Curriculum Vitae

Personal and Contact Information

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Professional History

August 2024 – ongoing	**Assistant Professor of Mathematical Physics** at the Department of Mathematics at Virginia Tech in Blacksburg, USA
July 2020 – July 2024	**Independent research fellow and lecturer** at the Institute of Mathematics of the University of Zurich (UZH) financed by an **Ambizione grant** of the Swiss National Science Foundation (SNSF)
Oct. 2019 – June 2020	**Marie Skłodowska-Curie individual fellow** at the Institute of Mathematics of the University of Zurich (UZH) in the group of Prof. Dr. Benjamin Schlein
Oct. 2016 – Sept. 2019	**Post-doc** at the Institute of Science and Technology Austria (ISTA) in the group of Prof. Dr. Robert Seiringer

Education

March 2012 – Sept. 2016	**Doctoral Studies in Mathematics** at the University of Tübingen under the supervision of Prof. Dr. Christian Hainzl within the framework of the Graduiertenkolleg 1838 (Spectral Theory and the Dynamics of Quantum Systems)
Apr. 2002 – Dec. 2010	**Studies of Physics** at the University of Heidelberg (Grade point average 1.0, with distinction)
July 2007 – July 2010	**Absence from Studies** due to illness (fully recovered)
Jan. 2005 – June 2005	**Studies in Mathematics** at the University of Orsay, Paris 11 (Erasmus program)

Grants

Awarded 2026	**Analysis Grant from the National Science Foundation**, 200 000 USD, 3 years, Funding period: July 2026 – July 2029.
2022, 2023	I was admitted to the second (final) round for an **ERC Starting Grant**.
Awarded 2019	**Marie Skłodowska-Curie Individual Fellowship**, $\sim$ 203 000 €, 2 years, Effective funding period: October 2019 – June 2020.
Awarded 2019	**Ambizione Fellowship of the Swiss National Science Foundation**, $\sim$ 551 000 CHF, 4 years, fundin period: July 2020 – July 2024.

Teaching Experience

Fall term 2026	**Real Analysis** at Virginia Tech
Spring term 2026	**Matrix Theory** at Virginia Tech
Fall term 2025	**Functional analysis** at Virginia Tech
Fall term 2024	**Fourier series and partial differential equations** at Virginia Tech
Spring term 2023	**Introduction to the statistical mechanics of lattice systems** at University of Zurich
Spring term 2022	**Variational methods in analysis** at University of Zurich (joint with Alessandro Olgiati)
Spring term 2021	**Mathematical statistical mechanics** at University of Zurich
Spring term 2020	**The mathematics of dilute quantum gases** at University of Zurich
Spring term 2016	**Repetitorium analysis 2** at University of Tübingen
Fall term 2015/16	**Repetitorium analysis 1** at University of Tübingen
2012 – 2015	**Teaching assistant** for various lectures and one seminar including Probability theory, Calculus of variations, Mathematical quantum mechanics, Mathematics for physicists I–III at University of Tübingen.

Lecture Series at Winter School

I gave an invited lecture series (4×75 min) on mathematical aspects of the BCS theory of superconductivity at the Winter School of the SFB TRR 352 Mathematics of Many-Body Quantum Systems and Their Collective Phenomena (Kochl am See, 18.–22.03.2024).

Supervision Experience

Supervision of Undergraduate Researchers

05/15/2025–ongoing	**Supervision of undergraduate physics researcher**: Benjamin Denson (3rd year physics student).

Supervision of Master Students

08/25/2025–June 2026	**Supervision of mathematics Master student**: Xuanyu Li.
02/01/2021–01/19/2022	**Supervision of mathematics Master student**: David Stocker.

