

Curriculum Vitæ

1. Basic information

1.1. Name

Dr. Konstantin Antonios Leo Merz

1.2. Date and place of birth

10 December 1991 in Munich, Germany

1.3. Gender

male

1.4. Workplace address, email address, and phone number

Swiss Federal Institute of Technology Zurich (ETH Zurich)

Institute for Theoretical Physics

Wolfgang–Pauli-Strasse 27

8093 Zurich

Switzerland

email address: k.merz@phys.ethz.ch, k.merz@tu-bs.de

Phone number: 0041 78 347 0693

1.5. Current employment

Since 10/2025: Established Researcher in the group of Prof. Dr. Gian Michele Graf at ETH Zurich.

1.6. Previous employment

- 10/2024 – 09/2025: Administrator of the W2 Professorship for Differential Equations at TU Braunschweig (comparable to associate professorship).
- 04/2024 – 09/2024 (currently on leave): Assistant Professor (fixed-term; Akademischer Rat, Beamtenverhältnis auf Zeit) at Institute of Analysis and Algebra at TU Braunschweig.
- 10/2019 – 03/2024: Postdoctoral researcher in the group of Prof. Dr. Volker Bach at Institute of Analysis and Algebra at TU Braunschweig.
- 10/2022 – 09/2023: Visiting postdoctoral researcher in the group of Prof. Haruya Mizutani at Osaka University.
- 10/2016 – 09/2019: Research assistant (PhD student), directed by Prof. Dr. Heinz Siedentop at Department of Mathematics at Ludwig Maximilian University Munich.

1.7. Higher education degrees

- 11/2024: Habilitation (venia legendi) in Mathematics, TU Braunschweig.
 - Thesis title: On Eigenvalue and Functional Inequalities for Schrödinger-type Operators
 - Mentor: Prof. Dr. Volker Bach
 - Title conferred: Privatdozent (PD)
- 07/2019: Dr. rer. nat. in Mathematics, Ludwig Maximilian University Munich.
 - Thesis title: Über die Grundzustandsdichte relativistischer Coulomb-Systeme (Translation: On the Ground State Density of Relativistic Coulomb Systems)

- Advisor: Prof. Dr. Heinz Siedentop
- Completion of the graduate training program at the International Max Planck Research School for Quantum Science and Technology
- 08/2016: M.Sc. in Physics, Ludwig Maximilian University Munich.
 - Thesis title: On the Ground State Energy of Two-Dimensional Coulomb Systems
 - Advisor: Prof. Dr. Heinz Siedentop
- 04/2014: B.Sc. in Physics, Ludwig Maximilian University Munich.
 - Thesis title: Stochastic Quantization in Quantum Mechanics
 - Advisor: Prof. Dr. Dieter Lüst

1.8. Languages

- German (native)
- English (fluent)
- French (basic knowledge, five years in high school)
- Japanese (basic knowledge, one-semester course, levels A1.1 & A1.2)

2. Research qualifications

2.1. Research interests

Analysis, mathematical physics, and spectral theory, in particular

- Functional inequalities and heat kernel estimates for fractional Schrödinger operators
- Eigenvalue and eigenfunction bounds and asymptotics for both self-adjoint and non-self-adjoint Schrödinger operators
- Derivation and analysis of effective theories for many-body quantum systems

2.2. Funding received

- (1) DFG (German Research Foundation) Sachbeihilfe (Individual Research Grant) to employ a PhD student at TU Braunschweig for 36 months.
Sole principal investigator.
Amount awarded: $\approx 239,000$ EUR.
- (2) DAAD (German Academic Exchange Service) PRIME (Postdoctoral Researchers International Mobility Experience) grant for an 18-month postdoc at Osaka University (12 months) and TU Braunschweig (six months) (10/2022 – 03/2024).
Sole principal investigator.
Amount awarded: 18-month employment contract at TU Braunschweig according to pay scale TV-L EG 13 ($\approx 92,000$ EUR pre-tax), expatriate allowance for the stay abroad ($\approx 33,300$ EUR, untaxed), lump sum travel allowance (1,700 EUR). Total amount $\approx 127,000$ EUR.

