

Curriculum vitae

of Mario Ullrich

Personal data

Name Priv.-Doz. Dr. Dipl.-Math. Mario Ullrich
Born March 3, 1987 in Mühlhausen, Germany
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Research areas

In general Theoretical numerical analysis and data science; information-based complexity; approximation theory; probability theory (in high dimensions); applied functional and harmonic analysis
In detail Complexity of high-dimensional problems; power of random information; geometry of Banach spaces; asymptotic geometric analysis; large random matrices; applied number theory; stochastic processes

Education

10/23 Habilitation (*venia docendi*) in Mathematics,
Johannes Kepler University Linz, Austria.
Thesis: “Random vs. optimal data for high-dimensional approximation”
12/12 Ph.D. in Mathematics (Dr. rer. nat., *summa cum laude*),
Friedrich Schiller University Jena, Germany.
Thesis: “Rapid mixing of Swendsen-Wang dynamics in two dimensions”
Advisor: Erich Novak
Supported by: DFG Research Training Group (1523/1)
“Quantum and Gravitational Fields”
07/09 Dipl.-Math. in Mathematics,
Friedrich Schiller University Jena, Germany.
Thesis: “Explicit error bounds and comparison of Importance
sampling and the Metropolis algorithm” (in German)
07/05 Abitur, Seiler-Gymnasium in Schlotheim, Germany.

Professional experience

- 01/25– Senior Scientist (50%) at *Department of Quantum Computing*,
JKU Linz, Austria
- 11/19– Universitätsassistent (permanent position) at *Institute of Analysis*,
JKU Linz, Austria
- 05/20–02/22 Associated researcher at *Moscow Center for Fundamental and Ap-
plied Mathematics* at Lomonosov Moscow State University, Russia.
- 10/18–03/19 Visiting Professor (Vertretungsprofessor-W3) for “Theoretical Nu-
merics” at Friedrich Schiller University Jena, Germany
- 03/15–10/19 Postdoc (Univ.-assistent) at JKU, Austria (suspended: 10/18–03/19)
- 01/13–02/15 Postdoc (wiss. Mitarbeiter) at FSU Jena, Germany
- 07/12–12/12 Postdoctoral fellowship at Università Roma Tre, Rome.
Supported by: ERC Advanced Grant “Phase transitions in random
evolutions of large-scale structures” (228032)
- 09/09–07/12 Ph.D. student at Friedrich Schiller University Jena, Germany.
Supported by: DFG Research Training Group 1523/1
“Quantum and Gravitational Fields”
- 10/07–06/09 Undergraduate teaching assistant in probability theory
Friedrich Schiller University Jena, Germany.

Awards and honors

- 2026 Invited author for *Acta Numerica* (vol. 35),
“Approximation of Functions: Optimal Sampling and Complexity”
- 2023 Nomination for the *Ars Docendi - Staatspreis für exzellente Lehre*
(engl.: Austrian national award for excellence in teaching)
for the project “Mathematics for Artificial Intelligence”,
published as “Example for good teaching” at www.gutelehre.at
- 2023 *Kepler Award for Excellence in Digital Teaching* of JKU Linz
for the lecture series “Mathematics for Artificial Intelligence 1–3”,
nominated by student representatives
- 2021 *Joseph F. Traub Prize for Achievement in Information-Based Complexity*
- 2019 *Journal of Complexity Best Paper Award*
for the article “The curse of dimensionality for numerical integration on
general domains” [J. Complexity 50 (2019), 25–42]
- 2015 *Information-Based Complexity Young Researcher Award*
- 2013 *Promotionspreis des Dekans* of the Friedrich Schiller University

Plenary talks and most important invitations

- 2026 Two invited talks at “Foundations of Computational Mathematics” (FoCM 2026) in the workshops “Information-based complexity” and “Foundations of Data Science and Machine Learning”, Vienna, Austria, Jul 2026
- 2026 Invited speaker at *BIRS-IMAG workshop “Multivariate Splines for Inferential Data Science”* (26w5609), Granada, Spain, May 2026
- 2026 Invited speaker at “*Quantum Harmonic Analysis 2026*” conference, Växjö, Sweden, March 2026
- 2026 Plenary speaker at Joint Conference of the Czech, Slovenian, Austrian, Slovak and Catalan Mathematical Societies (CSASC 2026), nominated by the Austrian Math. Society (ÖMG), Pilsen, Czech Republic, Feb 2026
- 2025 Keynote speaker at “Nonlinear Approximation for High-Dimensional Problems” (in honor of Albert Cohen’s 60th birthday), Paris, France, Jul 2025
- 2024 Keynote speaker at the workshop “*SIGMA’2024 (Signal-Image-Geometry-Modelling-Approximation)*” at CIRM, Marseille, France, Oct 2024
- 2024 Plenary speaker at the *XIV International Conference of the Georgian Mathematical Union*, Batumi, Georgia, Sep 2024
- 2024 Invited speaker (long talk) at the programme “*Discretization and recovery in high-dimensional spaces*” at Newton Institute for Mathematical Sciences, Cambridge, UK, July 2024
- 2024 Plenary speaker at the conference “*Function Spaces, Analysis, and Approximation*”, Astana, Kazakhstan, Feb 2024
- 2022 Plenary speaker at *International Conference on “Function Spaces and Applications”*, Apolda/Thür., Germany, Oct 2022
- 2022 Invited speaker at *BIRS-CMO workshop “Applied Functional Analysis”*, Oaxaca, Mexiko, August 2022
- 2022 Invited speaker at the *MASCOT-NUM Workshop “Optimal Sampling for Approximation”*, Institut Henri Poincaré, Paris, France, March 2022
- 2021 Invited speaker (2 lectures) at the conference “*Sampling recovery and related problems*” at the Laboratory of High-Dimensional Approximation and Applications, Moscow, Russia, May 2021 (online)
- 2020 Plenary speaker at “*14th International Conference in Monte Carlo & Quasi-Monte Carlo Methods in Scientific Computing*” (MCQMC 2020) at Oxford University, UK, August 2020
- 2017 Semi-plenary speaker at the *Information-based Complexity workshop* at the FoCM 2017 conference, Barcelona, July 2017
- 2016 Invited speaker at “*Approximate Counting, Markov Chains & Phase Transitions*” workshop at Simons Inst. for Theory of Computing, Berkeley, Feb ’16

