

**Prof. Dr. rer.nat. habil. Sebastian Sager**

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\* 7.3.1975, Westerstede (D), married, 2 daughters



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## — Education and Positions —

- 4/2017–
  - **Spokesperson** of DFG research training group 2297 “Mathematical Complexity Reduction”
- 4/2012–
  - **W3 full professor** at the Faculty of Mathematics, Otto-von-Guericke-Universität Magdeburg
- 4/2012
  - **Habilitation** at the Ruprecht-Karls-Universität Heidelberg
- 10/2008–3/2012
  - **Junior Research Group Leader** at the Interdisciplinary Center for Scientific Computing (IWR), Heidelberg
- 2/2008–9/2008
  - **Akademischer Rat auf Zeit** at IWR, Heidelberg
- 4/2007–1/2008
  - **Postdoc** in the SIMUMAT research team on aerodynamic shape optimization, Universidad Autónoma, Madrid (E)
- 10/2006–3/2007
  - Akademischer Rat auf Zeit at IWR Heidelberg
- 2/2006–9/2006
  - Postdoc at the IWR, Heidelberg
- 2/2002–2/2006
  - **PhD thesis** *Numerical methods for mixed-integer optimal control problems* in mathematics, supervised by G. Reinelt and H.G. Bock (grade: summa cum laude)
- 2/2002–2/2005
  - Member of the International DFG Graduiertenkolleg 710
- 2/2004–4/2004
  - Research stays at the Universidad Carlos III de Madrid and the Universidad de Valladolid (E)
- 10/1995–12/2001
  - Studies at the Universität Heidelberg, **diploma** in mathematics with specialization in physics/astronomy (grade: excellent)
- 1/2000–5/2000
  - Exchange student at the University of Ho-Chi-Minh-City (VN)
- 9/1997–7/1998
  - Exchange student at the Université de Montpellier (F)
- 6/1994
  - Abitur at the Gymnasium Westerstede

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## — Offers, Honors, and Awards —

- 2016
  - **ERC Proof of Concept Grant** isitFlutter-727417
- 2015
  - **ERC Consolidator Grant** MODEST-647573
  - “Mathematical Optimization for Clinical Decision Support and Training”
  - **Otto-von-Guericke Research Award**
- 2012–
  - Guest professor at IWR, University of Heidelberg
- 2011
  - Offer for a chair (W3 professor) at the University of Magdeburg, realized
- 2007
  - Klaus Tschira Award for Achievements in Public Understanding of Science
- 2006
  - Dissertation prize of the German Operations Research Society
- 2002
  - 3 year scholarship of the Deutsche Forschungsgemeinschaft

## — Teaching —

### Lectures

- 2013–, 3× • *Algorithmic Parameter Estimation and Experimental Design* (M)
- 2008 • *Introduction to Numerics* (B)
- 2012–, 2× • *Introduction to Optimization* (B)
- 2018–, 2× • *Mathematical Modeling* (B, for mathematical engineers)
- 2013–, 5× • *Nonlinear Optimization* (B/M)
- 2008–, 6× • *Mixed-integer nonlinear Optimization* (B/M)
- 2006–, 2× • *Numerics 2* (M)
- 2012–, 4× • *Optimal Control / Algorithmic Dynamic Optimization* (M)
- 2018 • *Optimization Methods for Machine Learning* (M)

### Seminars

- 2018–, 2× • *Optimization and Machine Learning* (M)
- 2013–, 2× • *Optimal Control* (M), *Optimal Control Software* (M)
- 2011–, 2× • *Global (and Stochastic) Optimization* (M)
- 2014 • *Chebfun* (M)
- 2009 • *Scientific Software Engineering* (M)
- 2008 • *Artificial Intelligence and Robotics* (B/M)
- 2006 • *Optimal control in economics* (M)

### Compact Courses

- 2013, '17 • *Optimization under Uncertainties* (PhD)
- 2014, '17 • *Complexity Reducing Formulations in Optimization* (PhD)
- 2009, '12 • *Optimization with Differential Equations* (PhD)
- 2010 • *Nonlinear Optimization* (PhD)
- 2005, '10 • *Mixed-Integer Nonlinear Programming* (PhD)

