# Bastian Grossenbacher Rieck

*Curriculum vitæ* (February 4, 2026)

**Professor of Machine Learning**
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The path to improving machine learning and artificial intelligence requires strong foundations. I study these foundations through the lens of geometry and topology, with the aim of gaining insights at both the fine-grained and the coarse-grained level.

## Academic Positions

08/2024–now **Full Professor**, AIDOS Lab
University of Fribourg, Switzerland

10/2021–now **Principal Investigator**, Institute of AI for Health
Helmholtz Munich, Germany

01/2020–09/2021 **Senior Assistant**, Machine Learning and Computational Biology Lab
ETH Zurich, Switzerland

01/2018–12/2019 **Postdoctoral Researcher**, Machine Learning and Computational Biology Lab
ETH Zurich, Switzerland

## Education

2011–2017 **Ph.D.** in Computer Science at Heidelberg University, Germany, final grade **1.0** (*with distinction*)
*Persistent Homology in Multivariate Data Visualization*

2005–2011 **M.Sc.**[1] in Mathematics at Heidelberg University, Germany, final grade **1.0** (*with distinction*)
*Smoothness Analysis of Subdivision Algorithms*

## Grants

2025 • SNSF Scientific Exchanges Grant (**25,500 CHF**) for Differentiable Multi-Parameter Representation of Complex Data

2024 • ERC Starting Grant for *HOLES: Higher-Order Learning of Essential Structures with Geometry and Topology* (**1,500,000 EUR**). The grant is financed by SERI[2] under the Swiss transitional measures for the Horizon package.

• Mitacs Globalink Research Award for collaborating with Myriam Lizotte and Lydia Mezrag

• Helmholtz Visiting Researcher Grants for hosting Rayna Andreeva and Irene Cannistraci

2023 • MDSI Focus Topic Grant for *InterConnect: Interdisciplinary Research on Graphs, Networks, and Connectivity Structures* (**140,000 EUR**)

• Helmholtz Visiting Researcher Grants for hosting Kyriakos Soulios and Dr. Ariane Mora

2022 • Helmholtz Visiting Researcher Grants for hosting Davide Buffelli, Alexandros Keros, and Alma Ademović Tahirović

2021 • Helmholtz Principal Investigator Starting Grant (**1,900,000 EUR**)

2019 • SNSF Spark Grant (**100,000 CHF**) for TOPAZ: Topology of Alzheimer's

[1] The German degree *Diplom* is equivalent to a master's degree. It has now been superseded.
[2] Swiss State Secretariat for Education, Research, and Innovation

## Honors & Awards

2025
- Awarded the title of "ELLIS Scholar"
- Best paper award at the ICLR 2025 Workshop on Machine Learning Multiscale Processes
- Spotlight presentation (top 5% of all submissions) at ICLR 2025

2024
- Outstanding area chair (top 10%) for NeurIPS 2024

2023
- Outstanding area chair (top 10%) for NeurIPS 2023

2022
- Top reviewer (top 10%) for NeurIPS 2022
- Oral presentation (top 5% of all submissions) at LoG 2022
- Highlighted reviewer (top 10%) for ICLR 2022
- Spotlight presentation (top 5% of all submissions) at ICLR 2022
- Co-director of the Applied Algebraic Topology Research Network (AATRN)

2021
- "SIB Remarkable Output 2021" award
- Awarded the title of "TUM Junior Fellow" (until 2025)
- Outstanding reviewer (top 10%) and expert reviewer for ICML 2021
- Outstanding reviewer (top 10%) for ICLR 2021

2020
- Spotlight presentation (top 3% of all submissions) at NeurIPS 2020
- Top reviewer for ICML 2020 (among the top 1000 reviewers)

2019
- Outstanding reviewer for the ECML PKDD 2019 Journal Track
- Spotlight presentation (top 3% of all submissions) at NeurIPS 2019
- Outstanding reviewer (among the top 400 reviewers) for NeurIPS 2019
- Outstanding reviewer (top 5%) for ICML 2019

2018
- Outstanding reviewer (among the top 200 reviewers) for NeurIPS 2018
- Outstanding reviewer (among the top 100 reviewers) for ICML 2018

2017
- Award for the best extended abstract at *Topology-Based Methods in Visualization* (TopoInVis) 2017

2011–2014
- Merit scholarship of the National German Science Foundation

## Publications

Authors are usually ordered according to their contribution to a paper. Equal contributions are indicated using †, while joint supervision is denoted using ‡. Owing to the interdisciplinary nature of my work, author lists for publications in mathematical venues are typically sorted alphabetically. When available, DOIs and links to preprints are provided. **Following the CORE 2023 ranking of conferences, I have published 30 papers in *flagship* (A*) conferences and 3 papers in *excellent* (A) conferences. Moreover, I have published 25 papers in *high-impact* journals.**[3]

### Conference & Journal Publications

*In press*

1. J. Amboage, E. Röell, P. Schnider, and **B. Rieck**: *LEAP: Local ECT-Based Learnable Positional Encodings for Graphs*. International Conference on Learning Representations, 2026. arXiv: 2510.00757 [cs.LG]. (In press)
2. K. Limbeck†, L. Mezrag†, G. Wolf‡, and **B. Rieck**‡: *Geometry-Aware Edge Pooling for Graph Neural Networks*. Advances in Neural Information Processing Systems, Volume 38, 2025. arXiv: 2506.11700 [cs.LG]. (In press)

[3] A journal is considered *high-impact* relative to other journals if it ranks in the top 25% of the respective research field with respect to its impact factor. This harmonizes fields with low citation counts (like applied mathematics) with those of high citation counts (like bioinformatics).

3. E. Röell and **B. Rieck**: *Point Cloud Synthesis Using Inner Product Transforms*. Advances in Neural Information Processing Systems, Volume 38, 2025. arXiv: 2410.18987 [cs.CV]. (In press)
4. B. M. Ruppik, J. von Rohrscheidt, C. van Niekerk, M. Heck, R. Vukovic, S. Feng, H.-c. Lin, N. Lubis, **B. Rieck**, M. Zibrowius, and M. Gašić: *Less is More: Local Intrinsic Dimensions of Contextual Language Models*. Advances in Neural Information Processing Systems, Volume 38, 2025. arXiv: 2506.01034 [cs.CL]. (In press)

2026

5. V. Toscano-Duran, F. Rottach, and **B. Rieck**: *Molecular Machine Learning Using Euler Characteristic Transforms*. Artificial Intelligence in Biomedicine, pp. 391–405, 2026. DOI: 10.1007/978-3-032-10661-2_30. arXiv: 2507.03474 [cs.LG]