Editorial boards

- 2027– Advances in Approximation Theory (AAT)
- 2026– Communication in Mathematics (CM)
- 2025– Journal of Machine Learning Research (JMLR)
- 2020– Journal of Complexity (JoC)

Conference organization and committees

- 2027 Scientific Committee for “*16th International Conference on Monte Carlo Methods and Applications*” (MCM 2027), Passau, Germany, July 2027
- 2027 Organizing Committee for the conference “*Stochastic analysis, functional analysis and complexity*” (in honor of Stefan Geiss’ retirement), 2027
- 2026 **Invited organizer** of RICAM workshop “*Complexity Theory in Machine Learning*” with M. Feischl, during *RICAM Special Semester “AI in Scientific Computing 2026”*, organized by P. Grohs, Linz, Austria, Nov 2026
- 2026 Scientific Committee for “*17th International Conference in Monte Carlo & Quasi-Monte Carlo Methods in Scientific Computing*” (MCQMC 2026), Edinburgh, UK, June 2026
- 2025 **Main organizer** of conference “*Approximation, Probability and Geometry in High Dimensions 2025*” (with L. Plaskota, J. Prochno, E. Werner), Banach Center, Bedlewo, Poland, August 2025, www.impan.pl/
- 2025 Mini-symposium on “*Information-Based Complexity*” at annual meeting of the *German and Austrian Math. Society* (with F. Pillichshammer), Linz, Austria, Sep 2025
- 2024 Scientific Committee for “*16th International Conference in Monte Carlo & Quasi-Monte Carlo Methods in Scientific Computing*” (MCQMC 2024), Waterloo, Canada, August 2024
- 2023 **Invited session organizer** at annual meeting of the *Austrian Mathematical Society* (ÖMG) on “*High-dimensional approximation*” (with D. Krieg), Graz, Austria, September 2023
- 2023 Mini-symposium on “*High-dimensional regression and sampling*” (with A. Uschmajew) at *ICIAM 2023 (“10th International Congress on Industrial and Applied Mathematics”)*, Tokyo, Japan, August 2023
- 2023 Mini-symposium “*On the power of iid information for (non-linear) approximation*” (with M. Sonleitner) at *MCM 2023 (“14th International Conference on Monte Carlo Methods and Applications”)*, Paris, France, June 2023

- 2022 **Main organizer** of conference “Approximation and Geometry in High Dimensions 2022” (with L. Plaskota, J. Prochno, S. Szarek, T. Ullrich), Banach Center, Poland, Oct 2022, www.impan.pl/
- 2022 Special session on “Approximation from random data” at “MCQMC 2022” (with D. Krieg), Linz, Austria, July 2022
- 2022 **Invited mini-symposium organizer** at “*Curves and Surfaces 2022*” on “Random matrices and approximation using function values”, Arcachon, France, June 2022
- 2020 Special session on “Random Points: Quality Criteria and Applications” at “MCQMC 2020” (with M. Gnewuch), Oxford University, UK, online
- 2020 **Invited section organizer** (“Discretization”) at the conference “Approximation Theory and Applications” (dedicated to 100th anniversary of S.B. Stechkin) at Steklov Institute of Mathematics, Moscow, Russia, Aug 2020
- 2020 **Main organizer** of conference “Approximation and Geometry in High Dimensions 2020” (with L. Plaskota, J. Prochno, S. Szarek, T. Ullrich), Banach Center, Poland, Aug 2020, www.impan.pl/, postponed
- 2018 Session “Dispersion and Applications” at “MCQMC 2018”, Rennes, France
- 2015 Special session “Integration, Approximation and Discrepancy” at “ICIAM 2015”, Beijing, China
- 2014 Special session “Tractability of integration and approximation” with A. Hinrichs at “MCQMC 2014”, Leuven, Belgium