Supervision of PhD Students

08/25/2026–ongoing	**Supervision of mathematics PhD student**: Xuanyu Li (joint with official supervisor Alexander Elgart)
08/25/2025–ongoing	**Supervision of mathematics PhD student**: Drake Woosley
08/25/2025–ongoing	**Supervision of mathematics PhD student**: Amitabha Roy

Assisted Supervision of PhD Students

02/01/2021–11/08/2023	**Assisted supervision of mathematics PhD student**: Marco Caporaletti, PhD supervisor: Prof. Dr. Benjamin Schlein.
02/01/2020–09/07/2022	**Assisted supervision of mathematics PhD student**: Marcel Maier (born Schaub), PhD supervisor: Prof. Dr. Christian Hainzl.
10/01/2018–11/30/2019	**Assisted supervision of physics PhD student**: Xiang Li, PhD supervisor: Prof. Dr. Mikhail Lemeshko.
12/01/2017–09/30/2019	**Assisted supervision of mathematics PhD student**: Simon Mayer, PhD supervisor: Prof. Dr. Robert Seiringer.

Referee and Review Activity

Inventiones Mathematicae, Probability and Mathematical Physics, Analysis and PDE, Forum of Mathematics Sigma, Calculus of Variations and PDE, SIAM Journal of Mathematical Analysis, Journal of Spectral Theory, Transactions of the American Mathematical Society, Annales Henri Poincaré, Nonlinearity, Journal of Statistical Physics, Journal of Mathematical Physics; Mathematical Physics, Analysis and Geometry; Reviews in Mathematical Physics, Mathematical Modelling and Analysis, Journal of Applied Physics, Journal of Statistical Physics: Theory and Experiment (JSTAT), Applied Physics Letters, Journal of Low Temperature Physics, Journal of Physics B, Zeitschrift für Naturforschung A, Scientific Reports, Springer Proceedings Series, MathSciNet (August 2020 – February 2024), zbMATH (May 2020 – February 2024).

Organization of Scientific Events

- Together with Tobias Ried (Georgia Tech) I organized a special session on Mathematical Physics, Nonlinear Partial Differential Equations, and Optimal Transportation at the AMS Fall Eastern Sectional Meeting hosted by George Washington University, Washington, DC on October 3-4, 2026.
- Together with Guher Camliyurt I organized a session on nonlinear PDEs and their microscopic derivation at the Southeastern Sectional Meeting of the AMS at Clemson University on March 8th–9th in 2025.
- I co-organized the summer school Current Topics in Mathematical Physics that took place in Zurich from July 19 to July 23 in 2021 (prior to the International Congress on Mathematical Physics in Geneva).

Participation in long programs

In the period March 31st – May 23rd in 2025 I participated as a Senior Fellow in the Spring Program Non-commutaive Optimal Transport at the Institute for Pure and Applied Mathematics (IPAM).

Talks at Conferences and Research Seminars and Poster Contributions

- Introduction to mathematical BCS theory, Mathematical Challenges in Quantum Mechanics - PhD Lecture (online lecture), (invited talk, 11/04/2026)
- The Gibbs state of the mean-field Bose gas, Operator Theory and Quantum Physics, Bedlewo, Poland (invited talk, 06/17/2026)
- The Gibbs state of the weakly interacting Bose gas, full counting statistics, and effective field theory, PDE Seminar, Penn State, State College (invited talk, 04/15/2026)
- The Gibbs state of the mean-field Bose gas, Probability and Statistical Mechanics at the Joint Mathematics Meeting (JMM) in Washington DC (contributed talk, 01/07/2026)
- Dynamics and equilibrium states of infinite systems of lattice bosons, Emergent phenomena in many-body quantum systems, CIRM in Marseille (invited talk, 12/11/2025)
- Recent Developments in the analysis of Bose gases at positive temperature, Quantum Many-body Systems and Bose-Einstein Condensation: A Mathematical Physics Perspective at the Erwin Schrödinger Institute in Vienna (invited talk, 11/24/2025)
- The Gibbs state of the mean-field Bose gas, Many-body Systems and their Effective Equations at the SIAM Conference on Analysis of Partial Differential Equations (PD25) held in Pittsburg (invited talk, 11/19/2025)
- The Gibbs state of the mean-field Bose gas, Mathematical Physics and Analysis Seminar, Institute of Science and Technology Austria (ISTA), Klosterneuburg (invited talk, 06/10/2025)
- The Gibbs state of the mean-field Bose gas, One world mathematical physics seminar of the International Association of Mathematical Physics (IAMP), online, video available here (invited talk, 04/15/2025)
- The Gibbs state of the mean-field Bose gas, Workshop I: Optimal Transport for Density Operators: Theory and Numerics, Part of the Long Program Non-commutative Optimal Transport, Institute of Pure and Applied Mathematics (IPAM), Los Angeles, video available here (invited talk, 04/03/2025)
- The Gibbs state of the mean-field Bose gas, Geometry and Topology Seminar, Virginia Tech, Blacksburg (local talk, 02/25/2025)
- The Gibbs state of the mean-field Bose gas and a new correlation inequality, Mathematical Physics Seminar, Georgia Tech, Atlanta (invited talk, 12/06/2024)
- The Gibbs state of the mean-field Bose gas, Analysis and Mathematical Physics Seminar, Virginia Tech, Blacksburg (local talk, 11/06/2024)
- Microscopic Derivation of GinzburgLandau Theory and the BCS Critical Temperature Shift in general external fields, European Congress of Mathematics (ECM), Sevilla (invited talk, 07/16/2024)