2025

6. C. Coupette†, J. Wayland†, E. Simons, and **B. Rieck**: *No Metric to Rule Them All: Toward Principled Evaluations of Graph-Learning Datasets*. Proceedings of the 42nd International Conference on Machine Learning. Proceedings of Machine Learning Research 267, pp. 11405–11434, 2025. arXiv: 2502.02379 [cs.LG] J. von Rohrscheidt and **B. Rieck**: *Diss-l-ECT: Dissecting Graph Data with Local Euler Characteristic Transforms*. Proceedings of the 42nd International Conference on Machine Learning. Proceedings of Machine Learning Research 267, pp. 61790–61809, 2025. arXiv: 2410.02622 [cs.LG]
7. R. Ballester and **B. Rieck**: *On the Expressivity of Persistent Homology in Graph Learning*. Proceedings of the Third Learning on Graphs Conference. Proceedings of Machine Learning Research 269, 42:1–42:31, 2025. arXiv: 2302.09826 [cs.LG]
8. D. Buffelli†, F. Soleymani†, and **B. Rieck**: *CliquePH: Higher-Order Information for Graph Neural Networks through Persistent Homology on Clique Graphs*. Proceedings of the Third Learning on Graphs Conference. Proceedings of Machine Learning Research 269, 45:1–45:17, 2025. arXiv: 2409.08217 [cs.LG]
9. **B. Rieck**: *Topology meets Machine Learning: An Introduction using the Euler Characteristic Transform*. Notices of the American Mathematical Society 72:7, pp. 719–727, 2025. DOI: 10.1090/noti3193. arXiv: 2410.17760 [cs.LG]
10. M. D. Luecken†, S. Gigante†, D. B. Burkhardt†, R. Cannoodt†, D. C. Strobl, N. S. Markov, L. Zappia, G. Palla, W. Lewis, D. Dimitrov, M. E. Vinyard, D. S. Magruder, M. F. Mueller, A. Andersson, E. Dann, Q. Qin, D. J. Otto, M. Klein, O. B. Botvinnik, L. Deconinck, K. Waldrant, S. N. Yasa, A. Szałata, A. Benz, Z. Li, Open Problems Jamboree Members, **B. Rieck**, C. Ahlmann-Eltze, E. da Veiga Beltrame, C. Bravo González-Blas, A. T. Chen, B. DeMeo, C. Ergen, S. Floc'hlay, A. Gayoso, S. Hicks, Y. Ji, V. Kleshchevnikov, G. La Manno, M. G. Lombardo, R. Lopez, D. Righelli, H. Sarkar, V. Svensson, A. Tong, G. Xing, C. Xu, J. M. Bloom, A. O. Pisco, J. Saez-Rodriguez, D. Wulsin, L. Pinello, Y. Saeys, F. J. Theis‡, and S. Krishnaswamy‡: *Defining and benchmarking open problems in single-cell analysis*. Nature Biotechnology, 2025. DOI: 10.1038/s41587-025-02694-w
11. J. Wayland, R. J. Funk, and **B. Rieck**: *Characterizing Physician Referral Networks with Ricci Curvature*. Pediatric and Lifespan Data Science, pp. 1–16, 2025. DOI: 10.1007/978-3-031-88346-0_1. arXiv: 2408.16022 [cs.SI]
12. R. Ballester†, E. Röell†, D. B. Schmid†, M. Alain†, S. Escalera, C. Casacuberta, and **B. Rieck**: *MANTRA: The Manifold Triangulations Assemblage*. International Conference on Learning Representations, 2025. arXiv: 2410.02392 [cs.LG]
13. L. Hetzel†, J. Sommer†, **B. Rieck**, F. Theis, and S. Günnemann: *MAGNet: Motif-Agnostic Generation of Molecules from Scaffolds*. International Conference on Learning Representations, 2025. Accepted as a *spotlight* presentation (**top 5%** of all submissions). arXiv: 2305.19303 [physics.chem-ph]
14. Y. Zhang, L. Mezrag, X. Sun, C. Xu, K. Macdonald, D. Bhaskar, S. Krishnaswamy‡, G. Wolf‡, and **B. Rieck**‡: *Principal Curvatures Estimation with Applications to Single Cell Data*. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 1–5, 2025. DOI: 10.1109/ICASSP49660.2025.10888433. arXiv: 2502.03750 [cs.LG]

2024

15. K. Limbeck, R. Andreeva, R. Sarkar, and **B. Rieck**: *Metric Space Magnitude for Evaluating the Diversity of Latent Representations*. Advances in Neural Information Processing Systems, Volume 37, pp. 123911–123953, 2024. arXiv: 2311.16054 [cs.LG]
16. J. von Rohrscheidt, **B. Rieck**‡, and S. M. Schmon‡: *Bayesian Computation Meets Topology*. Transactions on Machine Learning Research, 2024.

17. T. Papamarkou, T. Birdal, M. Bronstein, G. Carlsson, J. Curry, Y. Gao, M. Hajij, R. Kwitt, P. Liò, P. D. Lorenzo, V. Maroulas, N. Miolane, F. Nasrin, K. N. Ramamurthy, **B. Rieck**, S. Scardapane, M. T. Schaub, P. Veličković, B. Wang, Y. Wang, G.-W. Wei, and G. Zamzmi: *Position: Topological Deep Learning is the New Frontier for Relational Learning*. Proceedings of the 41st International Conference on Machine Learning. Proceedings of Machine Learning Research 235, pp. 39529–39555, 2024. arXiv: 2402.08871 [cs.LG]

18. J. Wayland, C. Coupette‡, and **B. Rieck**‡: *Mapping the Multiverse of Latent Representations*. Proceedings of the 41st International Conference on Machine Learning. Proceedings of Machine Learning Research 235, pp. 52372–52402, 2024. arXiv: 2402.01514 [cs.LG]

19. M. F. Adamer, E. De Brouwer, L. O'Bray, and **B. Rieck**: *The magnitude vector of images*. Journal of Applied and Computational Topology 8:3, pp. 447–473, 2024. DOI: 10.1007/s41468-024-00182-9. arXiv: 2110.15188 [cs.LG]

20. R. M. Levenson, Y. Singh, **B. Rieck**, Q. A. Hathaway, C. Farrelly, J. Rozenblit, P. Prasanna, B. Erickson, A. Choudhary, G. Carlsson, and D. Deepa: *Advancing Precision Medicine: Algebraic Topology and Differential Geometry in Radiology and Computational Pathology*. Laboratory Investigation 104:6, 102060, 2024. DOI: 10.1016/j.labinv.2024.102060

21. C. Bock†, J. E. Walter†, **B. Rieck**†, I. Strebel, K. Rumora, I. Schaefer, M. J. Zellweger, K. Borgwardt‡, and C. Müller‡: *Enhancing the diagnosis of functionally relevant coronary artery disease with machine learning*. Nature Communications 15:1, 5034, 2024. DOI: 10.1038/s41467-024-49390-y

22. C. Coupette, J. Vreeken, and **B. Rieck**: *All the World's a (Hyper)Graph: A Data Drama*. Digital Scholarship in the Humanities 39:1, pp. 74–96, 2024. DOI: 10.1093/llc/fqad071. arXiv: 2206.08225 [cs.LG]

23. K. Maggs, C. Hacker, and **B. Rieck**: *Simplicial Representation Learning with Neural $k$-Forms*. International Conference on Learning Representations, 2024. arXiv: 2312.08515 [cs.LG]

24. E. Röell and **B. Rieck**: *Differentiable Euler Characteristic Transforms for Shape Classification*. International Conference on Learning Representations, 2024. arXiv: 2310.07630 [cs.LG]

2023

25. J. Southern†, J. Wayland†, M. Bronstein, and **B. Rieck**: *Curvature Filtrations for Graph Generative Model Evaluation*. Advances in Neural Information Processing Systems, Volume 36, pp. 63036–63061, 2023. arXiv: 2301.12906 [cs.LG]

26. C. Morris, Y. Lipman, H. Maron, **B. Rieck**, N. M. Kriege, M. Grohe, M. Fey, and K. Borgwardt: *Weisfeiler and Leman go Machine Learning: The Story so far*. Journal of Machine Learning Research 24:333, pp. 1–59, 2023. arXiv: 2112.09992 [cs.LG]