Some other invited talks and visits

- Mini-symposium “High-Dimensional Approximation” (organized by O. Mula, Vienna) at “Curves and Surfaces 2026”, Saint-Malo, France, June 2026
- Oxford workshop “*Quantum Computing Theory in Practice (QCTiP)*”, Mathematical Institute, University of Oxford, April 2026
- *Quantum Cambridge-Oxford-Warwick Colloquium (QCOW)* on “Quantum Learning Theory”, University of Warwick, UK, April 2026
- Centre de Recerca Matemàtica Barcelona (invited by S. Tikhonov), Spain, April 2026
- “Deep learning theory seminar” at Vector Institute (invited by A. Kratsios), Toronto, Canada, Jan 2026
- Oberwolfach Workshop 2534 on “Computation and Learning in High Dimensions”, Germany, Aug 2025
- ESI Program “Quantum Harmonic Analysis”, Erwin Schrödinger Institute, Vienna, Austria, May 2025

- RWTH Aachen (invited by M. Bachmayr), Germany, Aug 2024
- University of Helsinki (invited by E. Saksman), Finland, Nov 2023
- Dagstuhl Seminar 23351 on “Algorithms and Complexity for Continuous Problems”, Schloss Dagstuhl, Leibniz Center for Informatics, Germany, Aug 2023
- Invited talk in minisymposium on “*High-dimensional approximation and reduced-order models*” at CSE 2023 (“SIAM Conference on Computational Science and Engineering”), Amsterdam, Netherlands, Feb 2023
- Invited talk at “*Harmonic analysis seminar*” of the University of Vienna (invited by K. Gröchenig and H. Feichtinger), Vienna, Austria, June 2022
- “30th birthday of Acta Numerica”, Banach Center, Bedlewo, PL, June 2022
- ESI Program “Optimal Point Configurations on Manifolds”, Erwin Schrödinger Institute, Vienna, Austria, Jan 2022
- ESI Program “Applied Functional Anal. & High-Dimensional Approximation”, Erwin Schrödinger Institute, Vienna, Austria, Apr-May 2021
- Dagstuhl Seminar 19341 on “Algorithms and Complexity for Continuous Problems”, Schloss Dagstuhl, Leibniz Center for Informatics, Germany, Aug 2019
- Programme: “Approximation, sampling and compression in data science”, Newton Institute for Mathematical Sciences, Cambridge, UK, Feb–Apr 2019
- University of Passau (invited by T. Müller-Gronbach), Germany, Jan 2019
- University of Osnabrück (invited by Michael Gnewuch), Germany, Dec 2018
- Special semester: “Multivariate Algorithms and their Foundations in Number Theory”, Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences, Linz, Austria, Oct–Dec 2018
- Mini-conference “High-dimensional approximation and discretization”, Laboratory of High-Dimensional Approximation and Applications, Lomonosov Moscow State University, Moscow, Russia, Sep 2018
- ESI Program “Tractability of High Dimensional Problems and Discrepancy”, Erwin Schrödinger Institute, Vienna, Austria, Sep–Oct 2018
- Invited speaker at LMS Durham Research Symposium “*Markov Processes, Mixing Times and Cutoff*” at the Durham University, UK, July 2017
- Oberwolfach Workshop 1706c on “Perspectives in High-dimensional Probability and Convexity”, Germany, Feb 2017
- Workshop in Discrepancy Theory, Villa Cipressi, Varenna, June 2016
- Hausdorff Center for Mathematics (invited by Tino Ullrich), Bonn, Germany, Mar 2016
- Dagstuhl Seminar 15391 on “Algorithms and Complexity for Continuous Problems”, Schloss Dagstuhl, Leibniz Center for Informatics, Germany, Sep 2015
- University of Geneva (invited by Ioan Manolescu), Switzerland, May 2015

- Conference on “Information-based complexity”, Banach Center, Bedlewo, Poland, Apr 2015
- IBC workshop at “Foundations of Computational Mathematics conference” (FoCM 2014), Montevideo, Uruguay, Dec 2014
- ESI Programm “Minimal Energy Point Sets, Lattices, and Designs”, Erwin Schrödinger Institute, Vienna, Austria, Oct 2014
- Hausdorff Center for Mathematics (by Tino Ullrich), Bonn, Apr 2014
- Workshop: “Discrepancy, Numerical Integration and Hyperbolic Cross Approximation”, Hausdorff Center for Mathematics, Bonn, Germany, Sep 2013
- Dagstuhl Seminar 12391 on “Algorithms and Complexity for Continuous Problems”, Schloss Dagstuhl, Leibniz Center for Informatics, Germany, Sep 2012
- University of Roma Tre (invited by Fabio Martinelli), Rome, Italy, May 2012

Visiting professorships and appointment procedures

10/18–03/19 Visiting professor (Vertretungsprofessur-W3) for “Theoretical Numerical Analysis” at Friedrich Schiller University Jena, Germany

Invitations: 2026: RWTH Aachen (W3, “Geometry and Probability in High Dimensions”, pending)

 2025: TU Graz (W3, “Foundations of Data Science”)