## — Academic Work —

### Academic work

- 2019-2020 • Guest editor of *Mathematical Programming*
- 2017- • Member *Forschungskommission* at OVGU
- 2016- • Member *Rektoratskommission Gleichstellung* at OVGU
- 2016 • Organizing committee member of the *IFAC FOSBE 2016*
- 2015 • Organizer of the *Oberwolfach Workshop on MINLP*
- 2013-2017 • Editor and Guest-Editor of *Optimal Control and Applications*
- 2013 • Co-organizer of the *CWMINLP13 workshop* in Paris
- 2012 • Scientific committee member of the *Global Optimization Workshop*
  - Guest editor of *Computational Science*
- 2012- • Main organizer of public outreach activity “Magdeburger Mathenacht”
- 2012- • Series editor of the *Differential-Algebraic Equations Forum*, Springer
- 2011 • Organizer of the ANLO11 workshop *Nonlinear Optimization*
  - Organizer of the OCE11 workshop *Optimal Control & Economics*
- 2010 • Organizer of the SOCCER 2010 conference on *Commodities*
  - Organizer of the SCCS 2010 symposium *Scientific Computing for the Cognitive Sciences*
- 2009 • Organizer: *German-American Frontiers of Engineering Symposium 2009*
- 2008 • Co-organizer of OPTEX2008 workshop on *Industrial Modeling*
- 2007 • Organizer and co-chair of the *Czech–French–German Conference on Optimization 2007*

## — Third Party Funding —

- 2019-2021 • **Excellency–Synergy** Program of Saxony-Anhalt
- 2018-2021 • BMBF Project *P2Chem*
- 2017-2021 • **DFG RTG 2297** *Mathematical Complexity Reduction* (spokesperson), with 12 PIs
- 2017-2020 • Project *OTTI* with Volkswagen, spokesperson, 2 PIs
- 2016-2019 • DFG SPP 1962: *Non-smooth Methods for Complementarity Formulations of Switched Advection-Diffusion Processes* with C. Kirches
- 2016-2018 • **ERC Proof of Concept Grant** isitFlutter-727417
- 2016 • **High Performance** Program of Saxony-Anhalt
- 2015-2020 • **ERC Consolidator Grant** MODEST-647573
- 2014-2017 • Project *Revenue Management* with Air Berlin
- 2013-2016 • BMBF Project “GOSSIP” on *Mixed-integer optimal control* with BASF, Daimler, TLK-Thermo
- 2013-2016 • Klaus-Tschira-Foundation: *Cardiac arrhythmia*
- 2010–2013 • EU project EMBOCON with ETH, ICL, Leuven, Bucharest, industry
- 2009-2012 • Project *Revenue Management* with Lufthansa
- 2009-2012 • DFG SPP 1253 *Optimization with Partial Differential Equations*, project with Dortmund
- 2009-2012 • 4 DFG Graduate School stipends (HD internal)

## — Supervision —

### 13 Ongoing PhD theses (as first advisor)

- 2019- • Bernhardt, F.: *Optimization & Machine Learning for Clinical Decision Support*
- 2019- • Gebhard, A.: *Real time optimization of leukemia therapy*
- 2019- • Ryzhkov, A.: *Lifting in Nonlinear Optimization*
- 2016- • Hahn, M.: *Mixed-integer PDE constrained optimization*
- 2015- • Jost, F.: *Dual control for individualized treatment of blood cancer*
- 2017- • Duc Le, D.: *Optimal urban traffic*
- 2017- • Lilienthal, P.: *Personalized mathematical modeling of haematopoiesis*
- 2015- • Matke, C.: *Modeling&optimization of battery storage in the German power grid*
- 2015- • Tetschke, M.: *Global optimal control for clinical treatment*
- 2017- • Uebbing, J.: *Modeling and Optimization of Power2Chemicals processes*
- 2014- • Weber, T.: *Optimal cardiac ablation strategies*
- 2015- • Weniger, S.: *Portfolio optimization with stochastic differential equations*
- 2015- • Zeile, C.: *Combinatorial Integral Approximation Decompositions for Mixed-Integer Optimal Control*

### 4 Ongoing PhD theses (as second advisor)

- 2015- • Himmel, A.: *Simultaneous design and control of Power2Chemicals processes*
- 2018- • Minakowska, M.: *Modeling and Simulation of Thrombosis*
- 2018- • Monem, S.: *Model Order Reduction and Mixed-Integer Nonlinear Optimization*
- 2016- • Peters, B.: *Polynomial optimization on polytopes*