27. B. Giunti, J. Lazovskis, and **B. Rieck**: *DONUT: Creation, Development, and Opportunities of a Database*. Notices of the American Mathematical Society 70:10, pp. 1640–1644, 2023. DOI: 10.1090/noti2797. arXiv: 2304.12417 [cs.DL]

28. D. J. E. Waibel, E. Röell, **B. Rieck**‡, R. Giryes‡, and C. Marr‡: *A Diffusion Model Predicts 3D Shapes from 2D Microscopy Images*. IEEE International Symposium on Biomedical Imaging (ISBI), 2023. DOI: 10.1109/ISBI53787.2023.10230752. arXiv: 2208.14125 [cs.CV]

29. M. Moor†, N. Bennet†, D. Plecko†, M. Horn†, **B. Rieck**, N. Meinshausen, P. Bühlmann, and K. Borgwardt: *Predicting Sepsis Using Deep Learning Across International Sites: A Retrospective Development and Validation Study*. eClinicalMedicine 62, p. 102124, 2023. DOI: 10.1016/j.eclinm.2023.102124. arXiv: 2107.05230 [cs.LG]

30. J. von Rohrscheidt and **B. Rieck**: *Topological Singularity Detection at Multiple Scales*. Proceedings of the 40th International Conference on Machine Learning. Proceedings of Machine Learning Research 202, pp. 35175–35197, 2023. arXiv: 2210.00069 [cs.LG]

31. C. Coupette, S. Dalleiger, and **B. Rieck**: *Ollivier–Ricci Curvature for Hypergraphs: A Unified Framework*. International Conference on Learning Representations, 2023. arXiv: 2210.12048 [cs.LG]

32. G. Huguet†, A. Tong†, **B. Rieck**†, J. Huang†, M. Kuchroo, M. Hirn‡, G. Wolf‡, and S. Krishnaswamy‡: *Time-Inhomogeneous Diffusion Geometry and Topology*. SIAM Journal on Mathematics of Data Science 5:2, pp. 346–372, 2023. DOI: 10.1137/21M1462945. arXiv: 2203.14860 [cs.LG]

33. M. Kuchroo†, M. DiStasio†, E. Song, E. Calapkulu, L. Zhang, M. Ige, A. H. Sheth, A. Majdoubi, M. Menon, A. Tong, A. Godavarthi, Y. Xing, S. Gigante, H. Steach, J. Huang, G. Huguet, J. Narain, K. You, G. Mourgkos, R. M. Dhodapkar, M. J. Hirn, **B. Rieck**, G. Wolf, S. Krishnaswamy‡, and B. P. Hafler‡: *Single-cell analysis reveals inflammatory interactions driving macular degeneration*. Nature Communications 14:1, p. 2589, 2023. DOI: 10.1038/s41467-023-37025-7

34. J. L. Moore†, D. Bhaskar†, F. Gao†, C. Matte-Martone, S. Du, E. Lathrop, S. Ganesan, L. Shao, R. Norris, N. Campamà Sanz, K. Annusver, M. Kasper, A. Cox, C. Hendry, **B. Rieck**, S. Krishnaswamy‡, and V. Greco‡: *Cell cycle controls long-range calcium signaling in the regenerating epidermis*. Journal of Cell Biology 222:7, e202302095, 2023. DOI: 10.1083/jcb.202302095

35. D. Yoneoka and **B. Rieck**: *A Note on Cherry-Picking in Meta-Analyses*. Entropy 25:4, 2023. DOI: 10.3390/e25040691

2022

36. R. Liu†, S. Cantürk†, F. Wenkel, D. Sandfelder, D. Kreuzer, A. Little, S. McGuire, L. O'Bray, M. Perlmutter‡, **B. Rieck**‡, M. Hirn‡, G. Wolf‡, and L. Rampášek†‡: *Taxonomy of Benchmarks in Graph Representation Learning*. Proceedings of the First Learning on Graphs Conference. Proceedings of Machine Learning Research 198, 6:1–6:25, 2022. Accepted as an *oral* presentation (**top 5%** of all submissions). arXiv: 2206.07729 [cs.LG]

37. F. Graf, S. Zeng, **B. Rieck**, M. Niethammer, and R. Kwitt: *On Measuring Excess Capacity in Neural Networks*. Advances in Neural Information Processing Systems, Volume 35, pp. 10164–10178, 2022. arXiv: 2202.08070 [cs.LG]

38. D. Bhaskar†, K. MacDonald†, O. Fasina, D. Thomas, **B. Rieck**, I. Adelstein‡, and S. Krishnaswamy‡: *Diffusion Curvature for Estimating Local Curvature in High Dimensional Data*. Advances in Neural Information Processing Systems, 2022. arXiv: 2206.03977 [cs.LG]

39. D. J. E. Waibel, S. Atwell, M. Meier, C. Marr, and **B. Rieck**: *Capturing Shape Information with Multi-Scale Topological Loss Terms for 3D Reconstruction*. Medical Image Computing and Computer Assisted Intervention (MICCAI), pp. 150–159, 2022. DOI: 10.1007/978-3-031-16440-8_15. arXiv: 2203.01703 [cs.CV]

40. M. Horn†, E. De Brouwer†, M. Moor, Y. Moreau, **B. Rieck**‡, and K. Borgwardt‡: *Topological Graph Neural Networks*. International Conference on Learning Representations, 2022. arXiv: 2102.07835 [cs.LG]

41. L. O'Bray†, M. Horn†, **B. Rieck**‡, and K. Borgwardt‡: *Evaluation Metrics for Graph Generative Models: Problems, Pitfalls, and Practical Solutions*. International Conference on Learning Representations, 2022. Accepted as a *spotlight* presentation (**top 5%** of all submissions). arXiv: 2106.01098 [cs.LG]

42. S. Horoi†, J. Huang†, **B. Rieck**, G. Lajoie, G. Wolf‡, and S. Krishnaswamy‡: *Exploring the Geometry and Topology of Neural Network Loss Landscapes*. Advances in Intelligent Data Analysis XX, pp. 171–184, 2022. DOI: 10.1007/978-3-031-01333-1_14. arXiv: 2102.00485 [cs.LG]

43. M. Kuchroo†, J. Huang†, P. Wong†, J.-C. Grenier, D. Shung, A. Tong, C. Lucas, J. Klein, D. B. Burkhardt, S. Gigante, A. Godavarthi, **B. Rieck**, B. Israelow, M. Simonov, T. Mao, J. E. Oh, J. Silva, T. Takahashi, C. D. Odio, A. Casanovas-Massana, J. Fournier, Yale IMPACT Team, S. Farhadian, C. S. Dela Cruz, A. I. Ko, M. J. Hirn, F. P. Wilson‡, J. G. Hussin‡, G. Wolf‡, A. Iwasaki‡, and S. Krishnaswamy: *Multiscale PHATE identifies multimodal signatures of COVID-19*. Nature Biotechnology 40:5, pp. 681–691, 2022. DOI: 10.1038/s41587-021-01186-x. bioRxiv: 10.1101/2020.11.15.383661v1

44. C. Weis, A. Cuénod, **B. Rieck**, O. Dubuis, S. Graf, C. Lang, M. Oberle, M. Brackmann, K. K. Søgaard, M. Osthoff, K. Borgwardt‡, and A. Egli‡: *Direct antimicrobial resistance prediction from clinical MALDI-TOF mass spectra using machine learning*. Nature Medicine 28:1, pp. 164–174, 2022. DOI: 10.1038/s41591-021-01619-9. bioRxiv: 10.1101/2020.07.30.228411v2

2021

45. S. C. Brüningk†, F. Hensel†, L. Lukas, M. Kuijs, C. R. Jutzeler‡, and **B. Rieck**‡: *Back to the basics with inclusion of clinical domain knowledge — A simple, scalable, and effective model of Alzheimer's Disease classification*. Proceedings of the 6th Machine Learning for Healthcare Conference. Proceedings of Machine Learning Research 149, pp. 730–754, 2021.