 2023: FAU Erlangen-N. (W3, chair of “Data Science”, shortlisted)

 2022: TU Ilmenau (W3, “Math. of Data Science”, shortlisted)

 2021: Universität Passau (W3, chair of “Functional analysis”)

 2018: EKU Tübingen (tenure-track W3, “Math. methods in CS”)

 2017: FAU Erlangen-Nürnberg (W1, “Applied mathematics”, shortlisted, procedure cancelled)

Grants

2025: Austrian Research Promotion Agency (FFG) project – 300.000 EUR
 “Protecting Quantum Information through high-dimensional Encoding” (HDcode, FO999921407), in cooperation with Linz (R. Küng), Vienna (N. Friis) and Innsbruck (H. Poulsen, L. Fiderer, P. Schindler),
 <https://projekte.ffg.at/projekt/5132493>,

Press releases

- 03/2025: Article in Austrian Newspaper (ÖÖNachrichten) on invitation to publish in *Acta Numerica*,
Title: “JKU-Mathematiker steigt in Königsklasse der Forschung auf”,
www.nachrichten.at/campus, March 22, 2025.
- 10/2024: *Best Bachelor Thesis Award in Artificial Intelligence*
(area: Math. Foundation of AI) for two of my students
www.jku.at/news-events/news/, Oct 21, 2024.
- 10/2022: Article in *Heureka* (science magazine published by Falter Verlag)
Title: “Smart Data statt Big Data”, epaper.falter.at/, Oct 26, 2022.
- 07/2022: *Oberösterreicher des Tages* (“*Upper Austrian of the Day*”),
Title: “Er ordnet mit Mathematik den Zufall”,
www.nachrichten.at/oberoesterreich/landsleute/, July 28, 2022.

Most Important Publications (Top-5 publications are [1, 2, 3, 5, 9].)

1. A sharp upper bound for sampling numbers in L_2
(with M. Dolbeault and D. Krieg).
Appl. Comput. Harmon. Anal. 63 (2023), 113–134,
DOI:10.1016/j.acha.2022.12.001, arXiv:2204.12621.
2. Function values are enough for L_2 -approximation (with D. Krieg).
Found. Comput. Math. 21 (2021), 1141–1151
DOI:10.1007/s10208-020-09481-w, arXiv:1905.02516.
3. Random sections of ellipsoids and the power of random information
(with A. Hinrichs, D. Krieg, E. Novak and J. Prochno).
Trans. Amer. Math. Soc. 374 (2021), no. 12, 8691–8713,
DOI:10.1090/tran/8502, arXiv:1901.06639.
4. The curse of dimensionality for numerical integration on general domains
(with A. Hinrichs and J. Prochno). *J. Complexity* 50 (2019), 25–42,
DOI:10.1016/j.jco.2018.08.003, arXiv:1804.03957.
5. Reproducing Kernels of Sobolev Spaces on $\mathbb{R}^d$ and Applications to Embedding
Constants and Tractability (with E. Novak, H. Woźniakowski and S. Zhang).
Analysis and Applications 16 (2018), no. 5, 693–715,
DOI:10.1142/S0219530518500094, arXiv:1709.02568.
6. A Monte Carlo method for integration of multivariate smooth functions.
SIAM J. Numer. Anal. 55 (2017), no. 3, 1188–1200,
DOI:10.1137/16M1075557, arXiv:1604.06008.
7. Change of variable in spaces of mixed smoothness and numerical integration
of multivariate functions on the unit cube (with V. K. Nguyen and T. Ullrich).
Constr. Appr. 46 (2017), 69–108,
DOI:10.1007/s00365-017-9371-9, arXiv:1511.02036.
8. The role of Frolov’s cubature formula for functions with bounded mixed deriva-
tive (with Tino Ullrich).
SIAM J. Numer. Anal. 54 (2016), no. 2, 969–993,
DOI:10.1137/15M1014814, arXiv:1503.08846.
9. The Curse of Dimensionality for Numerical Integration of Smooth Functions
(with Aicke Hinrichs, Erich Novak and Henryk Woźniakowski).
Math. Comp. 83 (2014), no. 290, 2853–2863,
DOI:10.1090/S0025-5718-2014-02855-X, arXiv:1211.0871.
10. Rapid mixing of Swendsen-Wang dynamics in two dimensions.
Dissertationes Math. 502 (2014), 64 pp.,
DOI:10.4064/dm502-0-1, arXiv:1212.4908.

