Curriculum Vitae

Personal Data

Name:	Prof. Dr. Matthias Gerdts
Date and place of birth:	15.03.1972 in Zeven, Germany
Nationality:	German
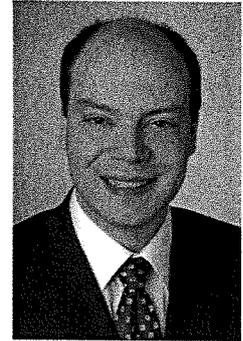
Education

12/2006	Habilitation in Mathematics, University of Bayreuth
02/2001	PhD, University of Bayreuth, Supervisor: Prof Dr. H. J. Pesch
09/1997	University Diploma (M.Sc.) in Mathematics, University of Technology Clausthal
10/1992-09/1997	Studies of Mathematics, University of Technology Clausthal

Professional Experience

since 10/2010	Full Professor (W3) for Engineering Mathematics, Universität der Bundeswehr München
04/2009-09/2010	Associate Professor (W2) for Applied Mathematics, University of Würzburg
03/2007-03/2009	Lecturer (B) for 'Mathematical Optimisation', University of Birmingham, U.K.
11/2004-02/2007	Professor (W1) at the University of Hamburg
01/2003-03/2003	Teaching visitor at the University of California, San Diego, USA
10/2000-10/2004	Research associate, Chair of Applied Mathematics, University of Bayreuth
10/1997-09/2000	Collaborator in the BMBF project "Simulation of test-drives of automobiles at driving limit"
06/1999-09/2000	Research associate, Chair of Engineering Mathematics, University of Bayreuth
10/1997-05/1999	Research associate, Institute of Mathematics, University of Technology Clausthal
01/1997-06/1997	Internship at Bodenseewerk Gerätetechnik GmbH (BGT)
07-09/1995, 03/1996	Internship at Siemens AG, Bremen, software engineering

Research Topics

- **optimal control with ODEs, DAEs, and PDEs:** necessary conditions, direct discretization methods, semismooth Newton methods, regularization methods, mixed-integer optimal control, convergence of discretized optimal control problems

- **differential-algebraic equations (DAEs):** consistent initialization, integration methods, sensitivity analysis

- **optimization methods:** SQP methods, convex quadratic programming, semismooth Newton methods

- **realtime optimization and sensitivity analysis:** parametric sensitivity analysis, model-predictive control

- **scientific computing and industrial applications:** virtual testdriving, driver assistance for autonomous vehicles, flight path optimization, robotics

Editorial Boards:

- Technical Associate Editor 21st IFAC World Congress 2020

- Associate Editor "Optimization" (since 2018)

- Editorial Board member "Differential-Algebraic Equations Forum" (since 2012)

- Editorial Board member "Dynamics of Continuous, Discrete and Impulsive Systems, Series B" (2007-2009)

Projects:

- principal investigator of 27 projects funded by DFG, BMBF, ESA, DLR, EU, industry

Scientific indicators: (Date: 22.10.2020)

- Scopus: HI 16, 715 citations

- Google Scholar: HI 25, 1864 citations

- MathSciNet: HI 9, 232 citations

- Researchgate: HI 20, 1202 citations

Talks and presentations: (a detailed list can be provided upon request)

- 8 plenary and semi-plenary talks

- 115 scientific talks at conferences and workshops

- 9 talks for pupils

Awards:

- Best Student Paper Award der European Control Conference (ECC) 2020 for the paper

  C. Specht, M. Gerdts, R. Lampariello: *Neighborhood estimation in sensitivity-based update rules for real-time optimal control*, European Control Conference (ECC'20), 2020.

- Best poster award for the BMBF project "SNiMoRed", BMBF seminar (20.-21.6.2013, Bonn).

- Teaching award "Teacher of the semester" for the course "Optimization", University of Hamburg, 2007

Teaching and Supervision: (a detailed list can be provided upon request)

- 1 habilitation, 8 PhDs completed, 9 PhDs under supervision, reviewer of 27 PhDs

- 79 master and bachelor theses

- 32 student projects

- Lectures: optimal control, linear and nonlinear optimization, numerical analysis, operations research, combinatorial optimization, nondifferentiable optimization, differential equations, discrete dynamic optimization, engineering mathematics, aircraft trajectory optimization, mathematical methods in the engineering sciences

Publications:

- 2 monographs
- 58 journal papers
- 45 conference papers and book chapters

The 10 most important publications:

1. M. Gerdts, F. Lempio: *Mathematische Optimierungsverfahren des Operations Research*, DeGruyter, 2011, 527 Seiten, ISBN 978-3-11-024994-1.

2. M. Gerdts: *Optimal Control of ODEs and DAEs*, DeGruyter, 2011, 458 Seiten, ISBN 978-3-11-024995-8.

3. C. Specht, M. Gerdts, R. Lampariello: *Neighborhood estimation in sensitivity-based update rules for real-time optimal control*, 2020 European Control Conference (ECC), Saint Petersburg, Russia, 2020, pp. 1999-2006 (Best Student Paper Award).

4. B. Martens, M. Gerdts: *Convergence Analysis for Approximations of Optimal Control Problems Subject to Higher Index Differential-Algebraic Equations and Mixed Control-State Constraints*, SIAM Journal on Control and Optimization, Vol 58 (1), pp. 1-33, 2020.