46. L. O'Bray†, **B. Rieck**†, and K. Borgwardt: *Filtration Curves for Graph Representation*. Proceedings of the 27th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp. 1267–1275, 2021. DOI: 10.1145/3447548.3467442

47. K. Ghalamkari, M. Sugiyama, L. O'Bray, **B. Rieck**, and K. Borgwardt: *Advances in Graph Kernels*. Japanese and English. Trans. by K. Ghalamkari and M. Sugiyama. Journal of the Japanese Society for Artificial Intelligence 36:4, pp. 421–429, 2021. This article constitutes an abridged translation of our survey "Graph Kernels: State-of-the-Art and Future Challenges". DOI: 10.11517/jjsai.36.4_421

48. M. Moor†, **B. Rieck**†, M. Horn, C. R. Jutzeler‡, and K. Borgwardt‡: *Early Prediction of Sepsis in the ICU Using Machine Learning: A Systematic Review*. Frontiers in Medicine 8, 2021. DOI: 10.3389/fmed.2021.607952

49. F. Hensel, M. Moor, and **B. Rieck**: *A Survey of Topological Machine Learning Methods*. Frontiers in Artificial Intelligence 4, 2021. DOI: 10.3389/frai.2021.681108

50. R. Vandaele, **B. Rieck**, Y. Saeys, and T. De Bie: *Stable Topological Signatures for Metric Trees through Graph Approximations*. Pattern Recognition Letters 147, pp. 85–92, 2021. DOI: 10.1016/j.patrec.2021.03.035

51. A. C. Gumpinger, **B. Rieck**, D. G. Grimm, International Headache Genetics Consortium, and K. Borgwardt: *Network-guided search for genetic heterogeneity between gene pairs*. Bioinformatics 37:1, pp. 57–65, 2021. DOI: 10.1093/bioinformatics/btaa581

52. J. Born†, N. Wiedemann†, M. Cossio, C. Buhre, G. Brändle, K. Leidermann, J. Goulet, A. Aujayeb, M. Moor, **B. Rieck**, and K. Borgwardt: *Accelerating Detection of Lung Pathologies with Explainable Ultrasound Image Analysis*. Applied Sciences 11:2, 2021. DOI: 10.3390/app11020672. arXiv: 2009.06116 [cs.CV]

2020

53. T. Gumbsch, C. Bock, M. Moor, **B. Rieck**, and K. Borgwardt: *Enhancing statistical power in temporal biomarker discovery through representative shapelet mining*. Bioinformatics 36:Supplement_2, pp. i840–i848, 2020. DOI: 10.1093/bioinformatics/btaa815

54. **B. Rieck**†, T. Yates†, C. Bock, K. Borgwardt, G. Wolf, N. Turk-Browne‡, and S. Krishnaswamy‡: *Uncovering the Topology of Time-Varying fMRI Data using Cubical Persistence*. Advances in Neural Information Processing Systems, Volume 33, pp. 6900–6912, 2020. Accepted as a *spotlight* presentation at NeurIPS (**top 3%** of all submissions). arXiv: 2006.07882 [q-bio.NC]

55. K. Borgwardt, E. Ghisu, F. Llinares-López, L. O'Bray, and **B. Rieck**: *Graph Kernels: State-of-the-Art and Future Challenges*. Foundations and Trends® in Machine Learning 13:5–6, pp. 531–712, 2020. DOI: 10.1561/2200000076. arXiv: 2011.03854 [cs.LG]

56. C. D. Hofer, F. Graf, **B. Rieck**, M. Niethammer, and R. Kwitt: *Graph Filtration Learning*. Proceedings of the 37th International Conference on Machine Learning. Proceedings of Machine Learning Research 119, pp. 4314–4323, 2020. arXiv: 1905.10996 [cs.LG]

57. M. Horn, M. Moor, C. Bock, **B. Rieck**, and K. Borgwardt: *Set Functions for Time Series*. Proceedings of the 37th International Conference on Machine Learning. Proceedings of Machine Learning Research 119, pp. 4353–4363, 2020. arXiv: 1909.12064 [cs.LG]

58. M. Moor†, M. Horn†, **B. Rieck**‡, and K. Borgwardt‡: *Topological Autoencoders*. Proceedings of the 37th International Conference on Machine Learning. Proceedings of Machine Learning Research 119, pp. 7045–7054, 2020. arXiv: 1906.00722 [cs.LG]

59. C. R. Jutzeler†, L. Bourguignon†, C. V. Weis, B. Tong, C. Wong, **B. Rieck**, H. Pargger, S. Tschudin-Sutter, A. Egli, K. Borgwardt‡, and M. Walter‡: *Comorbidities, clinical signs and symptoms, laboratory findings, imaging features, treatment strategies, and outcomes in adult and pediatric patients with COVID-19: A systematic review and meta-analysis*. Travel Medicine and Infectious Disease 37, p. 101825, 2020. DOI: 10.1016/j.tmaid.2020.101825. medRxiv: 10.1101/2020.05.20.20103804v1

60. C. Weis†, M. Horn†, **B. Rieck**†, A. Cuénod, A. Egli, and K. Borgwardt: *Topological and kernel-based microbial phenotype prediction from MALDI-TOF mass spectra*. Bioinformatics 36:Supplement_1, pp. i30–i38, 2020. DOI: 10.1093/bioinformatics/btaa429

61. S. L. Hyland†, M. Faltys†, M. Hüser†, X. Lyu†, T. Gumbsch†, C. Esteban, C. Bock, M. Horn, M. Moor, **B. Rieck**, M. Zimmermann, D. Bodenham, K. Borgwardt‡, G. Rätsch‡, and T. M. Merz‡: *Early prediction of circulatory failure in the intensive care unit using machine learning*. Nature Medicine 26:3, pp. 364–373, 2020. DOI: 10.1038/s41591-020-0789-4

2019

62. C. Bock†, M. Togninalli†, E. Ghisu, T. Gumbsch, **B. Rieck**, and K. Borgwardt: *A Wasserstein Subsequence Kernel for Time Series*. Proceedings of the 19th IEEE International Conference on Data Mining (ICDM), pp. 964–969, 2019. DOI: 10.1109/ICDM.2019.00108

63. M. Togninalli†, E. Ghisu†, F. Llinares-López, **B. Rieck**, and K. Borgwardt: *Wasserstein Weisfeiler–Lehman Graph Kernels*. Advances in Neural Information Processing Systems, Volume 32, pp. 6436–6446, 2019. Accepted as a *spotlight* presentation at NeurIPS (**top 3%** of all submissions). arXiv: 1906.01277 [cs.LG]

64. M. Moor, M. Horn, **B. Rieck**, D. Roqueiro, and K. Borgwardt: *Early Recognition of Sepsis with Gaussian Process Temporal Convolutional Networks and Dynamic Time Warping*. Proceedings of the 4th Machine Learning for Healthcare Conference. Proceedings of Machine Learning Research 106, pp. 2–26, 2019. arXiv: 1902.01659 [cs.LG]

65. **B. Rieck**†, C. Bock†, and K. Borgwardt: *A Persistent Weisfeiler–Lehman Procedure for Graph Classification*. Proceedings of the 36th International Conference on Machine Learning. Proceedings of Machine Learning Research 97, pp. 5448–5458, 2019.

