Dr. Jan Friedrich

Curriculum Vitae

RWTH Aachen University
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52056 Aachen
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Personal Data

Date, Place of Birth	October 13, 1991 in Marl
Nationality	German
Homepage	https://www.igpm.rwth-aachen.de/team/friedrich

Working Experience in Academia

since 09/2023 **Principal Investigator**, *RWTH Aachen University*, SPP 2410: Hyperbolic Balance Laws in Fluid Mechanics: Complexity, Scales, Randomness, German Research Foundation

Project: Balance laws with space-dependent nonlocalities: modeling, simulation and uncertainty quantification

- Analysis of multidimensional nonlocal partial differential equations
- Numerical methods for multidimensional systems of nonlocal balance laws
- Stochastic influences on the nonlocal dynamics

since 01/2022 **Postdoctoral Researcher**, *RWTH Aachen University*, Institute of Geometry and Applied Mathematics, Prof. Dr. Michael Herty

- Research related to Numerical Analysis, Optimization and Control of partial differential equations, including inverse problems
- Lecturer of *Applications of scalar conservation laws*

09/2021–12/2021 **Postdoctoral Researcher**, *University of Mannheim*, Chair of Scientific Computing, Prof. Dr. Simone Göttlich

- Lecturer of *Numerical methods for ordinary differential equations*

09/2017–08/2021 **Research Assistant**, *University of Mannheim*, Chair of Scientific Computing, Prof. Dr. Simone Göttlich

- Research on Numerical Analysis of nonlocal partial differential equations

02/2016–07/2016 **Student Assistant**, *University of Mannheim*, Chair of Scientific Computing, Prof. Dr. Oliver Kolb

- Tutor for Numerics

08/2015–01/2016 **Student Assistant**, *University of Mannheim*, Chair of Stochastic, Prof. Dr. Leif Döring

- Tutor for Analysis 1

02/2015–07/2015 **Student Assistant**, *University of Mannheim*, Chair of Business Mathematics II, Prof. Dr. Andreas Neuenkirch

- Tutor for Numerics

Working Experience outside Academia

10/2016–02/2017 **Horváth & Partners Management Consultants**, *Steering Lab*, Munich, Internship
- Analysis of price elasticizes
- dynamic pricing and prize optimization in an offline-store using receipt data

07/2016–09/2016 **Deutsche Bank**, *Risk (Rating Methodologies)*, Frankfurt, Internship
- Re-calibration and optimization of the *Leveraged and Structured Finance Scorecard*
- Regression-models using macro-economic data within the IFRS9 project

Education

09/2017–08/2021 **PhD in Mathematics (Dr. rer. nat.)**, *Chair of Scientific Computing*, University of Mannheim, Prof. Dr. Simone Göttlich
Thesis: Traffic flow models with nonlocal velocity
Grade: summa cum laude
Committee: Prof. Dr. Simone Göttlich, Dr. Paola Goatin, Prof. Dr. Axel Klar

02/2015–08/2017 **Master Studies**, *Business Mathematics*, University of Mannheim
Degree: *Master of Science with distinction*, Final Grade: 1.2

09/2013–01/2014 **Semester abroad**, *Swansea University*, Swansea, Wales

09/2011–01/2015 **Bachelor Studies**, *Business Mathematics*, University of Mannheim
Degree: *Bachelor of Science*, Final Grade: 1.3

2011 **High school diploma (Abitur)**, *Albert-Schweizer-/Geschwister-Scholl Gymnasium*, Marl, Final Grade: 1.4

Research Stays

02/2025 **Indian Institute of Petroleum and Energy (IIPE)**, *Visakhapatnam, India*, Paired Early Career Fellowship in Applied Research with Dr. Rathan Samala, financially supported by the Indo-German Science and Technology Centre (IGSTC)

02/2024 **Indian Institute of Petroleum and Energy (IIPE)**, *Visakhapatnam, India*, Dr. Rathan Samala, financially supported by IIPE
- Lecturer of a Ph.D. course on *Applications of scalar hyperbolic conservation laws*

08/2019 **Arizona State University**, *Phoenix, USA*, Prof. Dr. Dieter Armbruster, financially supported by DAAD-PPP USA

07 and 11/2019 **INRIA**, *Sophia Antipolis, France*, Dr. Paola Goatin, financially supported by DAAD France and PHC Procope

01/2019 **INRIA**, *Sophia Antipolis, France*, Research Tandem jointly with Dr. Felisia Angela Chiarello, financially supported by DAAD and BMBF

Third-party funds and grants received

since 08/2025 Exploratory Research Space, RWTH Aachen University, internal project funding
- Project: Regulation and Stabilization of Stem Cell Dynamics in Blood Cancer and Bone Marrow Failure Patients, together Dr. Wenhui Shi and Prof. Dr. Thomas Stiehl
- own/total Budget: 16.700 €/49.000 €

07/2024 **Paired Early Career Fellowship in Applied Research** (PECFAR) by the Indo-German Science and Technology Centre (IGSTC)
- Research tandem with Dr. Rathan Samala: planned visit in India 02/2025 and in Germany 05/2025
- own/total Budget for Travel: 3,200 €/9,000 €

02/2024 **Indian Institute of Petroleum and Energy**, Funding for a research stay: ≈ 3,500 €

since 09/2023 **Principal Investigator**, DFG-SPP 2410: Hyperbolic Balance Laws in Fluid Mechanics: Complexity, Scales, Randomness
- Project: Balance laws with space-dependent nonlocalities: modeling, simulation and uncertainty quantification
- Budget for Staff: 84,800 € (75%-Position for 18 months)
  Budget for Travel and Guests: 9,000 €
  Programme allowance for indirect project costs: 20,636 €

09/2023 **Organization of two workshops** on *Recent Trends in Optimization and Control* in Pretoria, South Africa and Dakar, Senegal, financed by the Volkswagen Foundation, Grant: 94,000 €

06/2020 **IDEUM**, Funding for a conference trip, Grant: 1,000 €

01/2019 **IPID4all mobility grant**, Research Tandem financially supported by DAAD and BMBF, Grant: 1.468 €

Academic self-administration

08/2023-07/2024 Member of the Search Committee W3 *Analysis and its Applications*, RWTH Aachen University

08/2022-07/2024 Deputy member of the Examination Board for Business Mathematics, RWTH Aachen University

12/2022-07/2023 Member of the Search Committee W1 *Uncertainty Quantification*, RWTH Aachen Univesity

Awards

10/2018 Werner-Oettli-Award for one of the best Master's theses in 2017/2018

06/2011 DMV-Abiturpreis

Memberships

since 07/2023 DFG-SPP 2410: *Hyperbolic Balance Laws in Fluid Mechanics: Complexity, Scales, Randomness*

since 03/2023 Deutscher Hochschulverband

01/2023-12/2023 Society for Industrial and Applied Mathematics (SIAM)

01/2022-07/2023 DFG-SPP 1962: *Non-smooth and Complementarity-based Distributed Parameter Systems: Simulation and Hierarchical Optimization*

Engagement in the scientific community

Network Coordination of a German-African network in the field of optimization and control
- Continuation of the network that emerged from the *Recent Trends in Optimization and Control* workshops
- Organization of online talks
- Management of the email distribution list with over 60 members

Guest editor **Special Issue: Nonlocal conservation laws**, *Networks and Heterogeneous Media*, http://www.aimspress.com/nhm/article/6300/special-articles

15 Reviews for

- Bull. Braz. Math. Soc.
- Discrete Contin. