotic performance of port-based teleportation". *arXiv preprint* (2018). Presented as a talk at QIP 2019. arXiv: 1809.10751 [quant-ph]

[12] F. Leditzky, M. A. Alhejji, J. Levin, and G. Smith. "Playing Games with Multiple Access Channels". *Nature Communications* (2020). To appear. arXiv: 1909.02479 [quant-ph]

[11] J. Bausch and F. Leditzky. "Quantum codes from neural networks". *New Journal of Physics* 22.2 (2020), p. 023005. arXiv: 1806.08781 [quant-ph]

[10] F. Leditzky, D. Leung, and G. Smith. "Dephrasure Channel and Superadditivity of Coherent Information". *Physical Review Letters* 121.16 (2018), p. 160501. arXiv: 1806.08327 [quant-ph]

[9] F. Leditzky, N. Datta, and G. Smith. "Useful states and entanglement distillation". *IEEE Transactions on Information Theory* 64.7 (2018), pp. 4689–4708. arXiv: 1701.03081 [quant-ph]

[8] F. Leditzky, D. Leung, and G. Smith. "Quantum and Private Capacities of Low-Noise Channels". *Physical Review Letters* 120.16 (2018), p. 160503. arXiv: 1705.04335 [quant-ph]

[7] F. Leditzky, E. Kaur, N. Datta, and M. M. Wilde. "Approaches for approximate additivity of the Holevo information of quantum channels". *Physical Review A* 97.1 (2018), p. 012332. arXiv: 1709.01111 [quant-ph]

[6] F. Leditzky, C. Rouzé, and N. Datta. "Data processing for the sandwiched Rényi divergence: a condition for equality". *Letters in Mathematical Physics* 107.1 (2017), pp. 61–80. arXiv: 1604.02119 [quant-ph]

[5] S. Beigi, N. Datta, and F. Leditzky. "Decoding Quantum Information via the Petz recovery map". *Journal of Mathematical Physics* 57.8, 082203 (2016). arXiv: 1504.04449 [quant-ph]

[4] F. Leditzky, M. M. Wilde, and N. Datta. "Strong converse theorems using Rényi entropies". *Journal of Mathematical Physics* 57.8, 082202 (2016). arXiv: 1506.02635 [quant-ph]

[3] F. Leditzky and N. Datta. "Second order asymptotics of visible mixed quantum source coding via universal codes". *IEEE Transactions on Information Theory* 62.7 (2016), pp. 4347–4355. arXiv: 1407.6616 [quant-ph]

[2a] N. Datta and F. Leditzky. "Second-Order Asymptotics for Source Coding, Dense Coding, and Pure-State Entanglement Conversions". *IEEE Transactions on Information Theory* 61.1 (2015), pp. 582–608. arXiv: 1403.2543 [quant-ph]

[2b] N. Datta and F. Leditzky. "Corrections to "Second-Order Asymptotics for Source Coding, Dense Coding, and Pure-State Entanglement Conversions"". *IEEE Transactions on Information Theory* 64.4 (2017), pp. 2625–2627

[1] N. Datta and F. Leditzky. "A limit of the quantum Rényi divergence". *Journal of Physics A: Mathematical and Theoretical* 47.4 (2014), p. 045304. arXiv: 1308.5961 [quant-ph]

Extended research visits

Mar 2019	Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA Program "Machine Learning for Quantum Many-Body Physics"
Dec 2017	Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA Program "Quantum Physics of Information"
Sep 2017	Institute Henri Poincaré, Paris, France Program "Analysis in Quantum Information Theory"

Presentations

Contributed talks

Jan 2020	*Quantum Information Processing*, Shenzhen, China Title: "Error thresholds for arbitrary Pauli noise"
Jul 2019	*Beyond I.I.D. in Information Theory*, Sydney, Australia

Title: "Quantum codes from neural networks"

Feb 2019 *Southwest Quantum Information and Technology*, Albuquerque, USA
Title: "Dephrasure channel and superadditivity of coherent information"