### 8 Completed PhD theses (as first advisor)

- 2018 • Kehrle, F.: *Inverse simulation of atrial tachycardia*
- 2017 • Rauch, J.: *The Airline Pricing Problem*
- 2016 • Sorgatz, S.: *Optimization of Vehicular Traffic at Traffic-Light Intersections*
- 2015 • Engelhart, M.: *Optimization-based training of human decision making*

## — Supervision (continued) —

- Diedam, H.: *Global optimal control using direct multiple shooting*
- 2014 • Fräsch, J.: *Parallel algorithms for optimization of dynamic systems in real time*
- Huschto, T.: *Numerical Methods for Random Parameter Optimal Control and the Optimal Control of Stochastic Differential Equations*
- 2013 • Jung, M.: *Relaxations and approximations for mixed-integer optimal control*

## 2 Completed PhD theses (as second advisor)

- 2013 • Kellner, S.: *Modeling of Demand for Commodities and a Case Study of the Petrochemical Market*
- Kramer, L.: *Modeling and Reduction of a Multi-Commodity Supply-Demand Trade Network*

## — Publications —

### 2 Patents

- 2016 • Scholz, E., Sager, S., Katus, H., *A system and computer program product for automatically distinguishing atrial flutter from atrial fibrillation*, EP2757940B1, 13.4.2016, <https://www.google.com/patents/EP2757940B1>
- 2010 • Gehring, O., Kauffmann, F., Bock, H.G., Kirches, C., Sager, S., Schlöder, J.P., *Verfahren zum Steuern des Betriebs eines Fahrzeugs*, DE102009030784A1, 4.2.2010, <http://www.google.com/patents/DE102009030784A1>

### 3 Theses

- 2011 • Sager, S., *On the Integration of Optimization Approaches for Mixed-Integer Nonlinear Optimal Control*, habilitation thesis, Ruprecht-Karls-Universität Heidelberg, 2011, <https://mathopt.de/PUBLICATIONS/Sager2011d.pdf>
- 2005 • Sager, S., *Numerical methods for mixed-integer optimal control problems*, PhD thesis, Ruprecht-Karls-Universität Heidelberg, published in Der Andere Verlag, Tönning, Lübeck, Marburg, ISBN 3-89959-416-9, available at <https://mathopt.de/PUBLICATIONS/Sager2005.pdf>
- 2001 • Sager, S., *Lange Schritte im Dualen Simplex-Algorithmus*, diploma thesis, Ruprecht-Karls-Universität Heidelberg, available at <https://mathopt.de/PUBLICATIONS/Sager2001.pdf>

## 52 Journal Publications (plus 7 submitted ones)

- Subm • Averkov, G., Peters, B., Sager, S., *Convexification of polynomial optimization problems by means of monomial patterns*, arXiv preprint 1901.05675, submitted to **SIAM Journal of Optimization**
- Hahn, M., Leyffer, S., Sager, S., *Binary Optimal Control by Trust-Region Steepest Descent*, Optimization Online, 2020/01/7589, submitted to **SIAM Journal of Optimization**
- Le, D.D., Merkert, M., Sorgatz, S., Hahn, M., Sager, S., *Autonomous traffic at intersections: an optimization-based analysis of possible time, energy, and CO<sub>2</sub> savings*, Optimization Online, 2020/02/7600, submitted to **Networks**
- Sager, S., Bernhardt, F., Kehrle, F., Merkert, M., Potschka, A., Meder, B., Katus, H., Scholz, E., *Expert-Enhanced Machine Learning for Cardiac Arrhythmia Classification*, Optimization Online, 2019/10/7421, submitted to **Artificial Intelligence in Medicine**

