

Curriculum Vitae of David Krieg

Born: 1991/07/08, Würzburg (Germany)

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Education

- 2016–19 Ph.D. in Mathematics (Dr. rer. nat., summa cum laude)
Friedrich Schiller University Jena, Germany
Thesis: Algorithms and complexity for some multivariate problems
Supervisor: Erich Novak
- 2015 Exchange Semester
Eötvös Loránd University Budapest, Hungary
- 2014–16 M.Sc. in Mathematics (grade 1.0)
Friedrich Schiller University Jena, Germany
Thesis: On the randomization of Frolov's algorithm for multivariate integration
- 2013 Exchange Semester
Lund University, Sweden
- 2011–14 B.Sc. in Mathematics (grade 1.0)
Friedrich Schiller University Jena, Germany
- 2008–10 Early study program in Mathematics
Julius Maximilian University Würzburg, Germany
- 2002–11 Abitur (German higher education entrance qualification, grade 1.0)
Friedrich-Koenig-Gymnasium Würzburg, Germany

Employments

- 07/22– Lise Meitner Fellow at the Johannes Kepler University, Austria. Funded by the Austrian Science Fund (FWF) Project M 3212 “Function approximation with restricted information”.
- 01/22–06/22 Postdoc, Johann Radon Institute for Computational and Applied Mathematics, Austrian Academy of Sciences, Austria. Funded by the Austrian Science Fund (FWF) Project F5506–N26 as a part of the Special Research Program “Quasi-Monte Carlo Methods: Theory and Applications”.
- 04/19–12/21 Postdoc, Johannes Kepler University, Austria. Funded by the Austrian Science Fund (FWF) Project F5513–N26 as a part of the Special Research Program “Quasi-Monte Carlo Methods: Theory and Applications”.
- 04/16–03/19 PhD student (with full time position), Friedrich Schiller University Jena, Germany.
- 04/15–08/15 Teaching assistant, Friedrich Schiller University Jena, Germany.
- 10/12–02/13 Undergraduate teaching assistant, Friedrich Schiller University Jena.

Third-Party Funding

- 07/21 Lise Meitner grant, Austrian Science Fund (FWF), M 3212-N, EUR 164 080
Function approximation with restricted information.

Honors and Awards

- 2020 *Joseph F. Traub Information-Based Complexity Young Researcher Award.*
- 2020 *Promotionspreis* of the Friedrich Schiller University for the thesis “Algorithms and complexity for some multivariate problems”.
- 2017 *Examenspreis* of the president of the Friedrich Schiller University for the thesis “On the randomization of Frolov’s algorithm for multivariate integration”.
- 2015 *Examenspreis* of the dean of the department of mathematics and computer science at the Friedrich Schiller University for the thesis “Optimal quadrature formulae for tensor product Sobolev spaces”.
- 2014–16 Scholarship at the *Studienstiftung des deutschen Volkes.*
- 2013–14 Scholarship *Deutschlandstipendium der Carl-Zeiss-Stiftung.*
- 2011 *Abitur-Preis der Siemens AG* for best graduation in the natural sciences.

Teaching

Lectures

- Monte Carlo methods, WS22/23, JKU Linz, English.
- Complexity of continuous problems, WS21/22, JKU Linz, German.
- Classical harmonic analysis, SS21, JKU Linz, German.

Exercise classes and tutorials

- Analysis 1 (B.Sc. Mathematics), exercises, WS19/20 & WS21/22, JKU Linz, German.
- Analysis 1 (for teachers), exercises and tutorial, SS16, FSU Jena, German.
- Analysis 2 (B.Sc. Mathematics), exercises, SS20 & SS22, JKU Linz, German.
- Analysis for computer scientists, exercises SS18 & tutorial SS15, FSU Jena, German.
- Mathematics for artificial intelligence III, exercises, WS20/21, JKU Linz, English.
- Mathematics for bio- and earth scientists, exercises, WS18/19 FSU Jena, German.
- Numerical analysis 1 (B.Sc. Mathematics), exercises, WS16/17, FSU Jena, German.
- Ordinary differential equations (for mathematicians and teachers), exercises, SS17, FSU Jena, German.
- Probability theory for computer scientists, exercises, WS12/13, FSU Jena, German.

Administration and Community Service

- Mid-level staff representative at the examination committee of the department of mathematics and computer science at the Friedrich Schiller University from October 2016 to March 2019.
- Official examiner for the first state examination for teachers of mathematics (gymnasium and regular school) in Thuringia in 2017 and 2018.
- Assistance for the admissions committee for international master students at the Friedrich Schiller University from July 2017 to March 2019.
- Referee for several bachelor and master theses.
- Reviewer for *Constructive Approximation*, *Foundations of Computational Mathematics*, *Journal of Complexity*, *Mathematics of Computation*, *Pure and Applied Functional Analysis*, *Proceedings of the AMS* and *SIAM Journal on Numerical Analysis*.
- Organization of the workshop “Information-Based Complexity” which will take place at the conference *Foundations of Computational Mathematics* in Paris, 2023.
- Organization of special sessions at the conference *Monte Carlo and Quasi-Monte Carlo Methods* and the annual meeting of the Austrian mathematical society.