Jan 2019* *Quantum Information Processing*, Boulder, USA
Title: "Asymptotic performance of port-based teleportation"

Jul 2018 *Beyond I.I.D. in Information Theory*, Cambridge, UK
Title: "Dephrasure channel and superadditivity of coherent information"

Jul 2017 *Beyond I.I.D. in Information Theory*, Singapore, Singapore
Title: "Useful states and entanglement distillation"

Jun 2017 *IEEE International Symposium on Information Theory*, Aachen, Germany
Title: "Degradable states and one-way entanglement distillation"

Jul 2016 *IEEE International Symposium on Information Theory*, Barcelona, Spain
Title: "Strong converse theorem for state redistribution using Rényi entropies"

Sep 2015 *Quantum Information Processing and Communication*, Leeds, UK
Title: "Second Order Asymptotics of Quantum Mixed Source Coding"

*Talk delivered by co-author.

Invited talks

Sep 2019 *57th Annual Allerton Conference on Communication, Control and Computing*, University of Illinois Urbana-Champaign, Monticello, USA
Title: "Quantum codes from neural networks"

Jul 2019 *Algebraic and Statistical ways into Quantum Resource Theories* (BIRS workshop), Banff, Canada
Title: "Asymptotic performance of port-based teleportation"

May 2019 *Symposium on Quantum resources and their application*, ICTQT & KCIK, Gdansk, Poland
Title: "Quantum Codes from Neural Networks"

Oct 2018 *Quantum Innovators in computer science and mathematics*, IQC, University of Waterloo, Canada
Title: "Quantum Codes from Neural Networks"

Apr 2018 *IQC Colloquium*, IQC, University of Waterloo, Canada
Title: "Asymptotic performance of port-based teleportation"

Nov 2017 *IEEE Information Theory Workshop*, Kaohsiung, Taiwan
Title: "Quantum and private capacities of low-noise channels"

Aug 2015 *Young Researchers in Mathematics*, University of Oxford, UK
Title: "Second Order Asymptotics in Quantum Information Theory: Quantum Source Coding"

Jul 2015 *Beyond I.I.D. in Information Theory*, Banff, Canada
Title: "Strong converse theorems using Rényi entropies"

Aug 2014 *QUTE-Europe Summer School*, Smolenice, Slovakia
Title: "Source coding for a mixed source: determination of second order asymptotics"

Poster presentations

Feb 2019 *Southwest Quantum Information and Technology*, Albuquerque, USA
Title: "Quantum codes from neural networks"

Jan 2019 *Quantum Information Processing*, Boulder, USA
Title: "Quantum codes from neural networks"

Jul 2018 *Beyond I.I.D. in Information Theory*, Cambridge, UK
Title: "Port-based teleportation in arbitrary dimension – asymptotics and a converse bound"

Jan 2018 *Quantum Information Processing*, Delft, Netherlands
Title: "Bounds on quantum channel capacities from approximate additivity of channel information quantities"
Title: "Quantum and private capacities of low-noise channels"

Jan 2017 *Quantum Information Processing*, Seattle, USA
Title: "Degradable states and one-way entanglement distillation"

Jul 2016 *Beyond I.I.D. in Information Theory*, Barcelona, Spain
Title: "Degradable states: Upper bounds on one-way distillable entanglement and quantum capacity"

Jan 2016 *Quantum Information Processing*, Banff, Canada
Title: "Strong converse theorems using Rényi entropies"

Feb 2014 *Quantum Information Processing*, Barcelona, Spain
Title: "A limit of the quantum Rényi divergence"

Seminar talks

Feb 2020 *IQC Seminar*, IQC, University of Waterloo, Canada
Title: "Error thresholds for arbitrary Pauli noise"

Nov 2019 *QuICS Seminar*, QuICS, University of Maryland, USA
Title: "Playing games with multiple access channels"

Sep 2019 *QUIST Seminar*, University of Illinois Urbana-Champaign, USA
Title: "Symmetries and asymptotics of port-based teleportation"

