

Evelyn Christin Herberg

Dr. rer. nat.

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Personal Information

Born 1993
Birth Place Mölln, Germany
Citizenship German

Academic Career

- Sep 2022 – **Postdoctoral Researcher**, *Interdisciplinary Center for Scientific Computing (IWR)*, Heidelberg University, Germany (group of Prof. Dr. Roland Herzog)
present Jul 2025 – present: Maternity Leave
- Aug 2021 – **Postdoctoral Researcher**, *Center for Mathematics and Artificial Intelligence (CMAI)*, George Mason University, U.S.A. (group of Prof. Dr. Harbir Antil)
- Apr 2019 – **Research Assistant**, *Mathematical Institute*, University of Koblenz-Landau, Germany (group of Prof. Dr. Michael Hinze)
- Oct 2017 – **Research Assistant**, *Department of Mathematics*, University of Hamburg, Mar 2019 Germany (group of Prof. Dr. Michael Hinze)

Education

- Jun 2021 **Dr. rer. nat. Mathematics**, *University of Koblenz-Landau*, Germany
Dissertation: “Sparse discretization of sparse control problems with measures”
Supervisor: Prof. Dr. Michael Hinze, Second Supervisor: Prof. Dr. Christian Clason
- Sep 2017 **M. Sc. Business Mathematics**, *University of Hamburg*, Germany
Master Thesis: “Variational discretization of parabolic control problems in space-time measure spaces”
Supervisor: Prof. Dr. Michael Hinze, Second Supervisor: Dr. Henrik Schumacher
- Sep 2015 **B. Sc. Business Mathematics**, *University of Hamburg*, Germany
Bachelor Thesis: “Das augmentierte Lagrange-Verfahren und dessen Anwendung auf semidefinite Programme”
Supervisor: Prof. Dr. Winnifried Wollner, Second Supervisor: Prof. Dr. Michael Hinze
- May 2011 **Abitur**, *Marion-Dönhoff Gymnasium*, Mölln, Germany

Honors

- 2024 – 2026 Elected GAMM Junior
- 2023 – 2026 Elected member of the inaugural cohort of European Mathematical Society Young Academy (EMYA)
- 2018 GAMM Certificate of Recognition

External Funding

Sep 2025 **Travel Support for Junior Researchers attending the European Conference on Numerical Mathematics and Advanced Applications (ENUMATH) 2025, Heidelberg University**

Funding Agencies:

- Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences (HGS MathComp)
- Interdisciplinary Center for Scientific Computing (IWR)
- STRUCTURES Cluster of Excellence

Total Funding: 28 450€

Oct 2024 – Sep 2027 **Project: Operator Learning for Optimal Control: Approximation and Statistical Theory**

Principal Investigators: *Evelyn Herberg*, Sven Wang (Humboldt University Berlin) and Jakob Zech (Heidelberg University)

PhD Students: Ly Duc Hoang and Mario Marić

Funding Agency: Deutsche Forschungsgemeinschaft (DFG) within SPP 2298 “Theoretical Foundations of Deep Learning”

Total Funding: 398 400€

Sep 2023 **Travel Support for Junior Researchers attending the European Conference on Computational Optimization (EUCO) 2023, Heidelberg University**

Funding Agency: Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences (HGS MathComp)

Funding: 5000€

Sep 2018 **Model Order Reduction Summer School**

Funding Agencies:

- University of Hamburg, Mathematics, Informatics, and Natural Sciences (MIN) Graduate School
- DFG SPP 1962 “Non-smooth and Complementarity-based Distributed Parameter Systems: Simulation and Hierarchical Optimization”
- Control and Optimization, Nonlinear PDEs, Calculus of Variations, Scientific Computing and Numerical Analysis (COPDESC)

Total Funding: 15 500€

Publications

Preprints

1. N. Emmons, E. Herberg, M. F. Gerchen, M. Pritsch, J. Rocha, V. Zamoscik, P. Kirsch, R. Herzog, and G. Koppe (2025). *A Data-Driven Closed-Loop Control Approach to Drive Neural State Transitions for Mechanistic Insight*. DOI: [10.1101/2025.07.21.665992](https://doi.org/10.1101/2025.07.21.665992)
2. B. Dittrich, E. Herberg, R. Herzog, and G. Müller (2025). *A DC-Reformulation for Gradient- L^0 -Constrained Problems in Function Spaces*. arXiv: [2506.11917](https://arxiv.org/abs/2506.11917)
3. E. Herberg, R. Herzog, F. Köhne, L. Kreis, and A. Schiela (2023). *SensLI: Sensitivity-Based Layer Insertion for Neural Networks*. arXiv: [2311.15995](https://arxiv.org/abs/2311.15995)

Journal Articles (peer reviewed)

4. J. Wagner, E. Herberg, and R. Herzog (2025). “Experiences with Physics-Informed Neural Networks for Optimal Control Problems”. In: *GAMM Archive for Students* 7. DOI: [10.](https://doi.org/10.1101/2025.07.21.665992)

14464/gammas.v7i1.813

5. H. Rickmann, E. Herberg, and R. Herzog (2025). “Global Convergence of Semismooth Newton Methods for Quadratic Problems”. In: *GAMM Archive for Students* 7. DOI: [10.14464/gammas.v7i1.810](https://doi.org/10.14464/gammas.v7i1.810)
6. M. Alshehri, H. Antil, E. Herberg, and D. P. Kouri (2024). “An inexact semismooth Newton method with application to adaptive randomized sketching for dynamic optimization”. In: *Finite Elements in Analysis and Design* 228. DOI: [10.1016/j.finel.2023.104052](https://doi.org/10.1016/j.finel.2023.104052)
7. H. Antil, H. Díaz, and E. Herberg (2023). “An optimal time variable learning framework for deep neural networks”. In: *Annals of Mathematical Sciences and Applications* 8, pp. 501–543. DOI: [10.4310/AMSA.2023.v8.n3.a4](https://doi.org/10.4310/AMSA.2023.v8.n3.a4)
8. E. Herberg and M. Hinze (2022b). “Variational discretization of one-dimensional elliptic optimal control problems with BV functions based on the mixed formulation”. In: *Mathematical Control & Related Fields* 13, pp. 695–720. DOI: [10.3934/mcrf.2022013](https://doi.org/10.3934/mcrf.2022013)
9. E. Herberg and M. Hinze (2022a). “Variational discretization approach applied to an optimal control problem with bounded measure controls”. In: *Optimization and Control for Partial Differential Equations*. De Gruyter, pp. 113–136. DOI: [10.1515/9783110695984-006](https://doi.org/10.1515/9783110695984-006)
10. E. Herberg, M. Hinze, and H. Schumacher (2020). “Maximal discrete sparsity in parabolic optimal control with measures”. In: *Mathematical Control & Related Fields* 10, pp. 735–759. DOI: [10.3934/mcrf.2020018](https://doi.org/10.3934/mcrf.2020018)

Conference Proceedings (peer reviewed)

11. E. Herberg, R. Herzog, and F. Köhne (2024). “Time regularization in optimal time variable learning”. In: *Proceedings in Applied Mathematics and Mechanics* 24. DOI: [10.1002/pamm.202300299](https://doi.org/10.1002/pamm.202300299)
12. R. J. Baraldi, E. Herberg, D. P. Kouri, and H. Antil (2023). “Adaptive randomized sketching for dynamic nonsmooth optimization”. In: *Model Validation and Uncertainty Quantification*. Vol. 3. Springer Nature Switzerland, pp. 107–116. DOI: [10.1007/978-3-031-37003-8_17](https://doi.org/10.1007/978-3-031-37003-8_17)
13. E. Herberg, M. Hinze, and H. Schumacher (2019). “Sparse discretization of sparse control problems”. In: *Proceedings in Applied Mathematics and Mechanics* 19. DOI: [10.1002/pamm.201900105](https://doi.org/10.1002/pamm.201900105)

Theses

14. E. Herberg (2021). “Sparse Discretization of Sparse Control Problems with Measures”. PhD thesis. University of Koblenz-Landau, Germany. URN: urn:nbn:de:kola-22019
15. E. Herberg (2017). “Variational discretization of parabolic control problems in space-time measure spaces”. Master Thesis. University of Hamburg, Germany
16. E. Herberg (2015). “Das augmentierte Lagrange-Verfahren und dessen Anwendung auf semidefinite Programme”. Bachelor Thesis. University of Hamburg, Germany