## — Publications (continued) —

- Sager, S., Tetschke, M. *Properties of time transformed mixed-integer optimal control problems*, Optimization Online, 2020/03/7698, submitted to **Journal of Global Optimization**
- Uebbing, J., Biegler, L.T., Rikho-Struckmann, L., Sager, S., Sundmacher, K., *Optimization of Pressure Swing Adsorption via a Trust-Region Filter Algorithm and Equilibrium Theory*, submitted to **Computers & Chemical Engineering**
- Zeile, C., Weber, T., Sager, S., *Combinatorial Integral Approximation Decompositions for Mixed-Integer Optimal Control*, Optimization Online, 2018/02/6472, submitted to **Optimization Methods and Software**
- 2021 • Minakowska, M., Richter, T., Sager, S., *A finite element / neural network framework for modeling suspensions of non-spherical particles Concepts and medical applications*, accepted by **Vietnam Journal of Mathematics**, <https://arxiv.org/abs/2009.10818>
- 2020 • Himmel, A., Sager, S., Sundmacher, K., *Time-minimal setpoint transition for nonlinear SISO systems under different constraints*, **Automatica**, Vol. 114, pp. 108806
- Jost, F., Schalk, E., Weber, D. Döhner, H., Fischer, T., Sager, S., *Model-based optimal AML consolidation treatment*, **IEEE Transactions on Biomedical Engineering**, accepted, arXiv preprint 1911.08980, DOI 10.1109/TBME.2020.2982749
- Jost, F., Zierk, J., Le, T.T.T., Raupach, T., Rauh, M., Suttorp, M., Stanulla, M., Metzler, M., Sager, S., *Model-based simulation of maintenance therapy of childhood acute lymphoblastic leukemia*, **Frontiers in Physiology**, DOI 10.3389/fphys.2020.00217
- Lilienthal, P., Tetschke, M., Schalk, E., Fischer, T., Sager, S., *Optimized and Personalized Phlebotomy Schedules for Patients suffering from Polycythemia Vera*, accepted by **Frontiers in Physiology**, <http://journal.frontiersin.org/article/10.3389/fphys.2020.00328>
- Rihko-Struckmann, L., Uebbing, J., Sager, S., Sundmacher, K., *CO<sub>2</sub> Methanation Process Synthesis by Superstructure Optimization*, accepted by **Journal of CO<sub>2</sub> Utilization**, DOI 10.1016/j.jcou.2020.101228
- Robuschi, N., Zeile, C., Sager, S., Braghin, F., Cheli, F., *Multiphase Mixed-Integer Nonlinear Optimal Control of Hybrid Electric Vehicles*, Optimization Online, 2019/05/7223, accepted by **Automatica**
- Sager, S., Zeile, C., *On Mixed-Integer Optimal Control with Constrained Total Variation of the Integer Control*, Optimization Online, 2019/10/7432, **Computational Optimization and Applications**, DOI: 10.1007/s10589-020-00244-5
- Scholz, E., Hartlage, C., Bernhardt, F., Weber, T., Salatzki, J., André, F., Lugenbiel, P., Riffel, J., Katus, H., Sager, S., *Spatial relationship between ablation sites within the pulmonary trunk and the left coronaries: Systematic risk assessment based on automated three-dimensional distance measurements*, **Heart Rhythm O<sub>2</sub>**, Vol. 1.1, pp. 14–20
- Zeile, C., Robuschi, N., Sager, S., *Mixed-Integer Optimal Control under Minimum Dwell Time Constraints*, Optimization Online, 2019/09/7366, **Mathematical Programming B**, DOI 10.1007/s10107-020-01533-x