Mar 2019 *Machine Learning for Quantum Many-Body Physics*, KITP, University of California Santa Barbara, USA
Title: "Quantum codes from neural networks"

Nov 2018 *CQIF group seminar*, University of Cambridge, UK
Title: "Asymptotic performance of port-based teleportation"

Sep 2018 *IQOQI Seminar*, Austrian Academy of Sciences & University of Vienna, Austria
Title: "Dephrasure channel and superadditivity of coherent information"

Jun 2018 *Stanford University Seminar*, Stanford University, USA
Title: "Dephrasure channel and superadditivity of coherent information"

May 2018 *MIT Seminar*, Massachussetts Institute of Technology, USA
Title: "Asymptotic performance of port-based teleportation"

May 2018 *PI Seminar*, Perimeter Institute for Theoretical Physics, Canada
Title: "Asymptotic performance of port-based teleportation"

Jan 2018 *QuSoft Seminar*, QuSoft, University of Amsterdam, Netherlands
Title: "Useful states and entanglement distillation, and a toy channel exhibiting superadditivity of coherent information"

Nov 2017 *Hunter College group seminar*, City University of New York, USA
Title: "Bounds on quantum channel capacities from approximate additivity of channel information quantities"

Sep 2017 *Analysis in Quantum Information Theory: Junior research seminar*, IHP, Paris, France

	Title: "Bounds on quantum channel capacities from approximate additivity of channel information quantities"
Jul 2017	*IQI Seminar*, Caltech, USA Title: "Useful states and entanglement distillation"
May 2017	*LSU group seminar*, Louisiana State University, USA Title: "On the quantum capacity of the qubit depolarizing channel"
May 2017	*LSU group seminar*, Louisiana State University, USA Title: "Relative entropies and their use in quantum information theory"
Apr 2017	*CTQM seminar*, University of Colorado Boulder, USA Title: "Upper bounds on the one-way and two-way distillable entanglement from suitable convex decompositions"
Apr 2017	*CQIF group seminar*, University of Cambridge, UK Title: "On the quantum capacity of the qubit depolarizing channel"
Feb 2016	*CAKE seminar*, University of Cambridge, UK Title: "Equality condition in the data processing inequality for the quantum relative entropy"
Jan 2016	IBM Thomas J. Watson Research Center, Yorktown Heights, USA Title: "Strong converse theorems using Rényi entropies"

Academic service

Jan 2018 – Jan 2019	Organizer of the conference *Quantum Information Processing (QIP) 2019* held at University of Colorado Boulder, USA, January 14-18, 2019. Co-organizer: Graeme Smith. Website: http://jila.colorado.edu/qip2019
Nov 2017 – Jun 2018	Organizer of the workshop *Rocky Mountain Summit on Quantum Information* held at JILA, University of Colorado Boulder, USA, June 25-29, 2019. Co-organizers: Graeme Smith, Mark M. Wilde. Website: http://jila.colorado.edu/rmsqi
April 2018	Member of program committee for conference *CEQIP 2018*. Website: http://ceqip.eu/2018/index.php
Oct 2013 – present	Reviewing for: *IEEE Transactions on Information Theory*, *Physical Review Letters*, *Physical Review A*, *Communications in Mathematical Physics*, *Journal of Mathematical Physics*, *Quantum Information Processing*, *Nature Communications*, *npj Quantum Information*, *New Journal of Physics*, *Quantum*, various conferences (*ISIT*, *ITW*, *QIP*, *TQC*, *AQIS*, *CEQIP*)
Oct 2014 – Jun 2015	Vice-President of the post-graduate community (MCR) of Girton College, University of Cambridge
Oct 2013 – Jun 2014	Social Secretary of the post-graduate community (MCR) of Girton College, University of Cambridge

Language & IT skills

Languages	German (native), English (fluent), Spanish (conversational), Latin (translation)
IT	Matlab, Mathematica, Python, HTML, CSS, Linux, LaTeX, Office applications

Interests

Music, playing guitar, reading, playing football, running, traveling

References

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