Evelyn Christin Herberg

Dr. rer. nat.

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Personal Information

Born	1993
Birth Place	Mölln, Germany
Citizenship	German
Children	Son (2025)

Academic Career

Sep 2022 – present **Postdoctoral Researcher**, *Interdisciplinary Center for Scientific Computing (IWR)*, Heidelberg University, Germany (group of Prof. Dr. Roland Herzog)
Jul 2025 – present: Maternity Leave & Part Time

Aug 2021 – Aug 2022 **Postdoctoral Researcher**, *Center for Mathematics and Artificial Intelligence (CMAI)*, George Mason University, U.S.A. (group of Prof. Dr. Harbir Antil)

Apr 2019 – Aug 2021 **Research Assistant**, *Mathematical Institute*, University of Koblenz-Landau, Germany (group of Prof. Dr. Michael Hinze)

Oct 2017 – Mar 2019 **Research Assistant**, *Department of Mathematics*, University of Hamburg, 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 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 (EUCCO) 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. Emonds, 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

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

3. E. Herberg, R. Herzog, F. Köhne, L. Kreis, and A. Schiela (2023). *SensLI: Sensitivity-Based Layer Insertion for Neural Networks*. arXiv: 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.

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

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

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

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

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

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

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

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

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

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

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

19. E. Herberg (2023a). *Lecture Notes: Neural Network Architectures*. arXiv: 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 90$^{\text{th}}$ 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 – present Mario Marić, *Operator Learning for Optimal Control*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Jakob Zech

Jan 2023 – present Leonie Kreis, *Multilevel Architectures in Deep Learning*, Heidelberg University, Germany
Co-Supervision with Prof. Dr. Roland Herzog

Mar 2022 – Aug 2022 Mohammed Alshehri, *Randomized Sketching for Dynamic Optimization and Inexact Adaptive Semismooth Newton methods*, George Mason University, VA, U.S.A.
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 – Apr 2025 Supervision of students competing in the 17$^{\text{th}}$ AIMMS-MOPTA Optimization 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 – present Editorial Board Member GAMM Archive for Students (GAMMAS)

Aug 2023 – present Editorial Board Member Examples & Counterexamples (EXCO)

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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