Georg Müller

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Personal Information

Date of Birth	April 10, 1988
Place of Birth	Berlin
Family Status	Married, 1 Child (born 07/2018)
Current Position	Assistant Professor (Ak. Rat), RG Scientific Computing and Optimization, University of Heidelberg

University Education

09/2013 – 05/2019	Doctoral studies in mathematics – University of Bayreuth (Anton Schiela) Focus: Optimal control of nonsmooth partial differential equations and complementarity constrained problems Thesis title: *"Optimal Control of Time-Discretized Contact Problems"* Grade: **Summa cum laude**
10/2010 – 03/2013	Graduate studies in scientific computing – TU Berlin Focus: Nonlinear optimization, optimal control of partial differential equations Minor: Physics M.Sc. grade: **1.0**
10/2007 – 11/2010	Undergraduate studies in mathematics – TU Berlin Focus: Differential equations Minor: Computer sciences / physics B.Sc. grade: **1.2**

Research Positions

since 09/2021	Assistant Professor (Ak. Rat), RG Scientific Computing and Optimization, University of Heidelberg
04/2018 – 08/2021	Research assistant, WG Numerical Optimization, University of Konstanz
09/2016 – 03/2018	Research assistant, Chair of Applied Mathematics, University of Bayreuth
10/2014 – 08/2016	Research assistant, Chair of Applied Mathematics, University of Bayreuth (BMBF project 'SOAK' - *"'Wear Simulation of Knee Implants and Shape Optimization for Patient-Group Specific Wear Minimization"'*)
09/2013 – 09/2014	Research assistant, Chair of Applied Analysis, Technical University of Hamburg-Harburg (BMBF project 'SOAK')
02/2011 – 02/2012 & 08/2012 – 03/2013	Student researcher, research group "'Nonlinear Optimization and Inverse Problems"', WIAS Berlin

Invited Research Stays

11/2019	Chair of Mathematical Optimization, TU Munich (with Lukas Hertlein and Michael Ulbrich)
06/2016	Research Group Numerical Mathematics, TU Chemnitz (with Gerd Wachsmuth and Roland Herzog)

Funding Proposals

12/2021	*"Efficient solvers for life-cycle- and recycling models of roller bearings"*, BMBF call "Mathematics for Innovations"; with Peter Maaß (Bremen), Gabriele Steidl (Berlin), Christian Schenck (Bremen), Andreas Rademacher (Bremen); rejected, € 766237
12/2021	*"AI-Based, Multicriteria Bilevel Design Assistant for Mechatronic Systems"*, DFG call for priority programme 2353; with Roland Herzog (Heidelberg); rejected, € 225000
01/2021	*"Efficient Simulation of a Spatiotemporal SIR Model"*, UKN Zukunftskolleg call for Independent Research Grants; granted, € 5825
10/2020 & 10/2019	*"Parameter Identification in Nonsmooth Systems Using Tailored Model Order Reduction"*, UKN Zukunftskolleg call for postdoctoral fellowship program; rejected
08/2020	*"Coordinated Policies for Epidemic Outbreaks with respect to Health, Economic and Social Implications"*, DFG call for multidisciplinary research into epidemics; with Stefan Volkwein (Konstanz), Michael Dellnitz and Sebastian Peitz (Paderborn), Christof Schütte and Tim Conrad (Berlin), rejected
10/2018	*"Multiobjective Optimization of Non-Smooth PDE-Constrained Problems"* (Collaboration), DFG priority programme 1962; with Stefan Volkwein (Konstanz), Michael Dellnitz and Sebastian Peitz (Paderborn), granted
07/2013	*"Shape Optimization for Induction Coils in Surface Hardening"*, PhD Scholarship, Berlin Mathematical School; granted but passed up, € 35232

Teaching

SS 2024	Exercises for *Linear Algebra II* (Roland Herzog)
SS 2024	Teaching at the university's "Help-Desk" (Interdisciplinary learning center for university mathematics with entry-level focus)
WS 2023	Exercises for *Linear Algebra I* (Roland Herzog)
WS 2023	Teaching at the university's "Help-Desk" (Interdisciplinary learning center for university mathematics with entry-level focus)
SS 2023	Exercises for *Nonlinear Optimization* (Roland Herzog)
SS 2023	*Software Practicals in Optimization* with Roland Herzog
WS 2022	Interdisciplinary Short Course *Introduction to Optimization* with Roland Herzog
WS 2022	Exercises for *Introduction to Optimization* (Roland Herzog)
SS 2022	Seminar *Selected Topics in Optimization* with Roland Herzog
SS 2022	Exercises for *Introduction to Numerical Mathematics* (Roland Herzog)
WS 2021	Exercises for *Introduction to Optimization* (Roland Herzog)
SS 2021	Exercises for *Optimization III* (Stefan Volkwein) with Luca Mechelli
WS 2020	Seminar *Advanced Methods in Optimization and Control, with Applications in Pandemic and Climate Protection* (Gabriele Ciaramella)
WS 2020	Exercises for *Optimization II* (Gabriele Ciaramella)
SS 2020	Seminar *Advanced Numerical Optimization Methods* (Gabriele Ciaramella)
WS 2019	Exercises for *Optimization II* (Stefan Volkwein)
SS 2019	Exercises for *Optimization III* (Stefan Volkwein)
WS 2018	Exercises for *Optimization II* (Stefan Volkwein) mit J. Lu
SS 2018	Exercises for *Numerics of Partial Differential Equations II* (Stefan Volkwein)
WS 2017	Exercises for *Analysis I* (Lars Grüne)
SS 2017	Exercises for *Analysis II* (Anton Schiela)
WS 2016	Exercises for *Analysis I* (Anton Schiela)
10/2016 – 03/2018	Teaching in the University of Bayreuth's "Lernzentrum" (Interdisciplinary learning center for university mathematics with entry-level focus)

Theses Coadvised **(Non-Official Capacity)**

currently	B.Sc. thesis of Jan Müller, *A Regularized Newton Method*, (with Roland Herzog)
12/2023	Ph.D. thesis of Marco Bernreuther, *Nonsmooth PDEs: Efficient Algorithms, Model Order Reduction, Multiobjective PDE-Constrained Optimization*, University of Konstanz (with Stefan Volkwein)
07/2023	B.Sc. thesis of Max Jungmann, *Convex Techniques in Stochastic Linear Programming*, Heidelberg University (with Roland Herzog)
06/2023	M.Sc. thesis of Melissa Weber, *Dualität und Sensitivität in der linearen Optimierung*, Heidelberg University (with Roland Herzog)
03/2023	B.Sc. thesis of Nico Haaf, *Measure valued optimal control of PDEs*, Heidelberg University (with Roland Herzog)
03/2023	B.Sc. thesis of Tomislav Popov, *Generalized Convexity and Neatly Quasiconvex Functions*, Heidelberg University (with Roland Herzog)
11/2022	M.Sc. thesis of Leonie Kreis, *Multilevel Training of Residual Neural Networks*, Heidelberg University (with Roland Herzog)
04/2019	M.Sc. thesis of Hai-Dang Nguyen Pham, *SIR Model Simulation with FEniCS*, University of Konstanz (with Stefan Volkwein)
09/2019	M.Sc. thesis of Marco Bernreuther, *RB-based PDE-Constrained Non-Smooth Optimization*, University of Konstanz (with Stefan Volkwein)
07/2016	M.Sc. thesis of Matthias Stöcklein, *Optimal Control of Static Contact Problems in Linear Elasticity*, University of Bayreuth (with Anton Schiela)

Reviews for

Computational Optimization and Applications
GAMM-Mitteilungen
SIAM Journal on Control and Optimization

Organization

since 09/2021	*Seminar on Optimization*, University of Heidelberg, continuously
since 03/2022	*Heidelberg Seminar on Optimal Control*, Haus im Ennstal, Austria, anually
09/2023	6^{th} European Conference on Computational Optimization (EUCCO), Heidelberg
12/2019	*Workshop on Model Order Reduction, Parameter Identification and Optimization with Nonsmooth Partial Differential Equations*, Konstanz

Publications

1. Gabriele Ciaramella, Felix Kwok and Georg Müller (2022). A nonlinear optimized schwarz preconditioner for elliptic optimal control problems. In Susanne C. Brenner, Eric Chung, Axel Klawonn, Felix Kwok, Jinchao Xu and Jun Zou, editors, *Domain Decomposition Methods in Science and Engineering XXVI*, pages 391–398. Springer International Publishing. doi:10.1007/978-3-030-95025-5_41.