66. B. Zheng, **B. Rieck**, H. Leitte, and F. Sadlo: *Visualization of Equivalence in 2D Bivariate Fields*. Computer Graphics Forum 38:3, pp. 311–323, 2019. DOI: 10.1111/cgf.13691

67. **B. Rieck**†, M. Togninalli†, C. Bock†, M. Moor, M. Horn, T. Gumbsch, and K. Borgwardt: *Neural Persistence: A Complexity Measure for Deep Neural Networks Using Algebraic Topology*. International Conference on Learning Representations, 2019. arXiv: 1812.09764 [cs.LG]

2018

68. K. Hanser, O. Klein, **B. Rieck**, B. Wiebe, T. Selz, M. Piatkowski, A. Sagristà, B. Zheng, M. Lukácová-Medvidová, G. Craig, H. Leitte, and F. Sadlo: *Visualization of Parameter Sensitivity of 2D Time-Dependent Flow*. Advances in Visual Computing (Proceedings of the 13th International Symposium on Visual Computing), pp. 359–370, 2018. DOI: 10.1007/978-3-030-03801-4_32

69. C. Bock, T. Gumbsch, M. Moor, **B. Rieck**, D. Roqueiro, and K. Borgwardt: *Association mapping in biomedical time series via statistically significant shapelet mining*. Bioinformatics 34:13, pp. i438–i446, 2018. DOI: 10.1093/bioinformatics/bty246

70. L. Hofmann, **B. Rieck**, and F. Sadlo: *Visualization of 4D Vector Field Topology*. Computer Graphics Forum 37:3, pp. 301–313, 2018. DOI: 10.1111/cgf.13421

71. K. Sdeo, **B. Rieck**, and F. Sadlo: *Visualization of Fullerene Fragmentation*. Proceedings of IEEE Pacific Visualization Symposium (PacificVis), pp. 111–115, 2018. DOI: 10.1109/PacificVis.2018.00022

72. **B. Rieck**, U. Fugacci, J. Lukasczyk, and H. Leitte: *Clique Community Persistence: A Topological Visual Analysis Approach for Complex Networks*. IEEE Transactions on Visualization and Computer Graphics 24:1, pp. 822–831, 2018. DOI: 10.1109/TVCG.2017.2744321

2016

73. **B. Rieck** and H. Leitte: *Exploring and Comparing Clusterings of Multivariate Data Sets Using Persistent Homology*. Computer Graphics Forum 35:3, pp. 81–90, 2016. DOI: 10.1111/cgf.12884

2015

74. **B. Rieck** and H. Leitte: *Persistent Homology for the Evaluation of Dimensionality Reduction Schemes*. Computer Graphics Forum 34:3, pp. 431–440, 2015. DOI: 10.1111/cgf.12655

2014

75. **B. Rieck** and H. Leitte: *Structural Analysis of Multivariate Point Clouds Using Simplicial Chains*. Computer Graphics Forum 33:8, pp. 28–37, 2014. DOI: 10.1111/cgf.12398

2013

76. **B. Rieck**, H. Mara, and S. Krömker: *Unwrapping Highly-Detailed 3D Meshes of Rotationally Symmetric Man-Made Objects*. ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences II-5/W1, pp. 259–264, 2013. DOI: 10.5194/isprsannals-II-5-W1-259-2013

2012

77. **B. Rieck**, H. Mara, and H. Leitte: *Multivariate Data Analysis Using Persistence-Based Filtering and Topological Signatures*. IEEE Transactions on Visualization and Computer Graphics 18:12, pp. 2382–2391, 2012. DOI: 10.1109/TVCG.2012.248

### Workshop Publications

2025

78. V. Toscano-Duran and **B. Rieck**: *A Topological Molecular Representation for Molecular Learning Based on the Euler Characteristic Transform*. ECML PKDD Workshop on Mining and Learning with Graphs, 2025.

79. K. Limbeck†, L. Mezrag†, G. Wolf‡, and **B. Rieck**‡: *Geometry-Aware Edge Pooling for Graph Neural Networks*. ECML PKDD Workshop on Mining and Learning with Graphs, 2025.

80. C. Koke, D. Schnaus, Y. Shen, A. Saroha, M. Eisenberger, **B. Rieck**, M. M. Bronstein, and D. Cremers: *On Multi-Scale Graph Representation Learning*. ICLR Workshop on Learning Meaningful Representations of Life (LMRL), 2025.

81. C. Koke, Y. Shen, A. Saroha, M. Eisenberger, **B. Rieck**, M. M. Bronstein, and D. Cremers: *Graph Networks Struggle with Variable Scale*. ICLR Workshop "I Can't Believe It's Not Better: Challenges in Applied Deep Learning", 2025.

82. C. Koke, Y. Shen, A. Saroha, M. Eisenberger, **B. Rieck**, M. M. Bronstein, and D. Cremers: *On Incorporating Scale into Graph Networks*. ICLR Workshop on Machine Learning Multiscale Processes, 2025.

2024

83. M. Alain, S. Takao, **B. Rieck**, X. Dong, and E. Noutahi: *Graph Classification Gaussian Processes via Hodgelet Spectral Features*. "Bayesian Decision-Making and Uncertainty" Workshop at NeurIPS, 2024.

84. Y. Zhang†, L. Mezrag†, X. Sun, C. Xu, S. Krishnaswamy‡, G. Wolf‡, and **B. Rieck**‡: *Adaptative Local PCA for Curvature Estimation on Data Manifolds*. Helmholtz AI Conference: AI for Science, 2024.

2023

85. R. Andreeva, K. Limbeck, **B. Rieck**‡, and R. Sarkar‡: *Metric Space Magnitude and Generalisation in Neural Networks*. Proceedings of the 2nd Annual Workshop on Topology, Algebra, and Geometry in Machine Learning (TAG-ML). Proceedings of Machine Learning Research 221, pp. 242–253, 2023. arXiv: 2305.05611 [cs.LG]

86. K. V. Nadimpalli, A. Chattopadhyay‡, and **B. Rieck**‡: *Euler Characteristic Transform Based Topological Loss for Reconstructing 3D Images from Single 2D Slices*. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW), pp. 571–579, 2023. arXiv: 2303.05286 [cs.LG]

2022

87. D. Thomas, S. Demers, S. Krishnaswamy‡, and **B. Rieck**‡: *Topological Jet Tagging*. "Machine Learning and the Physical Sciences" Workshop at NeurIPS, 2022.

88. J. Dyer, J. Fitzgerald, **B. Rieck**, and S. M. Schmon: *Approximate Bayesian Computation for Panel Data with Signature Maximum Mean Discrepancies*. "Temporal Graph Learning" Workshop at NeurIPS, 2022.

