

Dr. Armin Rund  
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## Curriculum Vitae

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### Personal Information

Name and Title: Dr. rer. nat. Armin Rund  
Date of Birth: 24.06.1980 in Bayreuth  
Citizenship: German



### Professional Career

Nov 2011 – Today Postdoctoral Researcher, Institute of Mathematics and Scientific Computing, University of Graz, Austria  
Mar – Sept 2015 Postdoctoral Researcher, Institute of Medical Engineering, Graz University of Technology, Austria  
Oct 2005 – Oct 2011 Research Assistant, Chair of Mathematics in Engineering Sciences, University of Bayreuth, Germany

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### Education

Feb 2012 Doctorate in Mathematics (magna cum laude (excellent)), University of Bayreuth  
Sept 2005 Diploma in Applied Mathematics with distinction (1.0), University of Bayreuth  
Autumn 2004 Three-month research stay at the Jülich Supercomputing Centre  
Jun 1999 German University-Entrance Diploma with distinction (1.0)

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### References

Prof. Dr. Karl Kunisch, Head of the Institute of Mathematics and Scientific Computing, University of Graz, [karl.kunisch@uni-graz.at](mailto:karl.kunisch@uni-graz.at)  
Prof. Dr. Hans Josef Pesch, Head of the Chair of Mathematics in Engineering Sciences (retired Apr 2015), University of Bayreuth, [hans-josef.pesch@uni-bayreuth.de](mailto:hans-josef.pesch@uni-bayreuth.de)  
Prof. Dr. Rudolf Stollberger, Head of the Institute of Medical Engineering, Graz University of Technology, [rudolf.stollberger@tugraz.at](mailto:rudolf.stollberger@tugraz.at)

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### Mathematical Areas of Expertise

- Optimal Control of Partial Differential Equations: Theory and Numerics
- Optimal Control of Coupled Systems and Multiphysics Models
- Numerics of Partial Differential Equations, FEM
- Numerics, Nonlinear Optimization, Mathematical Modelling

### Experience in Natural Sciences and Engineering

- Fluid Dynamics, Mechanics, Thermodynamics, Electrical Engineering, Control Theory, Reaction Kinetics, Fuel Cell Models
- Medical Engineering (MRI), Biomedical Engineering (heart models, cell models), mathematical physics (MRI), population dynamics

### Experience in Computer Sciences

- Algorithms, HPC, Parallelization (OpenMP, MPI)
- Programming (C, C++, FORTRAN 77, Fortran 90, Java)
- Mathematical Software (e.g. MATLAB, COMSOL, deal.II, CARP, AMPL, IPOPT)
- Software (e.g. SVN, Git, Eclipse, MS-Office, VisIt, ParaView), Windows, Linux

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## Awards

- Winner of the [ISMRM Challenge](#) on the design of shortest RF pulses for Magnetic Resonance Imaging, International Society for Magnetic Resonance in Medicine, May 2016
  - Nomination as „[GAMM Junior](#)“ for an excellent doctoral thesis in applied Mathematics, International Association of Applied Mathematics and Mechanics, 2011
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## Current Networks

- Member of the International Association of Applied Mathematics and Mechanics (GAMM) since 2012
  - Postdoc in [BioTechMed-Graz](#)
  - Associate Postdoc of the [international doctoral school](#) “Optimization and Numerical Analysis for Partial Differential Equations with Nonsmooth Structures”, DFG and FWF, cooperation of TU Graz, Uni Graz, TU Munich, Bundeswehr University Munich
  - Postdoc in the [special research center](#) “Mathematical Optimization and Applications in Biomedical Sciences”
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## Grants

- Coordination of the (successful) application for the extension of the special research center MOBIS in 2014, scientific contribution to the proposal part OPTIM
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## Organization of Meetings

- Workshop on „Future Research in Combinatorial Optimization“, Sept 2007, Bayreuth, Germany
  - International Workshop „From Open to Closed Loop Control“, Graz, Austria, June 2015
  - International Workshop „Optimal Control of Dynamical Systems“, Graz, Austria, May 2017
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## Attended Conferences (Selection)