- Condensate fluctuations and Bogoliubov theory in a weakly interacting Bose gas at positive temperature, International Congress of Mathematical Physics (ICMP), Strasbourg (contributed talk, 07/04/2024)
- Upper bound for the grand canonical free energy of the Bose gas in the Gross-Pitaevskii limit for general interaction potentials, Mathematical Physics and Analysis Seminar, Institute of Science and Technology Austria (ISTA), Klosterneuburg (invited talk, 02/13/2024)
- The mathematics of dilute Bose gases at positive temperature, Department of Mathematics, University of Ottawa, Ottawa (invited talk, 01/17/2024)
- The mathematics of dilute Bose gases at positive temperature, Department of Mathematics, Virginia Tech, Blacksburg (invited talk, 01/08/2024)
- Upper bound for the grand canonical free energy of the Bose gas in the Gross-Pitaevskii limit, Quantum and Dynamical Christmas, Milan (invited talk, 12/22/2023)
- The mathematics of dilute Bose gases at positive temperature, Department of Mathematics, University of Houston, Houston (invited talk, 12/13/2023)
- Upper bound for the grand canonical free energy of the Bose gas in the Gross-Pitaevskii limit, Workshop on Many-Body Quantum Systems, Oberwolfach (invited talk, 09/12/2023)
- Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in general external fields, Itinerant Quantum Math Meetings, Università degli Studi di Milano (invited talk, 06/05/2023)
- Upper bound for the grand canonical free energy of the Bose gas in the Gross-Pitaevskii limit, Calculus of Variations and Applications Seminar, Institute of Mathematics, LMU Munich (invited talk, 05/31/2023)
- The free energy of the two-dimensional dilute Bose gas, Exact Results in Quantum Theory and Gravity, University of Warsaw, Faculty of Physics (invited talk, 11/04/2022)
- Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in a weak homogeneous magnetic field, Theory of Duality Seminar, University of Warsaw, Faculty of Physics (invited talk, 11/03/2022)
- Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in a weak homogeneous magnetic field, Applied analysis and PDE section, DMV meeting, Berlin (contributed talk, 09/14/2022)
- The dynamics of weakly interacting trapped Bose gases at positive temperature, Mathematical analysis of complex quantum systems, Miniworkshop, DMV meeting, Berlin (contributed talk, 09/14/2022)
- The free energy of the two-dimensional dilute Bose gas, DPG meeting of the condensed matter section, Regensburg (contributed talk, 09/05/2022)
- The dynamics of weakly interacting trapped Bose gases at positive temperature, Mathematical results of many-body quantum systems, Herrsching (invited talk, 06/08/2022)
- Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in a weak homogeneous magnetic field, Workshop on Semiclassical Analysis, Quantum Field Theory and Nonlinear PDE, Politecnico di Milano (contributed talk, 05/26/2022)