Further Documents

17. I. De Blasi, M. Á. García-Ferrero, and E. Herberg (2024). “Environmental and mental sustainability in academia”. In: *European Mathematical Society Magazine* 134, pp. 50–52. DOI: [10.4171/MAG/226](https://doi.org/10.4171/MAG/226)
18. E. Herberg (2023b). “Variationelle Diskretisierung für Optimale Steuerung mit Maßkontrollen”. In: *Mitteilungen der Deutschen Mathematiker-Vereinigung* 31.3, pp. 156–159. DOI: [10.1515/dmvm-2023-0053](https://doi.org/10.1515/dmvm-2023-0053)
19. E. Herberg (2023a). *Lecture Notes: Neural Network Architectures*. arXiv: [2304.05133](https://arxiv.org/abs/2304.05133)

Talks and Posters

- Apr 2025 GAMM 95th Annual Meeting, Poznań, Poland
Talk: “DC-Reformulation for Gradient- L^0 -Constrained Problems in Function Spaces”
- Dec 2024 Seminar für Numerische Mathematik und Mechanik, Essen, Germany
Talk: “Neural Networks - A Mathematical Perspective”
- Sep 2024 Workshop Control and Optimization in the Age of Data, Bayreuth, Germany
Talk: “Adaptive deep neural network architectures: Time-adaptive pruning and sensitivity-based layer insertion”
- Jul 2024 European Congress of Mathematics (ECM), Seville, Spain
Talk: “Adaptive Layer Pruning and Insertion in Deep Neural Networks”
- Jun 2024 Oberseminar Numerical Optimization, Konstanz, Germany
Talk: “Adaptive Deep Neural Network Architectures: Time-adaptive pruning and sensitivity-based layer insertion”
- Apr 2024 Women in Optimization, Erlangen, Germany
Talk: “Optimalsteuerung und Machine Learning”
- Dec 2023 Oberseminar Numerical Optimization, Konstanz, Germany (virtual)
Talk: “Adaptive Deep Neural Network Architectures: Time variable framework and regularization”
- Sep 2023 European Conference on Computational Optimization (EUCCO), Heidelberg, Germany
Talk: “Physics-Informed Neural Networks for Optimal Control Problems”
- Aug 2023 International Congress on Industrial and Applied Mathematics (ICIAM), Tokyo, Japan
Talk: “Adaptive time stepping in DNNs and time regularization”
- Jun 2023 Research Seminar on Mathematical Optimization, WIAS, Berlin, Germany (virtual)
Talk: “Deep Learning with variable time stepping”
- May 2023 GAMM 93rd Annual Meeting, Dresden, Germany
Talk: “Deep Learning from an optimal control point of view with adaptive time stepping”
- Apr 2023 Numerical Analysis and PDE Seminar, University of Delaware, Newark, DE, U.S.A. (virtual)
Talk: “An Optimal Time Variable Learning Framework for DNNs”
- Apr 2023 East Coast Optimization Meeting, Fairfax, VA, U.S.A. (virtual)
Talk: “Adaptive Randomized Sketching for Dynamic Nonsmooth Optimization”