## — Publications (continued) —

- 2019 • A. Bürger, C. Zeile, A. Altmann-Dieses, S. Sager, M. Diehl, *Design, Implementation and Simulation of an MPC Algorithm for Switched Nonlinear Systems under Combinatorial Constraints*, **Journal of Process Control**, Vol. 81, pp. 15–30
- T. Huschto, M. Podolskij, Sager, S., *The asymptotic error of chaos expansion approximations for stochastic differential equations*, **Modern Stochastics: Theory and Applications**, Vol. 6 (2), pp. 145–165
- Jost, F., Schalk, E., Rinke, K., Fischer, T., Sager, S., *Mathematical Models for the Influence of Cytarabine on White Blood Cell Dynamics in Acute Myeloid Leukemia*, **PLOS One**, Vol. 14 (7), DOI 10.1371/journal.pone.0204540
- Weber, T., Sager, S., Gleixner, A., *Solving Quadratic Programs to High Precision using Scaled Iterative Refinement*, **Mathematical Programming Computation**, Vol. 11 (3), pp. 421–455
- 2018 • Diedam, H., Sager, S., *Global optimal control with the direct multiple shooting method*, **Optimal Control Applications and Methods**, Vol. 39 (2), pp. 449–470, DOI 10.1002/oca.2324
- Jung, M.N., Kirches, C., Sager, S., Sass, S., *Computational Approaches for Mixed-Integer Optimal Control Problems with Indicator Constraints*, **Vietnam Journal of Mathematics**, Vol. 46, pp. 1023–1051, DOI 10.1007/s10013-018-0313-z
- Le, T.T.T., Jost, F., Raupach, T., Zierk, J., Rauh, M., Suttorp, M., Stanulla, M., Metzler, M., Sager, S., *A mathematical model of white blood cell dynamics during maintenance therapy of childhood acute lymphoblastic leukemia*, **Mathematical Medicine and Biology**, DOI 10.1093/imammb/dqy017
- Le, T.T.T., Jost, F., Sager, S., *Optimal Control of Vibration-Based Micro Energy Harvesters*, **Journal of Optimization Theory and Applications**, Vol. 179 (3), pp. 1025–1042
- Tetschke, M., Lilienthal, P., Pottgießer, T., Fischer, T., Schalk, E., Sager, S., *Mathematical modeling of RBC count dynamics after blood loss*, **Processes**, Vol. 6 (9), 157, DOI 10.3390/pr6090157
- 2017 • Engelhart, M., Funke, J., Sager, S. *A Web-based Feedback Study on Optimization-based Training and Analysis of Human Decision Making*, **Journal of Dynamic Decision Making**, Vol. 3 (1)
- Jost, F., Sager, S., Le Thi, T.T., *A Feedback Optimal Control Algorithm with Optimal Measurement Time Points*, **Processes**, Vol. 5 (1), 10
- Weber, T., Katus, H.A., Sager, S., Scholz E.P., *Novel Algorithm for Accelerated Electroanatomic Mapping and Prediction of Earliest Activation of Focal Cardiac Arrhythmias using Mathematical Optimization*, **Heart Rhythm**, Vol 14 (6), pp. 875–882
- 2016 • Janka, D., Kirches, C., Sager, S., Wächter, A., *An SR1/BFGS SQP algorithm for nonconvex nonlinear programs with block-diagonal Hessian matrix*, **Mathematical Programming Computation**, Vol. 8 (4), pp. 435–459
- 2015 • Frasch, J. V., Sager, S., Diehl, M., *A parallel quadratic programming method for dynamic optimization problems*, **Mathematical Programming Computation**, Vol. 7 (3), pp. 289–329
- Jung, M.N., Reinelt, S., Sager, S., *The Lagrangian Relaxation for the Combinatorial Integral Approximation Problem*, **Optimization Methods and Software**, Vol. 30 (1), pp. 54–80

## — Publications (continued) —

- Sager, S., Claeys, M., Messine, F., *Efficient upper and lower bounds for global mixed-integer optimal control*, **Journal of Global Optimization**, Vol. 61 (4), pp. 721–743
- 2014 • Duran, B.J., Jung, M.N., Ocampo-Martinez, C., Sager, S., Cambrano, G., *Minimization of Sewage Network Overflow*, **Water Resources Management**, Vol. 28 (1), pp. 41–63
- Huschto, T., Sager, S., *Pricing conspicuous consumption products in recession periods with uncertain strength*, **European Journal of Decision Processes**, Vol. 2 (1–2), pp. 3–30
- Huschto, T., Sager, S., *Solving Stochastic Optimal Control Problems by a Wiener Chaos Approach*, **Vietnam Journal of Mathematics**, Vol. 42(1), pp. 83–113
- Scholz, E.P., Kehrle, F., Vossel, S., Hess, A., Zitron, E., Katus, H.A., Sager, S., *Discriminating atrial flutter from atrial fibrillation using a multilevel model of atrioventricular conduction*, **Heart Rhythm**, Vol. 11(5), pp. 877–884
- 2013 • Engelhart, M., Funke, J., Sager, S., *A Decomposition Approach for a New Test-Scenario in Complex Problem Solving*, **Journal of Computational Science**, Vol. 4(4), pp. 245–254
- Hante, F., Sager, S., *Relaxation Methods for Mixed-Integer Optimal Control of Partial Differential Equations*, **Computational Optimization and Applications**, Vol. 55(1), pp. 197–225
- Kirches, C., Potschka, A., Bock, H.G., Sager, S., *A Parametric Active Set Method for QPs with Vanishing Constraints Arising in a Robot Motion Planning Problem*, **Pacific Journal of Optimization**, Vol. 9(2), pp. 275–299
- Sager, S., *Sampling Decisions in Optimum Experimental Design in the Light of Pontryagin’s Maximum Principle*, **SIAM Journal on Control and Optimization**, Vol. 51(4), pp. 3181–3207
- 2012 • Sager, S., Bock, H.G., Diehl, M., *The Integer approximation error in mixed-integer optimal control*, **Mathematical Programming A**, Vol. 133(1-2), pp. 1–23
- 2011 • Engelhart, M., Lebiedz, D., Sager, S., *Optimal control for cancer chemotherapy ODE models: Potential of optimal schedules and choice of objective function*, **Mathematical Biosciences**, Vol. 229(1), pp. 123–134
- Huschto, T., Feichtinger, G., Kort, P., Hartl, R.F., Sager, S., Seidl, A., *Numerical solution of a conspicuous consumption model with constant control delay*, **Automatica**, Vol. 47(9), 1868–1877
- Kirches, C., Bock, H.G., Schlöder, J.P., Sager, S., *Block structured quadratic programming for the direct multiple shooting method for optimal control*, **Optimization Methods and Software**, Vol. 26(2), 239–257
- Kirches, C., Bock, H.G., Schlöder, J.P., Sager, S., *A factorization with update procedures for a KKT matrix arising in direct optimal control*, **Mathematical Programming Computation**, Vol 3(4), pp. 319–348
- Sager, S., Barth, C., Diedam, H., Engelhart, M., Funke, J., *Optimization as an analysis tool for human complex problem solving*, **SIAM Journal on Optimization**, Vol. 21(3), pp. 936–959
- Sager, S., Jung, M.N., Kirches, C., *Combinatorial integral approximation*, **Mathematical Methods for Operations Research**, Vol. 73(3), pp. 363–380