- ISMP Pittsburgh, 2015
  - SIAM CSE, Boston, 2014
  - GAMM Annual Meeting 2004, 2005, 2007, 2014
  - SIAM Conference on Optimization, Darmstadt, 2011
  - ICIAM Zürich, 2007
  - SIAM Conference on Control and its Applications, San Francisco, 2007
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## Teaching

- Mentoring of 5 PhD students
- Mentoring of 1 Bachelor and 7 Master Theses
- Exercises in Numerics (2016/2017, Uni Graz)
- Exercises in Analysis, Linear Algebra, Calculus (2012 – 2015, 2017, Uni Graz)
- Exercises for Mathematics and Numerics in Engineering Sciences (2005 – 2011, Uni Bayreuth)
- Exercises in Nonlinear Optimization and Optimal Control (2009 – 2011, Bayreuth)

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**Publications: (peer-reviewed journals in bold)**

1. A. Rund, C. Aigner, K. Kunisch, R. Stollberger: „RF pulse design by optimal control with physical constraints“. Proceedings of the 25th Scientific Meeting of ISMRM, 2017
2. C. Aigner, A. Rund, B. Bilgic, B. Gagoski, K. Setsompop, K. Kunisch, and R. Stollberger: „Application of time-optimal simultaneous multi-slice refocusing to TSE/RARE“. Proceedings of the 25th Scientific Meeting of ISMRM, 2017
3. A. Rund, C. Aigner, K. Kunisch, and R. Stollberger: „Simultaneous multislice refocusing by time-optimal control“. Proceedings of the 25th Scientific Meeting of ISMRM, 2017
4. **C. Aigner, C. Clason, A. Rund, R. Stollberger: „Efficient high-resolution RF pulse design applied to simultaneous multi-slice excitation“. Journal of Magnetic Resonance 263: 33-44, 2016**
5. **C. Clason, A. Rund, K. Kunisch, R. Barnard: „A convex penalty for switching control of partial differential equations“. Systems & Control Letters 89: 66-73, 2016**
6. K. Chudej, A. Rund, M. Wächter: „Trajectory optimization of a hypersonic plane s.t. heat limits“. In: D. Tikhomirov, H.-T. Mammen, T. Pawletta: Tagungsband Workshop ASIM STS/GMMS 2016, ARGESIM Report 51: 101-108, Wien, Österreich, 2016
7. C. Aigner, C. Clason, A. Rund, R. Stollberger: „Low SAR RF-pulse design by joint optimization of RF and gradient shape with physical constraints“. In Proceedings of the 24th Scientific Meeting of ISMRM, 1133, 2016
8. **K. Kunisch, K. Pieper, A. Rund: „Time optimal control for a reaction diffusion system arising in cardiac electrophysiology – a monolithic approach“. ESAIM: Mathematical Modelling and Numerical Analysis 50(2): 381-414, 2016**
9. C. Aigner, C. Clason, A. Rund, A. Petrovic, R. Stollberger: „Design of complex RF pulse shapes for asymmetric excitation patterns via optimal control“. Biomed Tech 61, S1, p. 140, 2016
10. M. Bödenler, C. Aigner, A. Rund, C. Clason, R. Stollberger: „Fast optimization of RF excitation“. Magnetic Resonance Materials in Physics, Biology and Medicine 29, S1, p. 358, 2016
11. C. Clason, K. Kunisch, A. Rund: „Optimal control of partial differential equations with nonsmooth cost functionals“. Proceedings of the 24th Congress on Differential Equations and Applications, Cádiz, 2015
12. C. Aigner, C. Clason, A. Rund, R. Stollberger: „RF pulse design for simultaneous multislice excitation with highly reduced B1 peak amplitude“. In Proceedings of the 23th Scientific Meeting of ISMRM, 660, 2015
13. C. Aigner, C. Clason, A. Rund, R. Stollberger: „SAR reduced excitation by joint design of RF pulse and slice selective gradient shape“. In Proceedings of the 23th Scientific Meeting of ISMRM, 661, 2015
14. **K. Kunisch, A. Rund: „Time optimal control of the monodomain model in cardiac electrophysiology“. IMA Journal of Applied Mathematics 80(6):1664-1683, 2015**
15. C. Aigner, C. Clason, A. Rund, R. Stollberger: „RF Pulse Design for low SAR Simultaneous Multislice (SMS) Excitation Using Optimal Control“. In Proceedings of the 22th Scientific Meeting of ISMRM, 3719, 2014