2.3. Publication list (reverse chronological order)

2.3.1. Referee-reviewed articles in international journals

- (1) K. Bogdan and K. Merz. Heat kernel bounds for the fractional Laplacian with Hardy potential in angular momentum channels, 38 pages. To appear in *Ann. Henri Poincaré*.
Preprint at arXiv 2506.08115.

- (2) R. L. Frank and K. Merz. Sharp upper bounds for the density of relativistic atoms: Noninteracting case, 29 pages. To appear in *Pure Appl. Funct. Anal.*
Preprint at arXiv 2604.04010.
- (3) T. A. Bui and K. Merz. Equivalence of Sobolev norms in Lebesgue spaces for Hardy operators in a half-space. *Math. Ann.* **395** (2026), paper number 28, 52 pages.
doi: 10.1007/s00208-026-03439-z
Preprint at arXiv 2309.02928.
- (4) T. A. Bui, X. T. Duong, and K. Merz. Equivalence of Sobolev norms for Kolmogorov operators with scaling-critical drift. *Nonlinearity* **39** (2026), no. 1, paper number 015021, 47 pages.
doi: 10.1088/1361-6544/ae277a
Preprint at arXiv 2410.00191.
- (5) J.-C. Cuenin and K. Merz. Random Schrödinger operators with complex decaying potentials. *Anal. PDE* **18** (2025), no. 2, 279–306.
doi: 10.2140/apde.2025.18.279
Preprint at arXiv 2201.04466.
- (6) K. Bogdan and K. Merz. Subordinated Bessel heat kernels. *Theory Probab. Math. Statist.* **112** (2025), 67–83.
doi: 10.1090/tpms/1227
Preprint at arXiv 2308.15026.
- (7) K. Bogdan and K. Merz. Ground state representation for the fractional Laplacian with Hardy potential in angular momentum channels. *J. Math. Pures Appl. (9)*. **186** (2024), 176–204.
doi: 10.1016/j.matpur.2024.04.003
Preprint at arXiv 2305.00881.
- (8) R. L. Frank, K. Merz, and H. Siedentop. The Scott conjecture for large Coulomb systems: a review. *Lett. Math. Phys.* **113** (2023), no. 1, paper number 11, 79 pages.
doi: 10.1007/s11005-023-01631-9
Preprint at arXiv 2204.10081.
- (9) R. L. Frank and K. Merz. On Sobolev norms involving Hardy operators in a half-space. *J. Funct. Anal.* **285** (2023), no. 10, paper number 110104, 54 pages.
doi: 10.1016/j.jfa.2023.110104
Preprint at arXiv 2303.05348.
- (10) J.-C. Cuenin and K. Merz. Lieb–Thirring-type inequalities for random Schrödinger operators with complex potentials, 14 pages. To appear in *RIMS Kôkyûroku Bessatsu*.
Preprint at arXiv 2308.08889 (2023). Acceptance letter attached.
- (11) K. Merz and H. Siedentop. Proof of the strong Scott conjecture for heavy atoms: the Furry picture. *Ann. H. Lebesgue* **5** (2022), 611–642.
doi: 10.5802/ahl.131
Preprint at arXiv 2007.03895.
- (12) K. Merz. On complex-time heat kernels of fractional Schrödinger operators via Phragmén–Lindelöf principle. *J. Evol. Equ.* **22** (2022), no. 3, paper number 62, 30 pages.
doi: 10.1007/s00028-022-00819-1
Preprint at arXiv 2107.10228.
- (13) J.-C. Cuenin and K. Merz. Weak coupling limit for Schrödinger-type operators with degenerate kinetic energy for a large class of potentials. *Lett. Math. Phys.* **111** (2021), no. 2, paper number

46, 29 pages.

doi: 10.1007/s11005-021-01385-2

Preprint at arXiv 2006.07110.