## — Publications (continued) —

- 2010 • Logist, F., Sager, S., Kirches, C., Van Impe, J.F., *Efficient multiple objective optimal control of dynamic systems with integer controls*, **Journal of Process Control**, Vol. 20(7), 810–822
- Kirches, C., Sager, S., Bock, H.G., Schlöder, J.P., *Time-optimal control of automobile test drives with gear shifts*, **Optimal Control Applications and Methods**, Vol. 31(2), 137–153
- 2009 • Sager, S., Reinelt, G., Bock, H.G., *Direct methods with maximal lower bound for mixed-integer optimal control problems*, **Mathematical Programming**, Vol. 118(1), pp. 109–149
- Sager, S., *Reformulations and algorithms for the optimization of switching decisions in nonlinear optimal control*, **Journal of Process Control**, Vol. 19, pp. 1238–1247
- 2008 • Brandt-Pollmann, U., Winkler, R., Sager, S., Moslener, U., Schlöder, J.P., *Numerical solution of optimal control problems with constant control delays*, **Computational Economics**, Vol. 31(2), pp. 181–206
- Shaik, O.S., Sager, S., Slaby, O., Lebiedz, D., *Phase tracking and restoration of circadian rhythms by model-based optimal control*, **IET Systems Biology**, Vol. 2, pp. 16–23
- 2007 • Slaby, O., Sager, S., Shaik, O.S., Kummer, U., Lebiedz, D., *Optimal control of self-organized dynamics in cellular signal transduction*, **Mathematical and Computer Modelling of Dynamical Systems**, Vol. 13, pp. 487–502
- Sager, S., Brandt-Pollmann, U., Diehl, M., Lebiedz, D., Bock, H.G., *Exploiting system homogeneities in large scale optimal control problems for speedup of multiple shooting based SQP methods*, **Computers & Chemical Engineering**, Vol. 31, pp. 1181–1186
- 2006 • König, R., Schramm, G., Oswald, M., Seitz, H., Sager, S., Zapatka, M., Reinelt, G., Eils, R., *Discovering functional gene expression patterns in the metabolic network of *Escherichia coli* with wavelet transforms*, **BMC Bioinformatics**, 7:119
- 2005 • Lebiedz, D., Sager, S., Bock, H.G., Lebiedz, P., *Annihilation of limit-cycle oscillations by identification of critical perturbing stimuli via mixed-integer optimal control*, **Physical Review Letters**, 95, 108303
- Brandt-Pollmann, U., Lebiedz, D., Diehl, M., Sager, S., Schlöder, J.P., *Real-time nonlinear feedback control of pattern formation in (bio)chemical reaction-diffusion processes: A model study*, **Chaos**, 15, 033901, selected for online-publication in **Virtual Journal of Biological Physics Research**, July 15, 2005