2. Marco Bernreuther, Georg Müller and Stefan Volkwein (2022). Efficient scalarization in multiobjective optimal control of a nonsmooth pde. doi:10.1007/s10589-022-00390-y.

3. Marco Bernreuther, Georg Müller and Stefan Volkwein (2022). Reduced basis model order reduction in optimal control of a nonsmooth semilinear elliptic pde. In *Optimization and Control for Partial Differential Equations*, pages 1–32. De Gruyter. doi:10.1515/9783110695984-001.

4. Constantin Christof and Georg Müller (2021). Multiobjective optimal control of a non-smooth semilinear elliptic partial differential equation. 27:S13. doi:10.1051/cocv/2020060.

5. Georg Müller (2019). *Optimal control of time-discretized contact problems*. PhD thesis, Bayreuth. doi:10.15495/EPub_UBT_00004379.

6. Constantin Christof and Georg Müller (2018). A note on the equivalence and the boundary behavior of a class of Sobolev capacities. *GAMM-Mitteilungen*, 40(3):238–266. doi:10.1002/gamm.201730005.

7. Georg Müller and Anton Schiela (2017). On the control of time discretized dynamic contact problems. *Computational Optimization and Applications. An International Journal*, 68(2):243–287. doi:10.1007/s10589-017-9918-5.

Preprints and publications in preparation (selected)

1. Konstantin Sonntag, Bennet Gebken, Georg Müller, Sebastian Peitz and Stefan Volkwein (2024). A descent method for nonsmooth multiobjective optimization in hilbert spaces. Journal article, *submitted*.

2. Marco Bernreuther, Michael Dellnitz, Bennet Gebken, Georg Müller, Sebastian Peitz, Konstantin Sonntag and Stefan Volkwein (2023). Multiobjective optimization of non-smooth pde-constrained problems.

3. Gabriele Ciaramella, Michael Kartmann and Georg Müller. Solving semi-linear elliptic optimal control problems with L^1-cost via regularization and ras-preconditioned newton. Journal article.

4. Bastian Dittrich, Evelyn Herberg, Georg Müller and Roland Herzog. Gradient sparsity via DC-reformulations in optimal control. Journal article.

5. Gabriele Ciaramella, Christian Jäkle, Georg Müller and Stefan Volkwein. Lectures on numerical optimization. Single-lecture prestructured textbook on numerical optimization.

6. Gabriele Ciaramella, Felix Kwok and Georg Müller. Nonlinear optimized schwarz preconditioner for elliptic optimal control problems. Journal article of proceedings publication Nr. 1.

Presentations

1. *Schwarz-Preconditioned Newton for (slightly nonsmooth) Optimal Control of PDEs*. 13th Heidelberg Seminar on Optimal Control, Haus im Ennstal, AT. 28.02.2023.

2. *Schwarz-Preconditioned Newton for (slightly nonsmooth) Optimal Control of PDEs*. Optimization Seminar, Heidelberg University). 19.01.2023.

3. *Solving Semi-Linear Elliptic Optimal Control Problems with L^1-Cost via Regularization and RAS Preconditioned Newton*. FGP Conference on Optimization, University of Porto, PG. 05.05.2022.

4. *Multiobjective Optimal Control of a Non-Smooth Semi-Linear Elliptic PDE*. IWR Seminar Scientific Computing, IWR (University of Heidelberg) **(invited)**. 16.06.2021.

5. *Multiobjective Optimal Control of a Non-Smooth Semi-Linear Elliptic PDE*. SIGOPT 2020 Conference on Optimization, TU Dortmund. 06.03.2020.