- Mar 2023 SPP1962 Young Researchers' Workshop on Deep Learning, *Essen, Germany*
 Talk: "Deep Learning with variable time stepping"
- Mar 2023 Special Interest Group in Optimization (SIGOPT) International Conference on Optimization, *Cottbus, Germany*
 Talk: "Variational Discretization of Optimal Control Problems with Measures"
- Feb 2023 Heidelberg Seminar on Optimal Control, *Haus im Ennstal, Austria*
 Talk: "Inexact Second Order Optimization using Randomized Sketching"
- Jan 2023 Lothar-Collatz-Seminar, *Hamburg, Germany*
 Talk: "Deep Learning with variable time stepping"
- Dec 2022 Oberseminar Applied Mathematics, *Bayreuth, Germany*
 Talk: "Learning the time step size in Deep Neural Networks"
- Nov 2022 Seminar Optimization, *Koblenz, Germany*
 Talk: "Learning the time step size in Deep Neural Networks"
- Nov 2022 Oberseminar Applied Mathematics, *Freiburg, Germany*
 Talk: "Learning the time step size in Deep Neural Networks"
- Sep 2022 Chemnitz Finite Element Symposium, *Herrsching am Ammersee, Germany*
 Talk: "An Optimal Time Variable Learning Framework for Deep Neural Networks"
- Jul 2022 International Conference on Continuous Optimization (ICCOPT), *Bethlehem, PA, U.S.A.*
 Talk: "Sketching for Nonsmooth PDE Constrained Optimization Problems"
- Jul 2022 Accurate Reduced Order Models for Industrial Applications at Virginia Tech (ARIA@VT), *Blacksburg, VA, U.S.A.*
 Talk: "Sketching for Nonsmooth PDE Constrained Optimization Problems"
- Apr 2022 The Spring Finite Element Circus, *Gainesville, FL, U.S.A. (virtual)*
 Talk: "An Optimal Time Variable Learning Framework for DNNs"
- Mar 2022 East Coast Optimization Meeting, *Fairfax, VA, U.S.A.*
 Talk: "An Optimal Time Variable Learning Framework for DNNs"
- Nov 2021 The Fall Finite Element Circus, *State College, PA, U.S.A.*
 Talk: "Sketching in dynamic constrained optimization"
- Sep 2021 44th SIAM Southeastern Atlantic Section Conference, *Auburn, AL, U.S.A. (virtual)*
 Talks: "Variational discretization for optimal control with BV functions based on the mixed formulation", and "Sparse discretization of optimal control problems with PDEs"
- Aug 2021 IFIP TC 7 Conference on System Modeling and Optimization, *Quito, Ecuador (virtual)*
 Talk: "Variational discretization applied to sparse control problems with BV functions"
- Mar 2021 GAMM 91st Annual Meeting, *Kassel, Germany (virtual)*
 Talk: "Variational discretization approach applied to an optimal control problem with bounded measure controls"
- Jan 2020 Lothar-Collatz-Seminar, *Hamburg, Germany*
 Talk: "Variational discretization approach applied to an optimal control problem with bounded measure controls"

- Oct 2019 Workshop: New trends in PDE constrained optimization, *Linz, Austria*
 Talk: “Variational discretization of PDE constrained optimal control problems with measure controls”
- Jul 2019 International Congress on Industrial and Applied Mathematics (**ICIAM**, *Valencia, Spain*)
 Talk and Poster: “Sparse discretization in PDE constrained optimization with measure controls”
- Feb 2019 **GAMM 90th Annual Meeting**, *Vienna, Austria*
 Talk: “Sparse discretization of sparse control problems”
 Poster: “Studentchapter Hamburg”
- Sep 2018 Model Order Reduction Summer School, *Hamburg, Germany*
 Talk: “Introduction to optimal control”
- Jul 2018 IFIP TC 7 Conference on System Modeling and Optimization, *Essen, Germany*
 Talk: “Maximal discrete sparsity in parabolic optimal control with measures”
- Mar 2018 Young Researchers Meeting and CSE Workshop, *Plön, Germany*
 Talk: “Time-sparse discretization for parabolic optimal control with measures”
- Feb 2018 Winter School Modern Methods in Nonsmooth Optimization, *Würzburg, Germany*
 Poster: “Time-sparse discretization for parabolic optimal control with measures”

Mentoring and Supervision

PhD Students

- Nov 2024 – Mario Marić, *Operator Learning for Optimal Control*, Heidelberg University, present Germany
 Co-Supervision with Prof. Dr. Jakob Zech
- Jan 2023 – Leonie Kreis, *Multilevel Architectures in Deep Learning*, Heidelberg University, present Germany
 Co-Supervision with Prof. Dr. Roland Herzog
- Mar 2022 – Mohammed Alshehri, *Randomized Sketching for Dynamic Optimization and Inexact Adaptive Semismooth Newton methods*, George Mason University, VA, U.S.A.
 Aug 2022 Mentoring, Student of Prof. Dr. Harbir Antil