- (14) R. L. Frank, K. Merz, and H. Siedentop. Equivalence of Sobolev norms involving generalized Hardy operators. *Int. Math. Res. Not.* **2021** (2021), no. 3, 2284–2303.
doi: 10.1093/imrn/rnz135
Preprint at arXiv 1807.09027.
- (15) K. Merz. On scales of Sobolev spaces associated to generalized Hardy operators. *Math. Z.* **299** (2021), no. 1, 101–121.
doi: 10.1007/s00209-020-02651-0
Preprint at arXiv 1904.07614.
- (16) R. L. Frank, K. Merz, H. Siedentop, and B. Simon. Proof of the strong Scott conjecture for Chandrasekhar atoms. *Pure Appl. Funct. Anal.* **5** (2020), no. 6, 1319–1356.
URL: <http://www.yokohamapublishers.jp/online2/oppafa/vol5/p1319.html>
Preprint at arXiv 1907.04894.
- (17) K. Merz and H. Siedentop. The atomic density on the Thomas–Fermi length scale for the Chandrasekhar Hamiltonian. *Rep. Math. Phys.* **83** (2019), no. 3, 387–391.
doi: 10.1016/S0034-4877(19)30057-6
Preprint at arXiv 1810.00632.

2.3.2. Publications in peer-reviewed book series (appeared or accepted)

- (1) J.-C. Cuenin and K. Merz. On the number and sums of eigenvalues of Schrödinger-type operators with degenerate kinetic energy. In: *From Complex Analysis to Operator Theory: A Panorama: In Memory of Sergey Naboko*, M. Brown, F. Gesztesy, P. Kurasov, A. Laptev, B. Simon, G. Stolz, and I. Wood, *Operator Theory: Advances and Applications* **291**, 313–340, Birkhäuser, Cham, 2023.
doi: 10.1007/978-3-031-31139-0_13
Preprint at arXiv 2202.05212.
- (2) R. L. Frank, K. Merz, and H. Siedentop. Relativistic strong Scott conjecture: a short proof. In: *Density Functionals for Many-Particle Systems. Mathematical Theory and Physical Applications of Effective Equations*, B.-G. Englert, H. Siedentop, and M.-I. Trappe (eds.), *Lect. Notes Ser. Inst. Math. Sci. Natl. Univ. Singap.* **41**, 69–79, World Scientific, Singapore, 2023.
doi: 10.1142/9789811272158_0003
Preprint at arXiv 2009.02474.

2.3.3. Preprints

- (1) J.-C. Cuenin, K. Merz, and E. Stefanescu. Random Schrödinger operators on manifolds and abstract bounds for multiplier-type operators, 33 pages (arXiv 2606.19075). Submitted.
- (2) K. Bogdan and K. Merz. Heat kernel bounds for the fractional Laplacian with Hardy potential in angular momentum channels, 38 pages (arXiv 2506.08115). Submitted.

2.4. Longer visits

- (1) Visiting Professor at Tokyo University of Science, Tokyo (four weeks in 04/2026 – 05/2026)

- (2) School of Mathematical and Physical Sciences at Macquarie University, Sydney (two weeks in 02/2025)
- (3) Faculty of Pure and Applied Mathematics at Wroclaw University of Science and Technology (one week in 11/2023)
- (4) Department of Mathematical Sciences at Loughborough University (two weeks in 08/2023)
- (5) Faculty of Pure and Applied Mathematics at Wroclaw University of Science and Technology (one week in 03/2023)
- (6) Mathematisches Forschungsinstitut Oberwolfach during the workshop “The Renormalization Group” (one week in 07/2022)
- (7) Institute for Mathematical Sciences at the National University of Singapore during the program “Density Functionals for Many-Particle Systems: Mathematical Theory and Physical Applications of Effective Equations” (four weeks in 09/2019)
- (8) Institut Mittag-Leffler (Stockholm) during the program “Spectral Methods in Mathematical Physics” (one week in 04/2019)