## 15 Book Contributions

- 2021 • Bethge, J., Findeisen, R., Le, D.D., Merkert, M., Rewald H., Sager, S., Savchenko, A., Sorgatz, S., *Mathematical Optimization and Machine Learning for Efficient Urban Traffic*, special volume “Mathematical Success Stories”
- Garmatter, D., Maggi, A., Wenzel, M., Monem, S., Hahn, M., Stoll, M., Sager, S., Benner, P., Sundmacher, K., *Power-to-Chemicals: A Superstructure Problem for Sustainable Syngas Production*, accepted for special volume “Mathematics in Industry”



## — Publications (continued) —

- 2020 • Hahn, M., Kirches, C., Manns, P., Sager, S., Zeile, C., *Decomposition and approximation for PDE-constrained mixed-integer optimal control*, SPP1962 special issue, Birkhäuser, accepted
- 2017 • Himmel, A., Sager, S., Sundmacher, K., *Set point tracking of a biogas plant coupled to a methanation reactor*, Computer Aided Chemical Engineering, Vol. 40, pp. 1645–1650, <https://doi.org/10.1016/B978-0-444-63965-3.50276-2>
- Matke, C., Bienstock, D., Munoz, G., Yang, G., Kleinhans, D., Sager, S., *Robust optimization of power network operation: storage devices and the role of forecast errors in renewable energies*, Studies in Computational Intelligence, Complex Networks & Their Applications V, Springer, ISBN 978-3-319-50900-6, pp. 809–820
- Matke, C., Medjroubi, W., Kleinhans, D., Sager, S., *Structure Analysis of the German Transmission Network Using the Open Source Model SciGRID*, Trends in Mathematics, Advances in Energy System Optimization, Springer, ISBN 978-3-319-51795-7, pp. 177–188
- 2014 • Zanon, M., Fräsch, J.V., Vukov, M., Sager, S., Diehl, M., *Model Predictive Control of Autonomous Vehicles*, Eds. Waschl, H., Kolmanovsky, I. Steinbuch, M., del Re, L., Optimization and Optimal Control in Automotive Systems, Springer, ISBN 978-3-319-05370-7, pp. 41–57
- 2013 • Jung, M.N., Kirches, C., Sager, S., *On perspective functions and vanishing constraints in mixed-integer nonlinear optimal control*, Eds. Jünger, M., Reinelt, G., Facets of Combinatorial Optimization, Springer, ISBN 978-3-642-38188-1, pp. 387–417
- 2012 • Bock, H.G., Potschka, A., Sager, S., Schlöder, J.P., *On the connection between forward and optimization problem in one-shot one-step methods*, in G. Leugering, S. Engell, A. Griewank, M. Hinze, R. Rannacher, V. Schulz, M. Ulbrich, and S. Ulbrich, editors, Constrained Optimization and Optimal Control for Partial Differential Equations, volume 160 of International Series of Numerical Mathematics, Springer, pp. 37–49
- Gerds, M., Sager, S., *Mixed-Integer DAE Optimal Control Problems: Necessary conditions and bounds*, Eds. Biegler, L., Campbell, S., Mehrmann, V., Control and Optimization with Differential-Algebraic Constraints, SIAM, ISBN 978-1-611972-24-5, pp. 189–212
- Sager, S., *A benchmark library of mixed-integer optimal control problems*, Springer, Eds. Lee, J., Leyffer, S., Mixed Integer Nonlinear Programming, The IMA Volumes in Mathematics and its Applications, Vol. 154, ISBN 978-1-4614-1926-6, pp. 631–670
- 2010 • Grüne, L., Sager, S., Allgöwer, F., Bock, H.G., Diehl, M., *Predictive planning and systematic action – on the control of technical processes*, Springer, Eds. Grötschel, M., Lucas, K., Mehrmann, V., Production Factor Mathematics, ISBN 978-3-6421-1247-8, pp. 9–38
- Kirches, C., Wirsching, L., Sager, S., Bock, H.G., *Efficient numerics for nonlinear model predictive control*, Springer, Eds. Diehl, M., Glineur, F., Jarlebring, E., Michiels, W., Recent Advances in Optimization and its Applications in Engineering, ISBN 978-3-6421-2597-3, pp. 339–359