5. M. Burger, M. Gerdts: *DAE Aspects in Vehicle Dynamics and Mobile Robotics*, in Applications of Differential-Algebraic Equations: Examples and Benchmarks, Eds. S. Campbell, A. Ilchmann, V. Mehrmann, T. Reis, Differential-Algebraic Equations Forum, Springer, 2019.

6. A. Dreves, M. Gerdts: *A generalized Nash equilibrium approach for optimal control problems of autonomous cars*, Optimal Control, Applications and Methods, Vol. 39, pp. 326–342, 2018, DOI 10.1002/oca.2348.

7. K. Palagachev, M. Gerdts: *Mathematical Programs with Blocks of Vanishing Constraints Arising in Discretized Mixed-Integer Optimal Control Problems*, Set-Valued and Variational Analysis, Vol. 23(1), pp. 149-167, 2015, DOI 10.1007/s11228-014-0297-0

8. J. Chen, M. Gerdts: *Smoothing technique of nonsmooth Newton methods for control-state constrained optimal control problems*, SIAM Journal on Numerical Analysis, Vol. 50(4), pp. 1982-2011, 2012.

9. M. Gerdts, S. Karrenberg, B. Müller-Beßler, G. Stock: Generating Optimal Trajectories for an Automatically Driven Car, Optimization and Engineering, Vol. 10 (4), pp. 439–463, 2009.

10. M. Gerdts: *A variable time transformation method for mixed-integer optimal control problems*, Optimal Control, Applications and Methods, Vol. 27 (3), pp. 169-182, 2006.

Organized Minisymposia and Workshops:

- Member scientific committee EPCO 2020/2021, Lisbon, 2021

- Minisymposium "Optimal Control Problems with ODEs and DAEs" (with Prof. Dr. K. Chudej), SciCADE 2019, Innsbruck, 2019 Minisymposiums "Numerical Optimal Control" (with Prof. Dr. K. Chudej and Dr. K. Flaßkamp), 18th French-German-Italian Conference on Optimization, Paderborn, 2017

- Minisymposiums "Semi-infinite optimization strategies and robust design" (with Prof. Dr. M. Zimmermann), IMA and OR Society Conference on Mathematics of Operational Research, Birmingham, U.K., 2017

- Minisymposiums "Model-predictive control and optimal control" (with Dr. J. Pannek), Optimization 2014, Guimaraes, Portugal, 2014

- Member of organizing committee of ECMI Workshop "Math for the Digital Factory", WIAS Berlin (with Prof. Dr. D. Hömberg, Prof. Dr. V. Mehrmann, Prof. Dr. M. Skutella), 2014

- Member of organizing committee of SADCO Industrial Workshop "Safety Systems, Driver Assistance and Optimal Control", Volkswagen AG, Wolfsburg (with Dr. R. Baier, I. Xausa, H. Meyer), 2014

- Minisymposia "Optimal Control in Robotics" (with Dr. C. Landry) and "Nonsmooth and Unilateral Problems - Modeling, Analysis and Optimization Methods I-II" (with Prof. Dr. J. Gwinner), IFIP Conference 2011, Berlin, 2011

- Member of organizing committee of the Workshop "Set-valued Numerical Analysis and Robust Optimal Control", 27.-29.3.2008, Hausdorff Research Institute for Mathematics, Bonn (with T. Lorenz, R. Baier, E. Crück, J. Rieger), 2008

- Minisymposium "Optimal Control of Industrial Applications Modelled by DAEs and PD(A)Es", ICIAM Conference 2007, Zurich, Switzerland (with Dr. K. Chudej), 2007

- "Mission Analysis Day" on "Optimization in Space Applications", University of Hamburg (with M. Katzkowski, OHB-System AG, Bremen), 2006

- Minisymposium "Numerical Methods in Mechanical Multibody Dynamics", ECMI Conference 2002, Jurmala, Latvia (with C. Führer and M. Arnold), 2002

Summerschools, Winterschools, and Intensive Courses:

- Winterschool "Mathematics for Engineering Applications – Online trajectory generation for mobile robots using model-predictive control", Politecnico di Bari, Bari, 2020

- Summerschool "Optimization of Dynamical Systems", Bremen, 2018

- Summerschool "Decision Support in Supply Chain Networks", Bremen, 2018

- Intensive course "Optimal Control Techniques", Elgersburg School, 2017

- Intensive course "Four Lectures on Optimal Control Problems", University of Trento, 2016

- Intensive course "Numerical Optimal Control", OMPC 2013 - SADCO Summer School and Workshop on Optimal and Model Predictive Control, Bayreuth, 2013

- "youBot Hackathon 2012", 2nd European Robotics Week, Universität der Bundeswehr München, 2012

- "Optimization workcamp" for students, Universities of Hamburg and Bremen, Varna/Bulgarien (with Prof. Dr. C. Büskens), funded by BMWi project "Sparse NLP Solver for Space Applications", 2006

- Intensive course "Set-Valued Numerical Analysis and Optimal Control", Sofia/Bulgaria (with Dr. R. Baier), funded by the DAAD project "Center of Excellence for Applications of Mathematics", 2005

- Intensive course "Discrete Dynamic Optimization",Sofia/Bulgaria (with Prof. Dr. F. Lempio), funded by the DAAD project "Center of Excellence for Applications o Mathematics", 2003