2.5. Talks at conferences, workshops, seminars, etc.

2.5.1. Invited conference and workshop talks

- (1) *Random Schrödinger operators on manifolds*, Conference “Operator Theory in Quantum Physics – OTQP” (06/2026)
- (2) *Random Schrödinger operators on manifolds*, Conference “Recent developments in mathematical physics and related fields” (05/2026)
- (3) *Random Schrödinger operators on manifolds*, ICMC Summer Meeting on Differential Equations at Universidade de São Paulo (02/2026)
- (4) *Hardy perturbations of subordinated Bessel heat kernels with applications to relativistic atomic physics*, Joint ÖMG and DMV annual meeting, Linz (09/2025)
- (5) *Lieb–Thirring inequalities for random Schrödinger operators with complex decaying potentials*, “Math4Q (Mathematics for Quantum)” in Merida (Mexico) (08/2025)
- (6) *Electron distribution of relativistic atoms and heat kernel bounds*, “Workshop on spectral geometry, PDEs and mathematical physics” at Fernuniversität Hagen (07/2025)
- (7) *Electron distribution of relativistic atoms and heat kernel bounds*, “IWOTA 2025” at University of Twente (Netherlands) (07/2025)
- (8) *Electron distribution of relativistic atoms and heat kernel bounds*, “Walkshop in Mathematical Physics” at Constructor University Bremen (06/2025)
- (9) *Electron distribution of relativistic atoms and heat kernel bounds*, “International Symposium on Analysis and Quantum Physics” at TSIMF in Sanya (China) (06/2025)
- (10) *Random Schrödinger operators with complex decaying potentials*, “VIASM-IAMP Summer School in Mathematical Physics” in Quy Nhon (Vietnam) (08/2023)
- (11) *Random Schrödinger operators with complex decaying potentials*, symposium “Harmonic Analysis and Nonlinear Partial Differential Equations” at RIMS in Kyoto (07/2023)
- (12) *Hardy operators in angular momentum channels*, conference “Nonlocal Operators and Markov Processes III” in Bedlewo (03/2023)
- (13) *Random Schrödinger operators with complex decaying potentials*, “Himeji Conference on Partial Differential Equations” in Himeji (03/2023)

- (14) *On some functional inequalities for generalized Hardy operators*, conference “The analysis of relativistic quantum systems”, Centre International De Rencontres Mathématiques in Luminy (01/2023)
- (15) *The Scott conjectures for large Coulomb systems*, conference “Mathematical Results of Many-Body Quantum Systems” in Herrsching (06/2022)
- (16) *Weak coupling limit for Schrödinger-type operators with degenerate kinetic energy for a large class of potentials*, online DMV–ÖMG annual meeting in Passau (09/2021)
- (17) *Weak coupling limit for Schrödinger operators with degenerate kinetic energy for a large class of potentials*, online workshop “Harmonic Analysis and Partial Differential Operators” (07/2021)
- (18) *On the strong Scott conjecture for Chandrasekhar atoms*, workshop “The Analysis of Complex Quantum Systems: Large Coulomb Systems and Related Matters”, Centre International De Rencontres Mathématiques in Luminy (10/2019)
- (19) *On the strong Scott conjecture for Chandrasekhar atoms*, program “Density Functionals for Many-Particle Systems: Mathematical Theory and Physical Applications of Effective Equations”, Institute for Mathematical Sciences in Singapore (09/2019)
- (20) *On the strong Scott conjecture for the Chandrasekhar model*, workshop “Analysis of Effective One-Particle Equations and their Derivation”, LMU Munich (06/2018)
- (21) *On the atomic density on the semiclassical length scale in relativistic quantum mechanics*, Joint DMV and GDM annual meeting, Paderborn (03/2018)
- (22) *On the atomic density on the semiclassical length scale in relativistic quantum mechanics*, workshop “Effective equations for many particle Coulomb systems”, Universität Mannheim (12/2017)
- (23) *Radial coherent states and the Scott correction*, workshop “Mean Fields for Fermions”, LMU Munich (01/2017)
- (24) *The atomic density on the length scale $Z^{-1/3}$* , workshop “Effective one-particle equations for fermionic many-particle Coulomb systems: derivation and properties”, Universität Mannheim (10/2016)

2.5.2. Invited lectures and minicourses

- (1) *From stability of matter to the ionization conjecture*, 4-lecture course at Tokyo University of Science (05/2026)
- (2) *Inequalities for orthonormal systems with applications: From stability of matter to quantum dynamics*, 3-lecture minicourse within the ICMC-USP (Instituto de Ciências Matemáticas e de Computação at University of São Paulo) Mathematics Summer Program (02/2026)
- (3) *The ionization conjecture in quantum mechanics and density functional theory: An introduction*, online Mathematical Challenges in Quantum Mechanics PhD lecture (04/2025)