Full Publication List

Online archives:

- Scopus: www.scopus.com/authid/detail.uri?authorId=55781373500
- MathSciNet: mathscinet.ams.org/mathscinet/author?authorId=1023200
- Google Scholar: scholar.google.com/citations?user=iGnssr8AAAAJ&hl=de
- ArXiv: arxiv.org/search/?query=Ullrich%2C+Mario&searchtype=all

Theses:

3. *Random vs. optimal data for high-dimensional approximation*, Habilitation thesis, 2023, Linz
2. *Rapid mixing of Swendsen-Wang dynamics in two dimensions*, Dissertation, 2012, Jena (cf. the paper [9])
1. *Explicit error bounds and comparison of Importance sampling and the Metropolis algorithm* (in German), Diploma thesis, 2009, Jena

Submitted manuscripts and preprints:

4. Approximation of functions: Optimal sampling and complexity (with D. Krieg), to appear in *Acta Numerica*. arXiv:2602.02066.
3. Constructive discretization and approximation in reproducing kernel Hilbert spaces (with A. Chkifa, M. Dolbeault and D. Krieg). arXiv:2602.18719.
2. Sparse grids vs. random points for high-dimensional polynomial approximation (with J. Eggl and E. Mindlberger). arXiv:2506.24054.
1. How many continuous measurements are needed to learn a vector? (with D. Krieg and E. Novak). arXiv:2412.06468.

Refereed journal papers:

45. Nonlocal techniques for the analysis of deep ReLU neural network approximations (with C. Schneider and J. Vybiral). *Journal of Machine Learning Research* **27**:11 (2026) 1–41, jmlr.org, arXiv:2504.04847.
44. Noisy nonlinear information and entropy numbers (with D. Krieg, E. Novak and L. Plaskota). *J Fourier Anal Appl* **32**:36 (2026), DOI:10.1007/s00041-026-10249-z, arXiv:2510.23213.

43. Sampling and entropy numbers in the uniform norm.
J. Complexity 92 (2026), 101992,
 DOI:10.1016/j.jco.2025.101992, arXiv:2507.20770.
42. On the power of adaption and randomization (with D. Krieg and E. Novak).
Forum of Mathematics, Sigma 13 (2025), e152.
 DOI:10.1017/fms.2025.10101, arXiv:2406.07108.
41. Sampling projections in the uniform norm
 (with D. Krieg, K. Pozharska and T. Ullrich).
J. Math. Anal. Appl. 553:2 (2026), Paper No. 129873, 17 pp.,
 DOI:10.1016/j.jmaa.2025.129873, arXiv:2401.02220.
40. Sampling recovery in L_2 and other norms
 (with D. Krieg, K. Pozharska and T. Ullrich).
Mathematics of Computation, published online: October 6, 2025.
 DOI:10.1090/mcom/4148, arXiv:2305.07539.
39. Inequalities between s-numbers.
Adv. Oper. Theory 9:4 (2024), Paper No. 82,
 (in: *Special issue in Memory of Albrecht Pietsch*),
 DOI:10.1007/s43036-024-00386-x, arXiv:2405.05509.
38. On the power of iid information for linear approximation (w/ M. Sonnleitner).
J. Applied and Numerical Analysis 1 (2023), 88–126,
 (invited survey in inaugural issue),
 DOI:10.30970/ana.2023.1.88, arXiv:2310.12740.
37. Exponential tractability of L_2 -approximation with function values
 (with D. Krieg, P. Siedlecki and H. Woźniakowski).
Adv. Comput. Math. 49, Article number: 18 (2023),
 DOI:10.1007/s10444-023-10021-7, arXiv:2205.04141.
36. A sharp upper bound for sampling numbers in L_2
 (with M. Dolbeault and D. Krieg).
Appl. Comput. Harmon. Anal. 63 (2023), 113–134,
 DOI:10.1016/j.acha.2022.12.001, arXiv:2204.12621.
35. Deterministic constructions of high-dimensional sets with small dispersion
 (with J. Vybíral).
Algorithmica 84 (2022), 1897–1915,
 DOI:10.1007/s00453-022-00943-x, arXiv:1901.06702.
34. Function values are enough for L_2 -approximation: Part II (with D. Krieg).
J. Complexity 66 (2021), 101569,
 DOI:10.1016/j.jco.2021.101569, arXiv:2011.01779.
33. On the worst-case error of least squares algorithms for L_2 -approximation with
 high probability.