- Dilute Bose gases at Positive Temperature, Mathematics Colloquium, University of Fribourg, (invited talk, 05/17/2022)
- The free energy of the two-dimensional dilute Bose gas, DPG Spring meeting, Heidelberg (contributed talk, 03/22/2022)
- The dynamics of weakly interacting trapped Bose gases at positive temperature, Workshop on Many-Body Quantum Mechanics, Quantum Statistical Mechanics and Open Quantum Systems, Politecnico di Milano (contributed talk, 03/08/2022)
- Semiclassical approximation and critical temperature shift for weakly interacting trapped bosons, Calculus of Variations and Applications Seminar, Institute of Mathematics, LMU Munich (invited talk, 12/08/2021)
- Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in a weak homogeneous magnetic field, PDE and Mathematical Physics Seminar, Institute of Mathematics, University of Zurich (local talk, 11/04/2021)
- Semiclassical approximation and critical temperature shift for weakly interacting trapped bosons, Analysis and Applied Mathematics Seminar, Institute of Mathematics, University of Toronto (invited talk, 03/12/21)
- The free energy of the two-dimensional dilute Bose gas, Calculus of Variations and Applications Seminar, Institute of Mathematics, LMU Munich (invited talk, 02/05/2020)
- The free energy of the two-dimensional dilute Bose gas, PDE and Mathematical Physics Seminar, Institute of Mathematics, University of Zurich (local talk, 10/24/2019)
- Gross–Pitaevskii limit of a homogeneous Bose gas at positive temperature, Workshop on Many-Body Quantum Systems, Oberwolfach (invited talk, 09/11/2019)
- Gross–Pitaevskii limit of a homogeneous Bose gas at positive temperature, QMath 14, Aarhus University (contributed talk, 08/13/2019)
- Gross–Pitaevskii limit of a homogeneous Bose gas at positive temperature, Workshop on Mathematical Physics, Karlsruhe Institute of Technology (invited talk, 04/11/2019)
- Gross–Pitaevskii limit of a homogeneous Bose gas at positive temperature, Mathematical Physics Seminar, Institute of Science and Technology Austria (local talk, 02/19/2019)
- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Journal Club of the Atom Chip Group, University of Vienna (invited talk, 10/23/2018)
- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Mathematical Physics Seminar, University of Grenoble (invited talk, 10/15/2018)
- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Equilibrium Statistical mechanics Session, ICMP 2018 in Montreal (contributed talk, 07/27/2018)
- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Mathematical Physics Seminar, University of Stuttgart (invited talk, 06/22/2018)
- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Mathematical Physics Seminar, University of Tübingen (invited talk, 05/14/2018)

- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Mathematical Physics Seminar, Institute of Science and Technology Austria (local talk, 03/20/2018)
- Bose–Einstein condensation in a dilute, trapped gas at positive temperature, Mathematical Challenges in Quantum Mechanics, Rome, Italy (contributed talk, 02/20/2018)
- Lower bound for the BCS functional with boundary conditions at infinity, Master Class on Exotic Phases of Quantum Matter, Copenhagen, Denmark (contributed Poster, 05/17/2017)
- Lower bound for the BCS functional with boundary conditions at infinity, Spectral Days, Stuttgart, Germany (contributed poster, 04/05/2017)
- A generalized relative entropy and a BCS functional without artificial boundary conditions, IST Austria, Austria (local talk, 10/25/2016)
- Note on a family of monotone quantum relative entropies, Young Researcher Symposium prior to ICMP, Santiago de Chile, Chile (contributed talk, 07/24/2015)
- Some remarks on a family of monotone quantum relative entropies defined by Mathieu Lewin and Julien Sabin, Stuttgart–Tübingen Doktorandenseminar, Stuttgart, Germany (local talk, 01/23/2015)
- The BCS functional and its connection to Ginzburg–Landau theory, Summer School on Mathematical Physics, Analysis and Stochastics, Heidelberg, Germany (contributed talk, 07/23/2014)
- The lower boundedness of the BCS functional in infinite space, Stuttgart–Tübingen Doktorandenseminar, Stuttgart, Germany (local talk, 07/14/2014)
- The BCS functional and its connection to the Ginzburg–Landau functional, Stuttgart–Tübingen Doktorandenseminar, Tübingen, Germany (local talk, 05/10/2013)