89. C. Hacker and **B. Rieck**: *On the Surprising Behaviour of* `node2vec`. Proceedings of Topological, Algebraic, and Geometric Learning Workshops 2022. Proceedings of Machine Learning Research 196, pp. 142–151, 2022. arXiv: 2206.08252 [cs.LG]

90. K. MacDonald, J. Paige, D. Thomas, S. Zhao, K. You, I. M. Adelstein, Y. Aizenbud, **B. Rieck**, D. Bhaskar, and S. Krishnaswamy: *Diffusion-Based Methods for Estimating Curvature in Data*. "Geometrical and Topological Representation Learning" Workshop at ICLR, 2022.

2021

91. M. Kuijs, C. R. Jutzeler, **B. Rieck**, and S. C. Brüningk: *Interpretability Aware Model Training to Improve Robustness against Out-of-Distribution Magnetic Resonance Images in Alzheimer's Disease Classification*. "Machine Learning for Health (ML4H)" Symposium, 2021. arXiv: 2111.08701 [eess.IV]

92. R. Liu†, S. Cantürk†, F. Wenkel, D. Sandfelder, D. Kreuzer, A. Little, S. McGuire, M. Perlmutter, L. O'Bray, **B. Rieck**, M. Hirn, G. Wolf, and L. Rampášek: *Towards a Taxonomy of Graph Learning Datasets*. "Data-Centric AI" Workshop at NeurIPS, 2021. arXiv: 2110.14809 [cs.LG]

93. M. D. Luecken†, D. B. Burkhardt†, R. Cannoodt†, C. Lance†, A. Agrawal, H. Aliee, A. T. Chen, L. Deconinck, A. M. Detweiler, A. A. Granados, S. Huynh, L. Isacco, Y. J. Kim, B. De Kumar, S. Kuppasani, H. Lickert, A. McGeever, J. C. Melgarejo, H. Mekonen, M. Morri, M. Müller, N. Neff, S. Paul, **B. Rieck**, K. Schneider, S. Steelman, M. Sterr, D. J. Treacy, A. Tong, A.-C. Villani, G. Wang, J. Yan, C. Zhang, A. O. Pisco‡, S. Krishnaswamy‡, F. J. Theis‡, and J. M. Bloom‡: *A Sandbox for Prediction and Integration of DNA, RNA, and Proteins in Single Cells*. Advances in Neural Information Processing Systems (Datasets and Benchmarks Track), 2021.

94. S. Horoi†, J. Huang†, **B. Rieck**, G. Lajoie, G. Wolf‡, and S. Krishnaswamy‡: *Exploring the Loss Landscape of Neural Networks with Manifold Learning and Topological Data Analysis*. Montreal AI Symposium, 2021.

95. M. Horn†, E. De Brouwer†, M. Moor, Y. Moreau, **B. Rieck**‡, and K. Borgwardt‡: *Topological Graph Neural Networks*. 29th Fall Workshop on Computational Geometry, 2021.

96. F. Gao, J. Moore, **B. Rieck**, V. Greco, and S. Krishnaswamy: *Exploring epithelial-cell calcium signaling with geometric and topological data analysis*. "Geometrical and Topological Representation Learning" Workshop at ICLR, 2021.

2020

97. M. Moor, M. Horn, K. Borgwardt, and **B. Rieck**: *Challenging Euclidean Topological Autoencoders*. "Topological Data Analysis and Beyond" Workshop at NeurIPS, 2020.

98. S. Groha†, C. Weis†, A. Gusev, and **B. Rieck**: *Topological Data Analysis of Copy Number Alterations in Cancer*. NeurIPS Workshop on Learning Meaningful Representations of Life (LMRL), 2020. arXiv: 2011.11070 [q-bio.GN],

99. S. C. Brüningk†, F. Hensel†, C. R. Jutzeler‡, and **B. Rieck**‡: *Scalable Solutions for MR Image Classification of Alzheimer's Disease*. "Medical Imaging meets NeurIPS" Workshop at NeurIPS, 2020.

100. S. C. Brüningk†, F. Hensel†, C. R. Jutzeler‡, and **B. Rieck**‡: *Image Analysis for Alzheimer's Disease Prediction: Embracing Pathological Hallmarks for Model Architecture Design*. "Machine Learning for Health (ML4H)" Workshop at NeurIPS, 2020. arXiv: 2011.06531 [cs.LG]

101. M. Moor, M. Horn, C. Bock, K. Borgwardt, and **B. Rieck**: *Path Imputation Strategies for Signature Models*. ICML Workshop on the Art of Learning with Missing Values (ARTEMISS), 2020.

102. **B. Rieck**[†], T. Yates[†], C. Bock, K. Borgwardt, G. Wolf, N. Turk-Browne[‡], and S. Krishnaswamy[‡]: *Topological Methods for fMRI Data*. ICML Workshop on Computational Biology, 2020.

103. C. Weis[†], M. Horn[†], **B. Rieck**[†], A. Cuénod, A. Egli, and K. Borgwardt: *Kernel-Based Antimicrobial Resistance Prediction from MALDI-TOF Mass Spectra*. ICML Workshop on Machine Learning for Global Health, 2020.

2019 104. C. Bock[†], M. Togninalli[†], E. Ghisu, T. Gumbsch, **B. Rieck**, and K. Borgwardt: *A Wasserstein Subsequence Kernel for Time Series*. "Optimal Transport & Machine Learning" Workshop at NeurIPS, 2019.

2017 105. **B. Rieck**, H. Leitte, and F. Sadlo: *Persistence Concepts for 2D Skeleton Evolution Analysis*. Workshop on Topology-Based Methods in Visualization (TopoInVis), 2017.

106. **B. Rieck**, H. Leitte, and F. Sadlo: *Hierarchies and Ranks for Persistence Pairs*. Workshop on Topology-Based Methods in Visualization (TopoInVis), 2017. **Award** for the best extended abstract.

2016 107. **B. Rieck** and H. Leitte: 'Shall I compare thee to a network?' — *Visualizing the Topological Structure of Shakespeare's Plays*. Workshop on Visualization for the Digital Humanities at IEEE Vis, 2016.

2015 108. **B. Rieck** and H. Leitte: *Comparing Dimensionality Reduction Methods Using Data Descriptor Landscapes*. Symposium on Visualization in Data Science (VDS) at IEEE VIS, 2015.

109. **B. Rieck** and H. Leitte: *Agreement Analysis of Quality Measures for Dimensionality Reduction*. Workshop on Topology-Based Methods in Visualization (TopoInVis), 2015.

2014 110. **B. Rieck** and H. Leitte: *Enhancing Comparative Model Analysis Using Persistent Homology*. IEEE Vis Workshop on Visualization for Predictive Analytics, 2014.