- J. Complexity* 60 (2020),
DOI:10.1016/j.jco.2020.101484, arXiv:2003.11947.
32. Function values are enough for L_2 -approximation (with D. Krieg).
Found. Comput. Math. 21 (2021), 1141–1151,
DOI:10.1007/s10208-020-09481-w, arXiv:1905.02516.
 31. Random sections of ellipsoids and the power of random information
(with A. Hinrichs, D. Krieg, E. Novak and J. Prochno).
Trans. Amer. Math. Soc. 374 (2021), no. 12, 8691–8713,
DOI:10.1090/tran/8502, arXiv:1901.06639.
 30. On the power of random information
(with A. Hinrichs, D. Krieg, E. Novak and J. Prochno).
In: F.J. Hickernell, P. Kritzer (eds.), *Multivariate Algorithms and Information-
Based Complexity*, pp. 43–64, DeGruyter, Berlin/Boston, 2020.
DOI:10.1515/9783110635461-004, arXiv:1903.00681.
 29. On the fixed volume discrepancy of the Fibonacci sets in the integral norms
(with V.N. Temlyakov).
J. Complexity 61 (2020),
DOI:10.1016/j.jco.2020.101472, arXiv:1908.04658.
 28. Numerical performance of optimized Frolov lattices in tensor product repro-
ducing kernel Sobolev spaces (w/ C. Kacwin, J. Oettershagen and T. Ullrich).
Found. Comput. Math. 21 (2021), 849–889,
DOI:10.1007/s10208-020-09463-y, arXiv:1802.08666.
 27. On a multi-dimensional Poissonian pair correlation concept and uniform dis-
tribution (with A. Hinrichs, L. Kaltenböck, G. Larcher and W. Stockinger).
Monatsh. Math. 190 (2019), no. 2, 333–352,
DOI:10.1007/s00605-019-01267-9, arXiv:1809.05672.
 26. The minimal k -dispersion of point sets in high-dimensions
(with A. Hinrichs, J. Prochno and J. Vybíral).
J. Complexity 51 (2019), 68–78,
DOI:10.1016/j.jco.2018.10.001, arXiv:1807.01492.
 25. A note on the dispersion of admissible lattices.
Discrete Appl. Math. 257 (2019), 385–387,
DOI:10.1016/j.dam.2018.08.032, arXiv:1710.08694.
 24. The curse of dimensionality for numerical integration on general domains
(with A. Hinrichs and J. Prochno).
J. Complexity 50 (2019), 25–42,
DOI:10.1016/j.jco.2018.08.003, arXiv:1804.03957.
 23. Comparison of hit-and-run, slice sampling and random walk Metropolis
(with Daniel Rudolf).

- J. Appl. Probab.* 55 (2018), no. 4, 1186–1202,
DOI:10.1017/jpr.2018.78, arXiv:1505.00579.
22. Lattice rules with random n achieve nearly the optimal $\mathcal{O}(n^{-\alpha-1/2})$ error independently of the dimension (with P. Kritzer, F. Y. Kuo and D. Nuyens).
J. Approx. Theory 240 (2019), 96–113,
DOI:10.1016/j.jat.2018.09.011, arXiv:1706.04502.
 21. Digital net properties of a polynomial analogue of Frolov’s construction (with J. Dick, F. Pillichshammer, K. Suzuki and T. Yoshiki).
Finite Fields Appl. 51 (2018), 325–350,
DOI:10.1016/j.ffa.2018.02.004, arXiv:1712.06831.
 20. Reproducing Kernels of Sobolev Spaces on $\mathbb{R}^d$ and Applications to Embedding Constants and Tractability (with E. Novak, H. Woźniakowski and S. Zhang).
Analysis and Applications 16 (2018), no. 5, 693–715,
DOI:10.1142/S0219530518500094, arXiv:1709.02568.
 19. An upper bound on the minimal dispersion (with J. Vybíral).
J. Complexity 45 (2018), 120–126,
DOI:10.1016/j.jco.2017.11.003, arXiv:171006754.
 18. Lattice based integration algorithms: Kronecker sequences and rank-1 lattices (with J. Dick, F. Pillichshammer, K. Suzuki and T. Yoshiki).
Ann. Mat. Pura Appl. (4) 197 (2018), no. 1, 109–126,
DOI:10.1007/s10231-017-0670-3, arXiv:1608.08687.
 17. A lower bound for the dispersion on the torus.
Math. Comput. Simulation 143 (2018), 186–190,
DOI:10.1016/j.matcom.2015.12.005, arXiv:1510.04617.
 16. A Monte Carlo method for integration of multivariate smooth functions.
SIAM J. Numer. Anal. 55 (2017), no. 3, 1188–1200,
DOI:10.1137/16M1075557, arXiv:1604.06008.
 15. Product rules are optimal for numerical integration in classical smoothness spaces (with A. Hinrichs, E. Novak and H. Woźniakowski).
J. Complexity 38 (2017), 39–49,
DOI:10.1016/j.jco.2016.09.001, arXiv:1604.00261.
 14. Complexity of oscillatory integrals on the real line (with E. Novak, H. Woźniakowski and S. Zhang).
Adv. Comput. Math. 43 (2017), 537–553,
DOI:10.1007/s10444-016-9496-6, arXiv:1511.05414.
 13. Change of variable in spaces of mixed smoothness and numerical integration of multivariate functions on the unit cube (with V. K. Nguyen and T. Ullrich).
Constr. Appr. 46 (2017), 69–108,
DOI:10.1007/s00365-017-9371-9, arXiv:1511.02036.