Publications

Preprints

- [2] New lower bounds for the integration of periodic functions (with J. Vybíral), arXiv: [2302.02639](#).
- [1] Function recovery on manifolds using scattered data (with M. Sonnleitner), arXiv: [2109.04106](#).

Refereed Journal Papers

- [16] A sharp upper bound for sampling numbers in L_2 (with M. Dolbeault and M. Ullrich). *Applied and Computational Harmonic Analysis*, 63:113–134, 2023.
DOI: [10.1016/j.acha.2022.12.001](#), arXiv: [2204.12621](#).
- [15] Exponential tractability of L_2 -approximation with function values (with P. Siedlecki, M. Ullrich, and H. Woźniakowski). *Advances in Computational Mathematics*, 49:18, 2023.
DOI: [10.1007/s10444-023-10021-7](#), arXiv: [2205.04141](#).
- [14] Random points are optimal for the approximation of Sobolev functions (with M. Sonnleitner). *IMA Journal of Numerical Analysis*, drad014, 2023.
DOI: [10.1093/imanum/drad014](#), arXiv: [2009.11275](#).
- [13] Recovery of Sobolev functions restricted to iid sampling (with E. Novak and M. Sonnleitner). *Mathematics of Computation*, 91:2715–2738, 2022.
DOI: [10.1090/mcom/3763](#), arXiv: [2108.02055](#).
- [12] Lower bounds for integration and recovery in L_2 (with A. Hinrichs, E. Novak, and J. Vybíral). *Journal of Complexity*, 72:101662, 2022.
DOI: [10.1016/j.jco.2022.101662](#), arXiv: [2108.11853](#).
- [11] Function values are enough for L_2 -approximation: Part II (with M. Ullrich). *Journal of Complexity*, 66:101569, 2021.
DOI: [10.1016/j.jco.2021.101569](#), arXiv: [2011.01779](#).
- [10] Lower bounds for the error of quadrature formulas for Hilbert spaces (with A. Hinrichs, E. Novak, and J. Vybíral). *Journal of Complexity*, 65:101544, 2021.
DOI: [10.1016/j.jco.2020.101544](#), arXiv: [2004.00274](#).
- [9] Function values are enough for L_2 -approximation (with M. Ullrich). *Foundations of Computational Mathematics*, 21:1141–1151, 2021.
DOI: [10.1007/s10208-020-09481-w](#), arXiv: [1905.02516](#).
- [8] Random sections of ellipsoids and the power of random information (with A. Hinrichs, E. Novak, J. Prochno, and M. Ullrich). *Transactions of the American Mathematical Society*, 374(12):8691–8713, 2021.
DOI: [10.1090/tran/8502](#), arXiv: [1901.06639](#).
- [7] Expected dispersion of uniformly distributed points (with A. Hinrichs, R.J. Kunsch, and D. Rudolf). *Journal of Complexity*, 61:101483, 2020.
DOI: [10.1016/j.jco.2020.101483](#), arXiv: [1911.12074](#).

- [6] Uniform recovery of high-dimensional C^r -functions.
Journal of Complexity, 50:116–126, 2019.
DOI: [10.1016/j.jco.2018.10.002](https://doi.org/10.1016/j.jco.2018.10.002), arXiv: [1805.06220](https://arxiv.org/abs/1805.06220).
- [5] Recovery algorithms for high-dimensional rank one tensors (with D. Rudolf).
Journal of Approximation Theory, 237:17–29, 2019.
DOI: [10.1016/j.jat.2018.08.002](https://doi.org/10.1016/j.jat.2018.08.002), arXiv: [1711.03986](https://arxiv.org/abs/1711.03986).
- [4] Optimal Monte Carlo methods for L^2 -approximation.
Constructive Approximation, 49:385–403, 2019.
DOI: [10.1007/s00365-018-9428-4](https://doi.org/10.1007/s00365-018-9428-4), arXiv: [1705.04567](https://arxiv.org/abs/1705.04567).
- [3] On the dispersion of sparse grids.
Journal of Complexity, 45:115–119, 2018.
DOI: [10.1016/j.jco.2017.11.005](https://doi.org/10.1016/j.jco.2017.11.005), arXiv: [1709.02983](https://arxiv.org/abs/1709.02983).
- [2] Tensor power sequences and the approximation of tensor product operators.
Journal of Complexity, 44:30–51, 2018.
DOI: [10.1016/j.jco.2017.09.002](https://doi.org/10.1016/j.jco.2017.09.002), arXiv: [1612.07680](https://arxiv.org/abs/1612.07680).
- [1] A universal algorithm for multivariate integration (with E. Novak).
Foundations of Computational Mathematics, 17(4):895–916, 2017.
DOI: [10.1007/s10208-016-9307-y](https://doi.org/10.1007/s10208-016-9307-y), arXiv: [1507.06853](https://arxiv.org/abs/1507.06853).