### Book Chapters

2020 111. **B. Rieck**, F. Sadlo, and H. Leitte: *Persistence Concepts for 2D Skeleton Evolution Analysis*. Topological Methods in Data Analysis and Visualization V, pp. 139–154, Springer, 2020. DOI: 10.1007/978-3-030-43036-8_9. arXiv: 1907.13486 [math.AT]

112. **B. Rieck**, F. Sadlo, and H. Leitte: *Topological Machine Learning with Persistence Indicator Functions*. Topological Methods in Data Analysis and Visualization V, pp. 87–101, Springer, 2020. DOI: 10.1007/978-3-030-43036-8_6. arXiv: 1907.13496 [math.AT]

113. **B. Rieck**, M. Banagl, F. Sadlo, and H. Leitte: *Persistent Intersection Homology for the Analysis of Discrete Data*. Topological Methods in Data Analysis and Visualization V, pp. 37–51, Springer, 2020. DOI: 10.1007/978-3-030-43036-8_3. arXiv: 1907.13485 [math.AT]

114. **B. Rieck**, F. Sadlo, and H. Leitte: *Hierarchies and Ranks for Persistence Pairs*. Topological Methods in Data Analysis and Visualization V, pp. 3–17, Springer, 2020. DOI: 10.1007/978-3-030-43036-8_1. arXiv: 1907.13495 [math.AT]

2017 115. **B. Rieck** and H. Leitte: *Agreement Analysis of Quality Measures for Dimensionality Reduction. Theory, Algorithms, and Applications*. Topological Methods in Data Analysis and Visualization IV, pp. 103–117, Springer, 2017. DOI: 10.1007/978-3-319-44684-4_6

2016 116. J. Fangerau, B. Höckendorf, **B. Rieck**, C. Heine, J. Wittbrodt, and H. Leitte: *Interactive Similarity Analysis and Error Detection in Large Tree Collections. Towards Making an Impact*. Visualization in Medicine and Life Sciences III, pp. 287–307, Springer, 2016. DOI: 10.1007/978-3-319-24523-2_13

### Other Publications

2024 117. Contributing author to P. Dłotko, D. Feichtner-Kozlov, A. Stefanou, Y. Wang, and J. F. Senge: *Applied and Combinatorial Topology (Dagstuhl Seminar 24092)*. Dagstuhl Reports 14:2, pp. 206–239, 2024. DOI: 10.4230/DagRep.14.2.206

2023 118. H. Alhoori, E. A. Fox, I. Frommholz, H. Liu, C. Coupette, **B. Rieck**, T. Ghosal, and J. Wu: *Who can Submit an Excellent Review for this Manuscript in the Next 30 Days? — Peer Reviewing in the Age of Overload*. ACM/IEEE Joint Conference on Digital Libraries (JCDL), pp. 319–320, 2023. DOI: 10.1109/JCDL57899.2023.00077

## Preprints

2026 119. M. Carrasco[†], O. Zaghen[†], K. Sumaraj, E. Bekkers, and **B. Rieck**: *Graph Homomorphism Distortion: A Metric to Distinguish Them All and in the Latent Space Bind Them*, 2026. arXiv: 2511.03068 [cs.LG]

2025 120. S. V. Bodea, R. G. Laiz, R. H. Williams, M. Gladkova, D. Thalmeier, **B. Rieck**, F. Sigmund, M. Piraud, A. Wohlschlaeger, D. Juestel, A. Stroh, S. Schneider, and G. G. Westmeyer: *Cortex-Wide Preservation of Multi-Stimulus Information across Degrees of Network Synchronization*, 2025. bioRxiv: 10.64898/2025.11.28.690948v1

121. F. Rottach, W. Rudman, **B. Rieck**, H. Scells, and C. Eickhoff: *From Topology to Retrieval: Decoding Embedding Spaces with Unified Signatures*, 2025. arXiv: 2511.22150 [cs.LG]

122. S. McGuire Scullen[†], E. Röell[†], E. Munch, **B. Rieck**, and M. Hirn: *NervePool: A Simplicial Pooling Layer*, 2025. arXiv: 2305.06315 [cs.CG]

123. N. Canova, S. Kališnik, A. Moser, **B. Rieck**, and A. Žegarac: *Persistent Homology via Ellipsoids*, 2025. arXiv: 2408.11450 [math.AT]

124. I. Cannistraci, S. Antonelli, E. Palumbo, T. M. Sutter, E. Rodolà, **B. Rieck**, and J. E. Vogt: *TOAST: Transformer Optimization using Adaptive and Simple Transformations*, 2025. arXiv: 2410.04941 [cs.LG]

125. T. L. Saidi, A. Hickok, **B. Rieck**, and A. J. Blumberg: *EmbedOR: Provable Cluster-Preserving Visualizations with Curvature-Based Stochastic Neighbor Embeddings*, 2025. arXiv: 2509.03703 [cs.LG]

126. C. de Bodt[†], A. Diaz-Papkovich[†], M. Bleher, K. Bunte, C. Coupette, S. Damrich, E. F. Sanmartin, F. A. Hamprecht, E.-Á. Horvát, D. Kohli, S. Krishnaswamy, J. A. Lee, B. P. F. Lelieveldt, L. McInnes, I. T. Nabney, M. Noichl, P. G. Poličar, **B. Rieck**, G. Wolf, G. Mishne[‡], and D. Kobak[‡]: *Low-dimensional embeddings of high-dimensional data*, 2025. arXiv: 2508.15929 [cs.LG]

127. M. Alain, S. Takao, X. Dong, **B. Rieck**, and E. Noutahi: *Graph and Simplicial Complex Prediction Gaussian Process via the Hodgelet Representations*, 2025. arXiv: 2505.10877 [cs.LG]

128. D. Bhaskar[†], Y. Zhang[†], J. Moore, F. Gao, **B. Rieck**, G. Wolf, F. Khasawneh, E. Munch, J. A. Noah, H. Pushkarskaya, C. Pittenger, V. Greco, and S. Krishnaswamy: *Neurospectrum: A Geometric and Topological Deep Learning Framework for Uncovering Spatiotemporal Signatures in Neural Activity*, 2025. bioRxiv: 10.1101/2023.03.22.533807v3

129. T. John, Y. Zhou, A. Aljishi, **B. Rieck**, N. B. Turk-Browne, and E. C. Damisah: *Representation of visual sequences in the tuning and topology of neuronal activity in the human hippocampus*, 2025. bioRxiv: 10.1101/2025.03.04.641300v1

2024 130. K. Limbeck and **B. Rieck**: *Detecting Spatial Dependence in Transcriptomics Data using Vectorised Persistence Diagrams*, 2024. arXiv: 2409.03575 [stat.ME]

131. S. Kazeminia, C. Marr[‡], and **B. Rieck**[‡]: *Topologically Regularized Multiple Instance Learning to Harness Data Scarcity*, 2024. arXiv: 2307.14025 [cs.LG]

132. B. Holmgren, E. Quist, J. Schupbach, B. T. Fasy, and **B. Rieck**: *The Manifold Density Function: An Intrinsic Method for the Validation of Manifold Learning*, 2024. arXiv: 2402.09529 [cs.LG]

2023 133. **B. Rieck** and C. Coupette: *Evaluating the "Learning on Graphs" Conference Experience*, 2023. arXiv: 2306.00586 [cs.LG]

2022 134. C. Weis[†], **B. Rieck**[†], S. Balzer[†], A. Cuénod, A. Egli, and K. Borgwardt: *Improved MALDI-TOF MS based antimicrobial resistance prediction through hierarchical stratification*, 2022. bioRxiv: 10.1101/2022.04.13.488198v1

2021 135. **B. Rieck**: *Basic Analysis of Bin-Packing Heuristics*, 2021. arXiv: 2104.12235 [math.OC]

2020 136. M. Moor, M. Horn, C. Bock, K. Borgwardt, and **B. Rieck**: *Path Imputation Strategies for Signature Models of Irregular Time Series*. A preliminary version of this work was accepted for presentation at the ICML Workshop on the Art of Learning with Missing Values (ARTEMISS), 2020. arXiv: 2005.12359 [cs.LG]

## Theses

2017 137. **B. Rieck**: *Persistent Homology in Multivariate Data Visualization*. Ph.D. thesis, Heidelberg University, 2017. DOI: 10.11588/heidok.00022914

2011 138. **B. Rieck**: *Smoothness Analysis of Subdivision Algorithms*. M.Sc. thesis, Heidelberg University, 2011. DOI: 10.11588/heidok.00013011

## Teaching (Selected)

2025
- UE-SIN.03023: *Algorithmics*
- UE-SIN.07833: *Seminar on Geometry and Topology in Deep Learning*
- UE-SIN.07835: *Seminar on AI and History: Machine Learning Meets Historical Methods*
- UE-SIN.06022 / UE-SIN.08022: *Machine Learning*

2024
- UE-SIN.03023: *Algorithmics*
- UE-SIN.07833: *Seminar on Geometry and Topology in Deep Learning*
- Taught a two-day online course on *Topological Machine Learning* as part of an *Introduction to Topological Data Analysis* course of the Spanish Topology Network.