12. The role of Frolov’s cubature formula for functions with bounded mixed derivative (with Tino Ullrich).
SIAM J. Numer. Anal. 54 (2016), no. 2, 969–993,
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9. Rapid mixing of Swendsen-Wang dynamics in two dimensions.
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7. Structure and eigenvalues of heat-bath Markov chains (with Martin Dyer and Catherine Greenhill).
Linear Algebra Appl. 454 (2014), 57–71,
DOI:10.1016/j.laa.2014.04.018, arXiv:1309.0360.
6. The Curse of Dimensionality for Numerical Integration of Smooth Functions II (with Aicke Hinrichs, Erich Novak and Henryk Woźniakowski).
J. Complexity 30 (2014), no. 2, 117–143,
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5. The Curse of Dimensionality for Numerical Integration of Smooth Functions (with Aicke Hinrichs, Erich Novak and Henryk Woźniakowski).
Math. Comp. 83 (2014), no. 290, 2853–2863,
DOI:10.1090/S0025-5718-2014-02855-X, arXiv:1211.0871.
4. Swendsen-Wang is faster than single-bond dynamics.
SIAM J. Discrete Math. 28 (2014), no. 1, 37–48,
DOI:10.1137/120864003, arXiv:1201.5793.
3. Positivity of hit-and-run and related algorithms (with Daniel Rudolf).
Electron. Commun. Probab. 18 (2013), no. 49, 1–8,
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2. Comparison of Swendsen-Wang and Heat-Bath Dynamics.
Random Structures Algorithms 42 (2013), no. 4, 520–535,
DOI:10.1002/rsa.20431, arXiv:1105.3665.
1. Exact Sampling for the Ising Model at all Temperatures.
Monte Carlo Methods Appl., 223–233, De Gruyter Proc. Math, De Gruyter,
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Teaching activities

Basic lectures:

- WS 24/25 *Operator theory for Machine Learning* (JKU Linz, lecture & exercise)
- SS 24 *Classical harmonic analysis* (JKU Linz, lecture & exercise)
- WS 23/24 *Approximation theory for Machine Learning* (JKU Linz, lecture)
- WS 22/23 *Mathematics for Artificial Intelligence 3* (JKU Linz, lecture)
- SS 22 *Mathematics for Artificial Intelligence 2* (JKU Linz, lecture)
- WS 21/22 *Mathematics for Artificial Intelligence 1* (JKU Linz, lecture)
- WS 20/21 *Mathematics for Artificial Intelligence 3* (JKU Linz, lecture)
- SS 20 *Mathematics for Artificial Intelligence 2* (JKU Linz, lecture)
- SS 20 *Mathematics for Artificial Intelligence 1* (JKU Linz, online lecture only)
- WS 19/20 *Mathematics for Artificial Intelligence 1* (JKU Linz, lecture)
- SS 19 *Mathematics for Biological Chemists 2* (JKU Linz, lecture)
- WS 18/19 *Harmonic analysis* (FSU Jena, lecture)
- SS 18 *Information-based complexity* (JKU Linz, lecture)
- SS 18 *Analysis 2* (JKU Linz, lecture)
- WS 17/18 *Analysis 1* (JKU Linz, lecture)
- SS 17 *Classical harmonic analysis* (JKU Linz, lecture)
- WS 16/17 *Complex analysis* (JKU Linz, lecture & exercise)
- others ~15 exercises/tutorials in analysis, numerical analysis, statistics and probability theory starting WS 07/08 (FSU Jena, JKU Linz)

Special courses:

- SS 25 *Seminar on “Math for AI & theory of computing”* (JKU Linz, seminar)
- WS 24/25 *Master’s Thesis Seminar in AI* (JKU Linz, seminar)
- SS 24 *Seminar on “Math for AI & theory of computing”* (JKU Linz, seminar)
- WS 23/24 *Practical Work in Artificial Intelligence* (JKU Linz, practical training)
- SS 23 *Optimal recovery with function values* (JKU Linz, seminar)
- SS 22 *Bachelor’s Thesis Seminar in AI* (JKU Linz, seminar)
- WS 21/22 *Practical Work in Artificial Intelligence* (JKU Linz, practical training)

SS 21	<i>Seminar on “Mathematics in AI”</i> (JKU Linz, seminar)
WS 20/21	<i>Structure of random point sets</i> (JKU Linz, seminar)
WS 19/20	<i>Approximation theory and Machine learning</i> (JKU, Linz, seminar)
SS 19	<i>High-dimensional numerical approximation</i> (JKU Linz, MSc seminar)
WS 18/19	<i>Modern applications of harmonic analysis</i> (FSU Jena, seminar)
WS 18/19	<i>Complexity theory for continuous problems</i> (FSU Jena, lecture)
WS 17/18	<i>High-dimensional numerical integration</i> (JKU Linz, lecture)
WS 17/18	<i>Discrepancy and numerical integration</i> (JKU Linz, seminar)
SS 17	<i>Modern applications of harmonic analysis</i> (JKU Linz, seminar)
WS 16/17	<i>Levin’s discrepancy bound for lattices</i> (JKU Linz, research seminar)
SS 16	<i>Modern methods in Approximation theory</i> (JKU Linz, lecture)
SS 16	<i>Optimal algorithms for numerical integration</i> (JKU Linz, seminar)

Special teaching service:

- 2019– Responsible for design and implementation of the “Mathematics for Artificial Intelligence 1–3” lecture series for the new “Artificial Intelligence” studies at the JKU Linz:
- Goal: Math on the level of “Math for Physicists” adjusted to AI topics
 - designed for distance learning (live streaming, recording, online service)
 - cooperation with Inst. of Machine Learning and Linz School of Education
- 2020– Development of the Master’s elective track “Mathematical Foundation of AI” in the AI studies; available since WS 23/24.
- 2022– Individual student advice, esp. for selection of lectures and topics for thesis in the elective track “Mathematical Foundation of AI”
- 2025– Responsible for design and implementation of the “Mathematics for Quantum Science 1–3” lecture series for the new “Quantum Science and Technology” studies at the JKU Linz (starting WS 2026)