16. C. Aigner, C. Clason, A. Rund, R. Stollberger: „Validation of a flexible optimal control approach for RF-pulse design including relaxation effects and SAR“. Tagungsband zur ÖGBMT-Jahrestagung 2014, 23-24, 2014
17. A. Rund, K. Chudej, J. Kerler, H.J. Pesch, K. Sternberg: „Optimal control of coupled multiphysics problems: Guidelines for real-life applications demonstrated for a complex fuel cell model“. *GAMM-Mitteilungen*, 35(2), pp. 146-174, 2012
18. A. Rund, K. Chudej: „Optimal control for a simplified 1D fuel cell model“. *Mathematical and Computer Modelling of Dynamical Systems*, 18(4), pp. 379-396, 2012
19. A. Rund: “Beiträge zur Optimalen Steuerung partiell-differential algebraischer Gleichungen“. Doktorarbeit, Universität Bayreuth, 2012
20. S. Wendl, H.J. Pesch, A. Rund: „On a state-constrained PDE optimal control problem arising from ODE-PDE optimal control“. In: M. Diehl, F. Glineur, W. Michiels (Eds.): *Recent Advances in Optimization and its Applications in Engineering*. Springer, Heidelberg, pp. 429-438, 2010
21. H.J. Pesch, A. Rund, W. von Wahl, S. Wendl: „On some new phenomena in state-constrained optimal control if ODE as well as PDE are involved“. *Control and Cybernetics*, 39, 3, pp. 647-660, 2010
22. S. Bechmann, M. Frey, H.J. Pesch, A. Rund: „On some new adjoining approaches for state-constrained elliptic optimal control problems“. AIP Conference Proceedings, 1168, 2009
23. A. Rund, K. Sternberg, H.J. Pesch, K. Chudej: „Optimal control of a large PDAE molten carbonate fuel cell model“. *Proceedings in Applied Mathematics and Mechanics* 7, 2008
24. K. Sternberg, K. Chudej, H.J. Pesch, A. Rund: „Parametric sensitivity analysis of fast load changes of a dynamic MCFC model“. *Journal of Fuel Cell Science and Technology*, 5(2), 2008
25. M. Scholle, A. Rund, N. Aksel: „Drag reduction and improvement of material transport in creeping films“. *Archive of Applied Mechanics* 75, 2-3, pp. 93-112, Springer, 2006
26. A. Rund: „Optimierung des Materialtransportes bei schleichenden Filmströmungen“, Diplomarbeit, Universität Bayreuth, 2005
27. A. Rund: „Fast parallel matrix multiplication: The Strassen-Winograd algorithm“. *Beiträge zum Wissenschaftlichen: Ergebnisse des Gaststudentenprogramms 2004 des John von Neumann-Instituts für Computing*, Rüdiger Esser(Ed.), pp. 53-64, Jülich, 2004

#### Submitted and Accepted Work

28. A. Rund, C. Aigner, K. Kunisch, and R. Stollberger: „Magnetic Resonance RF pulse design by optimal control with physical constraints“. Submitted to *IEEE Transactions on Medical Imaging*, 2017
29. C. Clason, K. Kunisch, and A. Rund: “Nonconvex penalization of switching control of partial differential equations. [SFB-Report 2016-001](#). Submitted to *Systems & Control Letters*, 2016

Graz, März 02, 2017

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