2.5.3. Invited seminar talks

- (1) *On the energy and particle distribution of relativistic atoms*, Tokyo University of Science (05/2026)
- (2) *Sharp upper bounds for the density of relativistic atoms*, Gakushuin University (05/2026)
- (3) *Sharp upper bounds for the density of relativistic atoms*, online “Tokyo–Osaka Spectral Theory Seminar” (05/2026)
- (4) *Fourier analytic methods in the spectral theory of Schrödinger operators*, University of the Basque Country (11/2025)
- (5) *Electron distribution of relativistic atoms and heat kernel bounds*, Kyushu University (03/2025)

- (6) *From weak coupling limits for degenerate Schrödinger operators to Schrödinger operators with complex potentials*, Universität Oldenburg (06/2024)
- (7) *Eigenvalue estimates for Schrödinger operators using Fourier analysis*, ETH Zurich (06/2024)
- (8) *Random Schrödinger operators with complex decaying potentials*, Hokkaido University (07/2023)
- (9) *On some functional inequalities for generalized Hardy operators*, Kansai University (07/2023)
- (10) *On some functional inequalities for generalized Hardy operators*, Kyoto University (06/2023)
- (11) *Relativistic Coulomb systems and Hardy operators 2*, Wrocław University of Science and Technology (03/2023)
- (12) *The Scott conjectures for relativistic atoms*, University of Warsaw (01/2023)
- (13) *Relativistic Coulomb systems and Hardy operators*, Wrocław University of Science and Technology (01/2023)
- (14) *Some applications of the Hardy–Kato–Herbst inequality*, Osaka University (10/2022)
- (15) *Random Schrödinger operators with complex decaying potentials*, online “Mathematical Physics and Harmonic Analysis Seminar”, Texas A&M University (09/2022)
- (16) *Random Schrödinger operators with complex decaying potentials*, online Munich–Aarhus–Santiago Seminar in Mathematical Physics (12/2021)
- (17) *Eigenvalue estimates for Schrödinger operators using Fourier analysis*, Friedrich-Alexander-Universität Erlangen–Nürnberg (11/2021)
- (18) *Weak coupling limit for Schrödinger-type operators with degenerate kinetic energy for a large class of potentials*, online seminar “Analysis Of Complex Physical Systems”, The University of Texas at Austin (11/2021)
- (19) *Eigenvalue estimates for Schrödinger operators using Fourier analysis*, Jacobs University Bremen (09/2021)
- (20) *Weak coupling limit for Schrödinger operators with degenerate kinetic energy for a large class of potentials*, online seminar “KIT Mathematical Physics Seminar” (07/2021)
- (21) *Equivalence of Sobolev norms involving generalized Hardy operators*, online seminar “Theory of Markov Semigroups and Schrödinger Operators” (05/2021)
- (22) *On the ground state density of relativistically described atoms*, LMU Munich (07/2019)
- (23) *On the strong Scott conjecture for Chandrasekhar atoms*, TU Braunschweig (04/2019)

2.5.4. Submitted talks

- (1) *Random Schrödinger operators with complex decaying potentials*, XXI International Congress on Mathematical Physics in Strasbourg (07/2024)
- (2) *Random Schrödinger operators with complex decaying potentials*, workshop of the GAMM Activity Group “Applied Operator Theory” in Hamburg (05/2024)
- (3) *Random Schrödinger operators with complex decaying potentials*, school and workshop “Mathematical Challenges in Quantum Mechanics” in Como (06/2022)
- (4) *Equivalence of Sobolev norms involving generalized Hardy operators*, workshop of the GAMM Activity Group “Applied Operator Theory” in Kaiserslautern (05/2019)
- (5) *On the strong Scott conjecture for Chandrasekhar atoms*, Young Researchers Symposium preceding the XIX International Congress on Mathematical Physics in Montréal (07/2018)