Students

- Jakob Eggl - Bachelor (AI), 2024, JKU Linz
Topic: “Compressed Sensing in Machine Learning”
(awarded with *Best Bachelor Thesis Award in AI*)

- Elias Mindlberger - Bachelor (AI), 2024, JKU Linz
Topic: “Non-asymptotic analysis of random matrices”
(awarded with *Best Bachelor Thesis Award in AI*)
- Thomas Premm - Bachelor (AI), 2024, JKU Linz
Topic: “Markov chains and the Ising model”
- Dmytro Borysenkov - Bachelor (AI), 2024, JKU Linz
Topic: “Low-rank Approximation of Matrices and Higher-Order Tensors”
- Gernot Zöcklein - Bachelor (AI), 2022, JKU Linz
Topic: “Spectral Graph Theory and Sparsification”
- Johannes Zischg - Bachelor (AI), 2022, JKU Linz
Topic: “Uniform Pooling for image reconstruction”
- Fabian Steigersdorfer - Bachelor (AI), 2022, JKU Linz
Topic: “Markov chains and the Ising model”
- Johannes K. Kröpfl - Bachelor (AI), 2022, JKU Linz
Topic: “Brownian Motion and Stochastic Calculus for deriving the Black-Scholes-Merton Model of Investing”
- Raphael-Pascal Endstrasser - Bachelor (AI), 2022, JKU Linz
Topic: “Model identification of ARIMA processes”
- Julian Hofstadler - Master, 2021, JKU Linz
Topic: “On the discrepancy of a subset of random points”
- Stefan Stockinger - Bachelor, 2020, JKU Linz, Topic: “Fehlerschranken für die L2 -Approximation in Sobolevräumen gemischter Glattheit”
- Lukas Weissinger - Bachelor, 2019, JKU Linz
Topic: “Numerische Integration mit Gittermethoden und der Zaremba-Index”
- Julian Hofstadler - Bachelor, 2019, JKU Linz
Topic: “Bounds for the star-discrepancy in high dimensions”
- Mathias Sonnleitner - Master, jointly with Prof. A. Hinrichs, 2019, JKU Linz,
Topic: “Discrepancy and Numerical Integration on Spheres”
- Sebastian Falkensteiner - Master, jointly with Prof. Hinrichs, 2016, JKU Linz
- David Krieg - Master, jointly with Prof. Dr. E. Novak, 2016, FSU Jena
- David Krieg - Bachelor, jointly with Prof. Dr. E. Novak, 2014, FSU Jena
Topic: “Optimal quadrature formulae for tensor product Sobolev spaces”
- Florian Blöthner - Diplom, jointly with Prof. Dr. E. Novak, 2011, FSU Jena

Scientific community service

- Administration:
- Elected member of the *Leitungsgremium des Fachbereichs* (~department leadership meeting) since Jan 2024
 - Deputy mid-level staff speaker of the *Fachbereich* (~math. department) at JKU since May 2022
 - Member of the study commission for the course “Artificial Intelligence” at JKU since Sep 2019
 - Responsible for design and implementation of the new “Math for Artificial Intelligence” courses at JKU since Feb 2019
 - Contact person (“Mentor”) for first year students in mathematics at JKU Linz, Oct 2016 – Sep 2019
 - Mid-level staff representative of the Institute of Analysis in the *Institutsversammlung* at JKU Linz, Jan 2016–Dec 2025

- Referee for:
- Advances in Computational Math., Advances in Operator theory, Analysis Mathematica, Ann. Inst. Henri Poincaré Probab. Stat., Applied Numerical Mathematics, Bulletin of Brazilian Mathematical Society, Communications in Math. Physics, Constructive Approximation, Contemporary Mathematics, Electronic Communications in Probability, J. Foundations of Computational Mathematics, IEEE Open J. Signal Processing, J. Approximation Theory, J. Complexity, J. Functional Analysis, J. Mathematical Finance, J. Statistical Physics, Mathematics and Computers in Simulation, Mathematics of Computation, Mathematika, Numerische Mathematik, Probability Theory and Related Fields, Proceedings of AMS, Pure and Applied Functional Analysis, Random Structures and Algorithms, Scandinavian J. Statistics, SIAM J. Discrete Mathematics, SIAM J. Numerical Analysis, SIAM J. Scientific Computing, SIAM Review, SMAI J. Computational Mathematics, Transactions of AMS
- Proceedings: Curves and Surfaces, Dagstuhl, FOCS, MCM, MCQMC, RANDOM, SLOAN80, SODA, STOC
 - Awards: J. F. Traub Prize for Achievement in IBC 2022–’24, IBC Young Researcher Award 2016–2018, J. Complexity Best Paper Award 2016

Miscellaneous

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Languages: German (native speaker), english (good)

Computer skills: Matlab (good), Geogebra (good), Python (basic), C++ (basic), R (basic)

Linz, May 15, 2026