Master's Theses

- 2025 Viktor Stein, *Genodesic: Trajectory Reconstruction in Single-Cell Sequencing Data Using Score Based Methods*, Heidelberg University, Germany
 Co-Supervision with Prof. Dr. Roland Herzog and Prof. Dr. Simon Anders
- 2024 Laurin Ernst, *Generative Models for Probability Density Estimation with Applications in Bayesian Inference*, Heidelberg University, Germany
 Co-Supervision with Prof. Dr. Roland Herzog
- 2024 Hannah Rickmann, *Global Convergence Theory for Non-Smooth Newton Methods Applied to Quadratic Programs*, Heidelberg University, Germany
 Co-Supervision with Prof. Dr. Roland Herzog

2024 Nico Haaf, *Optimal Control with Functions of Bounded Variation in Mixed Formulation*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Roland Herzog and Prof. Dr. Michael Hinze

2023 Isabel Gernand, *Prediction of Optimal Trajectories by Neural Networks*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Roland Herzog

2023 Johannes Wagner, *Physics-Informed Neural Networks for Optimal Control Problems*, University of Technology Chemnitz, Germany
Co-Supervision with Prof. Dr. Roland Herzog

Bachelor's Theses

2025 Simone Hechler, *Invex Optimization Problems*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Roland Herzog

2023 Karina Kniel, *Parametric Linear Optimization using Neural Networks*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Roland Herzog

2023 Nico Haaf, *Optimal Control with Measures*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Roland Herzog and Dr. Georg Müller

Teaching

Lectures

2024 Nonlinear Optimization, Heidelberg University, Germany

Mar 2024 Fundamentals of Optimization – heiAIMS Summer School Pre Course, *African Institute for Mathematical Science (AIMS)*, Cape Town, South Africa

2023/24 Fundamentals of Optimization, Heidelberg University, Germany

Mar 2023 Neural Network Architectures, *SPP1962 Young Researchers' Workshop on Deep Learning*, Essen, Germany

Seminars

2025 Mathematical Machine Learning - Operator Learning, Heidelberg University, Germany

2023 Mathematical Machine Learning - Selected Famous Papers, Heidelberg University, Germany

2022/23 Mathematical Machine Learning - Neural Network Architectures, Heidelberg University, Germany

2022/23 Advanced Topics of Numerics, Heidelberg University, Germany

2022 Research Interaction and Training - PDE and Data Control, George Mason University, U.S.A.

Organization of Exercise Classes

2021 Optimization I, University of Koblenz-Landau, Germany

2020/21 Optimization II, University of Koblenz-Landau, Germany

2020 Optimization I, University of Koblenz-Landau, Germany

- 2019/20 Optimization II, *University of Koblenz-Landau*, Germany
2019 Optimization I, *University of Koblenz-Landau*, Germany
- Exercise Classes**
- 2023 Nonlinear Optimization, *Heidelberg University*, Germany
2020/21 Applied Differential Equations, *University of Koblenz-Landau*, Germany
2018/19 Numerics, *University of Hamburg*, Germany
2018 Optimization, *University of Hamburg*, Germany
2017/18 Differential Equations I, *Technical University of Hamburg*, Germany
2017 Optimization, *University of Hamburg*, Germany
2016/17 Numerics, *University of Hamburg*, Germany
2016 Linear Algebra II, *University of Hamburg*, Germany
2015/16 Linear Algebra I, *University of Hamburg*, Germany
2015 Optimization, *University of Hamburg*, Germany
2014/15 Numerics, *University of Hamburg*, Germany

Further Teaching

- Apr 2025 “Girls’ Day”, *Heidelberg University*, Germany
Jan 2025 – Supervision of students competing in the 17th AIMMS-MOPTA Optimization
Apr 2025 Modeling Competition, *Heidelberg University*, Germany
Dec 2024 Supervision of an individual student internship, *Heidelberg University*, Germany
Feb 2017 “Girls go math”, *University of Hamburg*, Germany
Oct 2016 Preparation Course Mathematics for Students of Bachelor Mathematics, *University of Hamburg*, Germany
Oct 2015 Preparation Course Mathematics for Students of Bachelor Business Administration, *University of Hamburg*, Germany