Language Skills

German (mother tongue), English (fluent), French (advanced knowledge)

List of publications

The authors of the articles that appeared in mathematical journals and the mathematics preprints (items no. 1–12, 14, 15, 17 and 19–21) are, as usual, listed in alphabetical order. In the case of publications in physics journals (items no. 13, 16, 18 and 22), the order matters. The first author prepared the manuscript, the last author led the project, all other authors contributed important ideas.

My five most relevant contributions are, in my opinion, items no. 1, 6, 11, 15, and 17.

Published research articles and preprints

1. (**A. Deuchert**, Marcin Napiórkowski, Błażej Ruba), **Random field approximation and local counting statistics for the weakly interacting thermal Bose gas**, preprint (2026), 54 pages.
arXiv:2609.12804 [math-ph]

2. (**A. Deuchert**, Xuanyu Li), **Large Deviations for the Bose–Einstein Condensate of the Ideal Gas in the Canonical Ensemble**, preprint (2026), 27 pages.
arXiv:2608.26378 [math-ph]

3. (Giulia Basti, Chiara Boccato, Serene Cenatiempo, **A. Deuchert**), **A new upper bound on the specific free energy of dilute Bose gases**, preprint (2025), 83 pages.
arXiv:2507.20877 [math-ph]

4. (**A. Deuchert**, Jonas Lampart and Marius Lemm), **Dynamics and equilibrium states of infinite systems of lattice bosons**, preprint (2025), 27 pages.
arXiv:2505.13170 [math-ph]

5. (**A. Deuchert**, Phan Thành Nam and Marcin Napiórkowski), **A note on spontaneous symmetry breaking in the mean-field Bose gas**, Letters in Mathematical Physics **115**, 111, (2025), 33 pages.
arXiv:2501.19402 [math-ph], doi.org/10.1007/s11005-025-01996-z.

6. (**A. Deuchert**, Phan Thành Nam and Marcin Napiórkowski) **The Gibbs state of the mean-field Bose gas**, preprint (2025), 102 pages.
arXiv:2501.19396 [math-ph].

7. (M. Caporaletti and **A. Deuchert**) **Upper bound for the grand canonical free energy of the Bose gas in the Gross–Pitaevskii limit for general interaction potentials**, Annales Henri Poincaré (online first, 2024), 61 pages.
arXiv:2310.12314 [math-ph], doi.org/10.1007/s00023-024-01505-3.

8. (C. Boccato, **A. Deuchert** and D. Stocker) **Upper bound for the grand canonical free energy of the Bose gas in the Gross–Pitaevskii limit**, SIAM Journal on Mathematical Analysis **56**, No. 2, 2611-2660 (2024), 50 pages.
arXiv:2305.19173 [math-ph], doi.org/10.1137/23M1580930.

9. (**A. Deuchert**, C. Hainzl and M. Maier) **Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in general external fields**, Calculus of Variations and PDE **62**, 203 (2023), 81 pages.
arXiv:2210.09356 [math-ph],doi.org/10.1007/s00526-023-02539-x.

10. (M. Caporaletti, **A. Deuchert** and B. Schlein), **Dynamics of mean-field bosons at positive temperature**, Annales de l'Institut Henry Poincaré, Analyse Non Linéaire 41, no. 4, pp. 995-1054 (2024), 60 pages.
arXiv:2203.17204 [math-ph], doi.org/10.4171/AIHPC/93.

11. (**A. Deuchert**, C. Hainzl and M. Maier) **Microscopic derivation of GinzburgLandau theory and the BCS critical temperature shift in a weak homogeneous magnetic field**, Probability and Mathematical Physics **4** (1), 1-89, (2023), 91 pages.
arXiv:2105.05623 [math-ph], doi.org/10.2140/pmp.2023.4.1.