## — Publications (continued) —

- 2009 • Sager, S., Bock, H.G., Diehl, M., Reinelt, G., Schlöder, J.P., *Numerical methods for optimal control with binary control functions applied to a Lotka-Volterra type fishing problem*, Springer, Eds. Seeger, A., Recent Advances in Optimization, ISBN 978-3-5402-8257-0, pp. 269–289
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- 2020 • Bürger, A., Zeile, C., Hahn, M., Altmann-Dieses, A., Sager, S., Diehl, M., *pycombina: An Open-Source Tool for Solving Combinatorial Approximation Problems arising in Mixed-Integer Optimal Control*, accepted for IFAC World Congress 2020
- 2018 • Bürger, A., Zeile, C., Altmann-Dieses, A., Sager, S., Diehl, M., *An Algorithm for Mixed-Integer Optimal Control of Solar Thermal Climate Systems with MPC-capable runtime*, **ECC 2018**
- 2017 • Zeile, C., Rauwolf, T., Schmeisser, A., Weber, T., Sager, S., *The Influence of Right Ventricular Afterload in Cardiac Resynchronization Therapy: A CircAdapt Study*, **Computing in Cardiology 2017**
- 2016 • Jost, F., Rinke, K., Fischer, T., Schalk, E., Sager, S., *Patient specific sampling decisions by optimum experimental designs for Leukopenia*, **6th IFAC Conference on Foundations of Systems Biology in Engineering**
- Rinke, K., Jost, F., Findeisen, R., Fischer, T., Bartsch, R., Schalk, E., Sager, S. *Parameter estimation for leukocyte dynamics after chemotherapy*, **6th IFAC Conference on Foundations of Systems Biology in Engineering**
- Thuy T. T. Le, Binh D. Truong, Cuong P. Le, Sebastian Sager, *On the power optimization of the vibration-based energy harvesters under swept input acceleration*, **IEEE SENSORS**, Orlando, FL
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- Huschto, T., Sager, S., *Stochastic Optimal Control in the Perspective of the Wiener Chaos*, **ECC 2013**
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- 2011 • Kehrle, F., Frasch J.V., Kirches, C., Sager, S., *Optimal control of Formula 1 race cars in a VDrift based virtual environment*, **IFAC World Congress 2011**, Paper ThB21.2, Milano

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- 2010 • Sager, S., Barth, C., Diedam, H., Engelhart, M., Funke, J., *Optimization to measure performance in the Tailorshop test scenario — structured MINLPs and beyond*, Proceedings **EWMINLP10**, pp. 261–269, CIRM, Marseille
- 2008 • S. Sager, C. Kirches, H.G. Bock, *Fast solution of periodic optimal control problems in automobile test-driving with gear shifts*, **IEEE CDC08 Proceedings**, ISBN: 978-1-4244-3124-3
- 2007 • Sager, S., Diehl, M., Singh, G., Küpper, A., Engell, S., *Determining SMB superstructures by mixed-integer optimal control*, Proceedings OR 2006, Eds. K.-H. Waldmann, U.M. Stocker, Springer, pp. 37–44
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- 2018 • Sager, S., *Optimization and Clinical Decision Support*, **Optima**, 104, pp. 1–8
- Sager, S., *Optimierung und Klinische Entscheidungsunterstützung*, **Mitteilungen der Deutschen Mathematiker-Vereinigung**, 26, pp. 101–111
- 2011 • Fräsch, J., Janka, D., Kircheis, R., Sager, S., *Das Rucksackproblem der Bundesligamanager*, **OR News**, 43, pp. 6–9
- 2007 • Sager, S., *Von diskreten Mathematikern und Wanderungen im Gebirge*, **Bild der Wissenschaft plus**, Vol. 11, pp. 12–15, available at [http://www.klaus-tschira-preis.info/download/2007/BDW\\_KTP\\_2007.pdf](http://www.klaus-tschira-preis.info/download/2007/BDW_KTP_2007.pdf)
- 2006 • Sager, S., *Numerische Methoden für Probleme der gemischt-ganzzahligen Optimalen Steuerung*, **OR News**, 28, pp. 30–31

## Reviewing Activities

- CDC, Computational and Mathematical Methods in Medicine, Computational Optimization and Applications, Computers and Chemical Engineering, Discrete Optimization, Environmental Modelling and Software, European Journal of Operational Research, IEEE TAC, IFAC, Industrial & Engineering Chemistry Research, INFORMS Journal on Computing, Int J. of Biomathematics, Journal of Biological Systems, Journal of Process Control, MMOR, Mathematical Programming, Open Applied Mathematics Journal, OCAM, Optimization, Optimization and Engineering, Scientific Reports, SICON
- Klaus Tschira Foundation
- Alexander von Humboldt Foundation
- Dutch National Science Foundation