Book chapters

- [1] On the power of random information (with A. Hinrichs, E. Novak, J. Prochno, and M. Ullrich). In F. J. Hickernell, P. Kritzer (eds.): *Multivariate Algorithms and Information-Based Complexity*, pp. 43–64, Berlin/Boston: DeGruyter, 2020.
DOI: [10.1515/9783110635461](https://doi.org/10.1515/9783110635461), arXiv: [1903.00681](https://arxiv.org/abs/1903.00681).

Theses

- [2] Algorithms and Complexity for some Multivariate Problems.
Dissertation, Friedrich Schiller University Jena, Germany, 2019, arXiv: [1905.01166](https://arxiv.org/abs/1905.01166).
- [1] On the randomization of Frolov’s algorithm for multivariate integration.
Master thesis, Friedrich Schiller University Jena, Germany, 2016, arXiv: [1603.04637](https://arxiv.org/abs/1603.04637).

Talks and research visits

- [28] School of Mathematics and Statistics, UNSW Sydney, Australia, March 2023.
Research visit and seminar talk.
- [27] *9th Workshop on High-Dimensional Approximation (HDA2023)*, Canberra, Australia, February 2023. Contributed talk.

- [26] Conference *Approximation and geometry in high dimensions*, Będlewo, Poland, October 2022. **Plenary talk.**
- [25] Oberseminar M15, TU Munich, July 2022. Research visit and talk.
- [24] Conference *Curves and Surfaces*, Arcachon, France, June 2022. Invited talk.
- [23] Workshop *Optimal Point Configurations on Manifolds*, Erwin Schrödinger Institute, Vienna, Austria, January 2022. Invited talk.
- [22] *13th International Conference on Monte Carlo Methods and Applications* (MCM 2021), University of Mannheim, online, August 2021. Invited talk.
- [21] School and conference *Sampling Recovery and Related Problems*, Laboratory of High-Dimensional Approximation and Applications of the Lomonosov Moscow State University, Chemnitz Technical University, and Moscow Center of Fundamental and Applied Mathematics, online, May 2021. Two invited talks.
- [20] Webinar *Point Distributions*, organized by Damir Ferizović (TU Graz), Ryan Matzke (University of Minnesota), and Oleksandr Vlasiuk (Florida State University), online, August 2020. Invited talk.
- [19] Conference *Foundations of Computational Mathematics* (FoCM 2020), Simon Fraser University of Vancouver, Canada, June 2020 [canceled due to COVID]. Invited for a **semi-plenary lecture.**
- [18] Conference *New Perspectives and Computational Challenges in High Dimensions*, Mathematical Research Institute of Oberwolfach, Germany, February 2020. Invited talk.
- [17] Fall School *Algorithms and Complexity in High Dimensions*, Graz, Austria, October 2019. Two invited talks.
- [16] Summer School *Analysis and Theoretical Numerics*, Siegmundsburg, Germany, August 2019. Two invited talks.
- [15] Dagstuhl Seminar *Algorithms and Complexity for Continuous Problems*, Schloss Dagstuhl, Germany, August 2019. Invited talk.
- [14] *9th International Congress on Industrial and Applied Mathematics* (ICIAM 2019), Valencia, Spain, July 2019. Invited talk.
- [13] *12th International Conference on Monte Carlo Methods and Applications* (MCM 2019), Sydney, Australia, July 2019. Invited talk.
- [12] Workshop *Stochastic Computation and Complexity* at the Henri Poincaré Institute (IHP), Paris, France, April 2019. Invited talk.
- [11] *9th International Conference on Numerical Methods and Applications* (NM&A18), Borovets, Bulgaria, August 2018. Invited talk.
- [10] *13th International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing* (MCQMC 2018), Rennes, France, July 2018. Invited talk.

- [9] Research Seminar of the Johann Radon Institute for Computational and Applied Mathematics (RICAM), Linz, Austria, February 2018. Research visit and talk.
- [8] Annual celebrations of the Faculty of Mathematics and Computer Science at the Friedrich Schiller University, Jena, Germany, November 2017. Invited talk.
- [7] 2nd workshop of the program *Tractability of high dimensional problems and discrepancy* at the Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna, Austria, October 2017. Invited talk.
- [6] *11th International Conference on Monte Carlo Methods and Applications* (MCM 2017), Montreal, Canada, July 2017. Invited talk.
- [5] Seminar *Mathematics of Computation*, University Bonn, Germany, February 2017. Research visit and talk.
- [4] *IBC on the 70th anniversary of Henryk Woźniakowski*, Będlewo, Poland, August 2016. Invited talk.
- [3] *12th International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing* (MCQMC 2016), Stanford, USA, August 2016. Invited talk.
- [2] Research Seminar *Functional Analysis*, Johannes Kepler University, Linz, Austria, June 2016. Research visit and talk.
- [1] *Workshop in Discrepancy Theory*, Varenna, Italy, June 2016. Invited talk.