2.5.5. Posters

- (1) *Weak coupling limit for Schrödinger-type operators with degenerate kinetic energy for a large class of potentials*, XX International Congress on Mathematical Physics in Geneva (08/2021)
- (2) *Weakly coupled bound states of $|p^2 - 1| - \lambda V$* , online summer school “Applications of Bogoliubov theory” (06/2020)
- (3) *On the ground state density of relativistic models of atoms on the semiclassical length scale* (poster), Joint CoQuS & IMPRS-QST Vienna Summer School on Complex Quantum Systems (09/2017)
- (4) *On the ground state energy of the statistical model of the two-dimensional atom using phase space localization techniques* (poster), Vienna Central European Seminar on Particle Physics and Quantum Field Theory (11/2015)

2.6. Organization of scientific events

- (1) 01/2025: Organization of the *Gauss Mini Workshop* on Analysis, PDE, and Mathematical Physics at TU Braunschweig
- (2) 09/2022: Organization of the mini-symposium *Mathematical Analysis of Complex Quantum Systems* at the DMV annual meeting in Berlin jointly with Heinz Siedentop
- (3) 11/2020 – 02/2024: Organization of the online *GAuS seminar* on topics in analysis, PDE, and mathematical physics jointly with Christoph Kehle and Simone Rademacher

2.7. Membership of academies / committees etc.

- (1) American Mathematical Society (AMS)
- (2) Deutsche Mathematiker-Vereinigung (DMV)
- (3) Deutsche Physikalische Gesellschaft (DPG)
- (4) International Association of Mathematical Physics (IAMP)
- (5) Association of Women in Mathematical Physics (AWMP)

2.8. Assignments as reviewer / independent expert

- (1) Referee for *Advances in Mathematics*, *Advances in Nonlinear Analysis*, *Annales Henri Poincaré*, *Annali della Scuola Normale Superiore di Pisa*, *Communications in Mathematical Physics*, *Communications on Pure and Applied Analysis*, *Complex Analysis and Operator Theory*, *Documenta Mathematica*, EMS Press, *Journal of Applied and Engineering Mathematics*, *Journal of Fourier Analysis and Applications*, *Journal of Integral Equations and Applications*, *Journal of Mathematical Analysis and Applications*, *Journal of Mathematical Physics*, *Journal of Physics A*, *Journal of the London Mathematical Society*, *Kragujevac Journal of Mathematics*, *Letters in Mathematical Physics*, *Nonlinear Differential Equations and Applications*, *Nonlinearity*, *Probability and Mathematical Statistics* (30 reports since 12/2019)
- (2) Reviewer for *Mathematical Reviews* and *zbMATH* (53 reviews since 07/2019)

3. Pedagogical proficiency

3.1. Teaching experience

3.1.1. Lectures instructed

- (1) 04/2025 – 07/2025: Discrete Mathematics, Bachelor course, one lecture and one exercise class weekly, ca. 300 students
- (2) 04/2025 – 07/2025: Fourier Restriction and Applications, Master course, one lecture and one exercise class weekly, 5 students
- (3) 04/2025 – 07/2025: Organization of the mathematics ramp up course for freshmen of the Master's program Data Science, ca. 50 students
- (4) 04/2025 – 05/2025: Logic and analysis parts of the mathematics ramp up course for freshmen of the Master's program Data Science, 16 hours, ca. 50 students
- (5) 10/2024 – 02/2025: Advanced Analysis for Electrical Engineers, Bachelor course, two lectures and one exercise class weekly, ca. 100 students
- (6) 10/2024 – 02/2025 Ordinary Differential Equations, Bachelor course, two lectures and one exercise class weekly, ca. 20 students
- (7) 10/2024 – 02/2025 Mathematics using Mathematica, Bachelor course, one lecture and one exercise class weekly, 10 students
- (8) 04/2024 – 07/2024: Discrete Mathematics, Bachelor course, one lecture and one exercise class weekly, ca. 300 students
- (9) 04/2024: Analysis part of the mathematics ramp up course for freshmen of the Master's program Data Science, 12 hours, ca. 50 students
- (10) 10/2023 – 02/2024: Harmonic Analysis, Master course, two lectures and one exercise class weekly, 5 students
- (11) 11/2023: Analysis part of the mathematics ramp up course for freshmen of the Master's program Data Science, Master, 12 hours, ca. 50 students
- (12) 04/2021 – 07/2021: Fourier Restriction and Applications, Master course, one lecture and one exercise class weekly, 5 students
- (13) 10/2020 – 02/2021: Topics in Partial Differential Equations, Master course, one lecture and one exercise class weekly, 5 students
- (14) 04/2020 – 07/2020: Harmonic Analysis, Master course, two lectures and one exercise class weekly, 5 students