12. (**A. Deuchert** and R. Seiringer) **Semiclassical approximation and critical temperature shift for weakly interacting trapped bosons**, Journal of Functional Analysis **281**, Issue 6, 109096 (2021), 74 pages.
arXiv:2009.00992 [math-ph], doi.org/10.1016/j.jfa.2021.109096.

13. (X. Li, E. Yakaboylu, G. Bighin, R. Schmidt, M. Lemeshko and **A. Deuchert**) **Intermolecular forces and correlations mediated by a phonon bath**, Journal of Chemical Physics **152**, 164302 (2020), 13 pages.
arXiv:1912.02658 [cond-mat.mes-hall], doi.org/10.1063/1.5144759.

14. (**A. Deuchert**, S. Mayer and R. Seiringer) **The free energy of the two-dimensional dilute Bose gas. I. Lower bound**, Forum of Mathematics, Sigma **8** (2020), 74 pages.
arXiv:1910.03372 [math-ph], doi.org/10.1017/fms.2020.17.

15. (**A. Deuchert** and R. Seiringer) **Gross–Pitaevskii limit of a homogeneous Bose gas at positive temperature**, Archive for Rational Mechanics and Analysis **236**, 1217-1271 (2020), 55 pages.
arXiv:1901.11363 [math-ph], doi.org/10.1007/s00205-020-01489-4.

16. (E. Yakaboylu, B. Midya, **A. Deuchert**, N. Leopold and M. Lemeshko) **Theory of the rotating polaron: Spectrum and self-localization**, Physical Review B **98**, 224506 (2018), 11 pages.
arXiv:1809.01204 [cond-mat.quant-gas], doi.org/10.1103/PhysRevB.98.224506.

17. (**A. Deuchert**, R. Seiringer and J. Yngvason) **Bose–Einstein condensation in a dilute, trapped gas at positive temperature**, Communications in Mathematical Physics **368**, 723-776 (2019), 54 pages.
arXiv:1803.05180 [math-ph], doi.org/10.1007/s00220-018-3239-0.

18. (E. Yakaboylu, **A. Deuchert** and M. Lemeshko) **Emergence of non-abelian magnetic monopoles in a quantum impurity problem**, Physical Review Letters **119**, 235301 (2017), 6 pages.
arXiv:1705.05162 [cond-mat.quant-gas], doi.org/10.1103.

19. (**A. Deuchert**) **A lower bound for the BCS functional with boundary conditions at infinity**, Journal of Mathematical Physics **58**, 081901 (2017), 21 pages.
arXiv:1703.04616 [math-ph], doi.org/10.1063/1.4996580.

20. (**A. Deuchert**, A. Geisinger, C. Hainzl and M. Loss) **Persistence of translational symmetry in the BCS model with radial pair interaction**, Annales Henri Poincaré **19**, 1507 (2018), 21 pages.
arXiv:1612.03303 [math-ph], doi.org/10.1007.

21. (**A. Deuchert**, C. Hainzl and R. Seiringer) **Note on a Family of Monotone Quantum Relative Entropies**, Letters in Mathematical Physics **105**, 1449-1466 (2015), 18 pages.
arXiv:1502.07205 [math-ph], doi.org/10.1007/s11005-015-0787-5.

22. (**A. Deuchert**, K. Sakmann, A. I. Streltsov, O. E. Alon and L. S. Cederbaum) **Dynamics and symmetries of a repulsively bound atom pair in an infinite optical lattice**, Physical Review A **86**, 013618 (2012), 11 pages.
arXiv:1202.4111 [cond-mat.quant-gas], doi.org/10.1103/PhysRevA.86.013618.

Press coverage

Publication no. 16 has been covered in e.g. (english) Gizmodo, Phys.org, (german) Der Standard.

Oberwolfach reports

1. Three page summary of publication no. 6 that has been prepared for the report of the “Workshop on Many-Body Quantum Systems” in Oberwolfach in September 2023.
2. Three page summary of publication no. 13 that has been prepared for the report of the “Workshop on Many-Body Quantum Systems” in Oberwolfach in September 2019.