Organizational Activities

- Sep 2025 Focus Session “Optimization and Machine Learning”, *European Conference on Computational Optimization (EUCCO)*, Klagenfurt, Austria
with Anna Shalova
- Sep 2025 European Conference on Numerical Mathematics and Advanced Applications (ENUMATH), Heidelberg, Germany
Support Team Member
- Sep 2025 Minisymposium “Numerical Optimization in Machine Learning”, *ENUMATH*, Heidelberg, Germany
with Pierfrancesco Beneventano
- Apr 2025 Young Academics Meet Mentors (YAMM) Lunch, *GAMM 95th Annual Meeting*, Poznań, Poland
Head of Organization Team

- Aug 2024 Minisymposium “Optimal Control and Machine Learning”, *IFIP TC7 System Modeling and Optimization*, Hamburg, Germany
with Roland Herzog
- Jul 2024 EMYA Activities, *European Congress of Mathematics (ECM)*, Seville, Spain
 - EMYA Ice Breaking Session
 - EMYA Lightning Talks
 - Sustainability Panel & Group Discussion
Organization Team
- Mar 2024 Section 16 - Optimization, *GAMM 94th Annual Meeting*, Magdeburg, Germany
with Christian Kahle
- Sep 2023 European Conference on Computational Optimization (EUCCO), Heidelberg, Germany
Organization Team
- Aug 2023 Minisymposium “Machine Learning and Differential Equations”, *International Congress on Industrial and Applied Mathematics (ICIAM)*, Tokyo, Japan
with Roland Maier
- Jul 2022 Minisymposium “Recent Advances in Hierarchical and PDE Constrained Optimization”, *International Conference on Continuous Optimization (ICCOPT)*, Bethlehem, PA, U.S.A.
with Harbir Antil and Uday V. Shanbhag
- Mar 2022 East Coast Optimization Meeting, Fairfax, VA, U.S.A.
Support Team Member
- 2020 – 2021 CMAI Colloquium, Fairfax, VA, U.S.A.
Support Team Member
- Sep 2018 Model Order Reduction Summer School, Hamburg, Germany
Organization Team

Professional Responsibilities

- 2025 Vice-President, GAMM Juniors
- 2023 – 2025 Treasurer, EMYA
- 2024 Formulation of the By-Laws of GAMM Juniors
- 2023 Formulation of the By-Laws of EMYA
- 2018 – 2019 Finance Officer, GAMM Chapter Hamburg
- 2018 Co-Founder, GAMM Chapter Hamburg
- 2017 – 2019 Finance Officer, SIAM Chapter Hamburg

Membership in Professional Societies

- EMS (European Mathematical Society)
- EMYA (EMS Young Academy)
- GAMM (International Association of Applied Mathematics and Mechanics)
- GAMM Activity Group on Optimization with PDE Constraints
- GAMM Juniors

- Structures YRC (Young Researchers Convent)
- 2017 – 2020 SIAM (Society for Industrial and Applied Mathematics)
- 2017 – 2020 Student Chapter Hamburg

Editorial Activities

- Jan 2025 – Editorial Board Member GAMM Archive for Students (GAMMAS)
present
- Aug 2023 – Editorial Board Member Examples & Counterexamples (EXCO)
present

Manuscripts Refereed for Journals

- Advances in Computational Mathematics (ACOM)
- Electronic Transactions on Numerical Analysis (ETNA)
- Journal of Inverse and Ill-Posed Problems (JIIP)
- Journal of Optimization Theory and Applications (JOTA)
- Proceedings in Applied Mathematics and Mechanics (PAMM)

Skills

- Languages German (native), English (fluent), French (good), Spanish (basics)
- Programming MATLAB, Python

References

- Prof. Dr. Michael Hinze, *University of Koblenz*, Germany
email: hinze@uni-koblenz.de
- Prof. Dr. Harbir Antil, *George Mason University*, U.S.A.
email: hantil@gmu.edu
- Prof. Dr. Roland Herzog, *Heidelberg University*, Germany
email: roland.herzog@iwr.uni-heidelberg.de

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