3.1.2. Seminars organized

- (1) 04/2025 – 07/2025: Dispersive Partial Differential Equations
- (2) 10/2024 – 02/2025: Distribution Theory
- (3) 04/2022 – 07/2022: Topics in Many-Body Quantum Mechanics
- (4) 04/2021 – 07/2021: High-Dimensional Probability Theory
- (5) 10/2020 – 02/2021: Scattering Theory
- (6) 10/2019 – 02/2020: Trace Ideals and Matrix Inequalities

3.1.3. Lectures assisted

- (1) 04/2022 – 07/2022: Linear Algebra 2, Bachelor course, one large and one small exercise class
- (2) 10/2021 – 02/2022: Linear Algebra 1, Bachelor course, one large and one small exercise class

- (3) 10/2019 – 02/2020: Partial Differential Equations 2, Master course, one large exercise class
- (4) 10/2016 – 02/2017: Analysis of Several Variables, Measure and Integration Theory, Bachelor course, one large and one small exercise class

3.2. Supervision

3.2.1. Supervision of B.Sc. and M.Sc. students

Preparation of students for their thesis as part of a proseminar:

- (1) Luca Agostino, ETH Zurich, M.Sc. Physics, 02/2026 – 08/2026
- (2) Keerthana Jaishankar, ETH Zurich, M.Sc. Physics, 02/2026 – 08/2026
- (3) Iancu Scurtu, ETH Zurich, M.Sc. Physics, 02/2026 – 08/2026
- (4) Timo Saro, ETH Zurich, M.Sc. Physics, 02/2026 – 08/2026

Thesis supervision:

- (1) Julian Rausch, TU Braunschweig, B.Sc. Mathematics, 05/2025 – 08/2025.

3.2.2. PhD supervision

- (1) Since 10/2023: Jakob Geisler, TU Braunschweig, co-supervision with Prof. Dr. Volker Bach being the principal advisor, admission in 2022, graduation expected in 2026, funded by TU Braunschweig, Dr. rer. nat., Mathematics
- (2) Since 10/2023: Matthias Herdrik, TU Braunschweig, co-supervision with Prof. Dr. Volker Bach being the principal advisor, admission in 2023, graduation expected in 2027, partially funded by DFG (German Research Foundation), Dr. rer. nat., Mathematics
- (3) 01/2020 – 09/2022: Robert Rauch, TU Braunschweig, co-supervision with Prof. Dr. Volker Bach being the principal advisor, admission in 2015, graduation in 2024, partially funded by DFG (German Research Foundation), Dr. rer. nat., Mathematics

3.3. Educational administration

- (1) 04/2025 – 07/2025: Organization of a mathematics ramp up course for students in the M.Sc. program Data Science at TU Braunschweig
- (2) 04/2025 – 09/2025: Member of the curriculum and admissions committees for the study program Data Science at TU Braunschweig

3.4. Other educational activities towards the general public, companies etc. Other educational qualifications, prizes, and awards

- (1) Nomination for the teaching award for best undergraduate teaching (Discrete Mathematics, summer term 2024)
- (2) Outreach: Lecture during freshmen students' orientation week at TU Braunschweig 10/2021: "Wie viel Platz braucht man, um eine Nadel zu drehen? – Das Kakeya-Problem" (Translation: "How much space is needed to turn a needle? – Kakeya's problem")

3.5. Pedagogical courses

- (1) "Integrating AI-based tools in teaching and learning", ETH Zurich, 03/2026
- (2) "Effective thesis supervision", ETH Zurich, 02/2026