6. *An Introduction to Version Control Using Git*. Seminar on Numerics, University of Konstanz. 17.12.2019.

7. *Multiobjective Optimal Control of a Non-Smooth Semi-Linear Elliptic PDE*. Workshop on Optimal Control, University of Konstanz. 03.12.2019.

8. *Multiobjective Optimal Control of a Non-Smooth Semi-Linear Elliptic PDE*. Special Semester on Optimization, Johan Radon Institute for Computational and Applied Mathematics, Linz, AT. 26.11.2019.

9. *Multiobjective Optimal Control of a Non-Smooth Semi-Linear Elliptic PDE*. Seminar of the International Research Training Group IGDK Munich – Graz, TU Munich **(invited)**. 21.11.2019.

10. *Multiobjective Optimal Control of a Non-Smooth Semi-Linear Elliptic PDE*. 6th International Conference on Continuous Optimization, TU Berlin. 07.08.2019.

11. *Improved Gradient Descent Schemes and the Barzilai-Borwein Method*. Seminar on Numerics, University of Konstanz. 23.07.2019.

12. *Optimal Control of Time Discretized Dynamic Contact Problems*. GAMM annual meeting, TU Munich. 20.03.2018.

13. *Optimal Control of Time Discretized Contact Problems*. SIAM Conference on Optimization, Vancouver, CA. 23.05.2017.

14. *Boundary Behavior of Sobolev Capacities and Implications for Contact Problems*. 9th Chemnitz Seminar on Optimal Control, Haus im Ennstal, AT. 14.02.2017.

15. *Optimal Control of Time Discretized Contact Problems*. Research Center for Modeling and Simulation (MODUS), University of Bayreuth. 27.06.2016.

16. *Optimal Control of Time Discretized Contact Problems*. Seminar on Scientific Computing, TU Chemnitz **(invited)**. 21.06.2016.

17. *Optimal Control of Time Discretized Dynamic Contact Problems*. GAMM / DMV annual meeting, TU Braunschweig. 08.03.2016.

18. *Optimal Control of Dynamic Contact – Modelling, Stationarity and Application*. 8th Chemnitz Seminar on Optimal Control, Haus im Ennstal, AT. 29.02.2016.

19. *Optimal Control of Dynamic Contact and Application to Knee Joint Prostheses*. 6th Conference on High Performance Scientific Computing, Hanoi, VN. 19.03.2015.

20. *Optimal Control of Dynamic Contact and Application to Knee Joint Prostheses*. 7th Chemnitz Seminar on Optimal Control, Haus im Ennstal, AT. 25.02.2015.

Programming Languages

C, C++	advanced
Python	advanced
Fortran	basic

Software Used

Mathematical Tools	Matlab, DUNE, Kaskade7, FEniCS, Latex
Version Control	Git, SVN
Visualization	Paraview, Gnuplot
Operating Systems	Linux, Windows
Website Development	Hugo, HTML
Software Development	Make, CMake

Languages

German	Native speaker
English	Very good command

Miscellaneous

01/2024	Implementation of a linear optimization based scheduler (LOBS) for tutor-to-class scheduling assignments
09/2019	Fall School *"Quasi-Variational Inequalities: Theory, Algorithms, and Applications"*, Würzburg
04/2018 – 12/2018	Technology Transfer Liaison position at the University of Konstanz
07/2016	Grading the mathematics competition of the 11th Day of Mathematics, University of Bayreuth
07/2015	Co-Supervision of the lab "Planetary Orbits on the Computer" – 10th Day of Mathematics, University of Bayreuth
08/2014	Gene Golub SIAM Summer School – *"Simulation, Optimization, and Identification in Solid Mechanics"*, RICAM, Linz, AT
03/2012 – 07/2012	MATHEON Technology Transfer Internship, Ingenieursgesellschaft Auto und Verkehr (IAV)
08/2004 – 06/2005	Stay abroad in student exchange program, Waterford, Michigan, USA (Kettering High-School)

Georg Müller, Heidelberg, 22. 04. 2024