2023
- Substitute lecturer, *Statistical Learning*, Technical University of Munich

2022
- Taught a three-day course on *Synergies between Topological Data Analysis and Machine Learning* as part of the "STRUCTURES Cluster of Excellence" of Heidelberg University.

2021
- Mentor and lecturer for the *Diffusion Geometry and Topology* project of the Summer Undergraduate Maths Research at Yale (SUMRY) program.

2020
- Lecturer and teaching assistant, *Data Mining I*, ETH Zurich
- Substitute lecturer, *Data Mining II*, ETH Zurich

## Students

### Current Group Members

2025–now
- Inés García-Redondo (Postdoctoral Researcher, University of Fribourg)
- Elena Xinyi Wang (Postdoctoral Researcher, University of Fribourg)
- Martin Carrasco (Ph.D. Student, University of Fribourg)
- Johannes Schmidt (Ph.D. Student, University of Fribourg)
- Nadja Häusermann (Ph.D. Student, University of Fribourg)

2024–now
- Richard von Moos (Ph.D. Student, University of Fribourg)
- Rubén Ballester (Ph.D. Student, Universitat de Barcelona)

2023–now
- Sebastian Birk (Ph.D. Student, Technical University of Munich)

2022–now
- Lydia Mezrag (Ph.D. Student, Université de Montréal)
- Katharina Limbeck (Ph.D. Student, Technical University of Munich)
- Salome Kazeminia (Ph.D. Student, Technical University of Munich)
- Ernst Röell (Ph.D. Student, Technical University of Munich)
- Jeremy Wayland (Ph.D. Student, Technical University of Munich)
- Julius von Rohrscheidt (Ph.D. Student, Technical University of Munich)

### Alumni & Alumnæ

2023
- Corinna Coupette (Ph.D. Student, Saarland University & Max Planck Institute for Informatics)

## Service to the Community

I am actively serving the community as a committee member, reviewer, and organizer. Moreover, I am promoting STEM research in general and my research in particular by participating in outreach activities. For conciseness reasons, the subsequent lists only reflect recent activities of the last five years.

## Conference & Workshop Organization

2024
- Scientific Committee Member, London Geometry and Machine Learning Summer School (LOGML)

2023
- Organized SampTA, the 14th International Conference on Sampling Theory and Applications. Also serving as program chair for the conference.
- Organized a workshop on "Topology, Algebra, and Geometry for Machine Learning" as part of ICML 2023.
- Organized a workshop on "Topology, Algebra, and Geometry for Pattern Recognition with Applications" as part of CVPR 2023.

2022
- Serving as a program chair for the first conference on Learning on Graphs (LoG)
- Organized a BIRS Workshop on Deep Exploration of Non-Euclidean Data with Geometric and Topological Representation Learning
- Organized an ICLR 2022 workshop on Geometrical and Topological Representation Learning.

2021
- Organized a NeurIPS 2021 competition on Multimodal Single-Cell Data Integration.
- Organized an ICLR 2021 workshop on Geometrical and Topological Representation Learning.
- Organizer and panel moderator for a track on Clinical Machine Learning at the Applied Machine Learning Days 2021, which brings together practitioners and researchers to showcase state-of-the-art machine learning models for the clinical practice.

2020
- Organized a NeurIPS 2020 workshop Topological Data Analysis and Beyond, which brings together experts, users, and industry practitioners to discuss the future of the field.

## Editorial Board Memberships

- Editorial board member for the journal "Machine Learning"
- Editorial board reviewer for the "Journal of Machine Learning" (JMLR)

## Grant Reviewing

2023
- Dutch Research Council (NWO, *Nederlandse Organisatie voor Wetenschappelijk Onderzoek*)

2021
- National Science Center of Poland (*Narodowe Centrum Nauki*)

## Hiring Committee Memberships

2024
- External reviewer, LEAD AI Postdoctoral Research Fellow in Reeb Graph Learning, University of Bergen (*Universitetet i Bergen*)

2023
- Reviewing applications for Principal Investigator positions, Institute of AI for Health, Helmholtz Munich

2022
- Expert reviewer, AI Health Innovation Cluster, German Cancer Research Center & Heidelberg University

2021
- External reviewer, SEAS Postdoctoral Research Fellow in Topological and Geometric Machine Learning for Marine Sustainability, University of Bergen (*Universitetet i Bergen*)

## Outreach

2023
- Gave a talk on *Why Mathematicians confuse coffee cups with doughnuts* on algebraic topology and the Poincaré conjecture as part of the "Pint of Science" science festival.
- Participated again in "I'm a Scientist, Get me out of here!" to discuss recent advances in machine learning and artificial intelligence.

2022
- Participated in "I'm a Scientist, Get me out of here!" to communicate complex questions in machine learning and computational healthcare to school classes.

2020
- Participated again in Skype a Scientist.
- Participated in the "Machine Learning Mentors" and "Black in STEM" programs, i.e., informal lists of researchers willing to provide additional guidance to minority groups. I am mentoring young researchers by providing feedback on their texts and serving as an informal reviewer of their work.

### Ph.D. Thesis Committee Memberships

I have been honored to serve as a committee member to many outstanding junior scientists: Maosheng Yang (Delft University of Technology, 2025), Franka Bause (University of Vienna, 2025), Jonathan Pirnay (Technical University of Munich, 2025), Sebastian Zeng (University of Salzburg, 2025), David Loiseaux (Inria Center at Université Côte d'Azur, 2024), Alexandros Keros (University of Edinburgh, 2023), Beichen Gao (ETH Zurich, 2023), Uzu Lim (Oxford University, 2023), Corinna Coupette (Saarland University & Max Planck Institute for Informatics, 2023), Davide Buffelli (University of Padova, 2023), Robin Vandaele (Ghent University, 2020).

### Program Committee Memberships

Since 2024, I am serving as an *area chair* for ICLR, ICML, and NeurIPS. I am also a regular reviewer for conferences, journals, and workshops in my field.

## Social Media & Academic Profiles

Since 2006, I am blogging about mathematical subjects, aiming to explain complicated phenomena in an accessible manner. The blog enjoys a sizable number of readers, receiving over 5.5 million page views since 2017; moreover, my articles are featured on platforms such as Hacker News or the Blog on Maths Blogs of the American Mathematical Society. Since its official inception in 2020, my channel acquired more than 1,000 subscribers and more than 35,000 views.

Other academic profiles comprise:

- La7zuKQAAAAJ
- Pseudomanifold
- 0000-0003-4335-0302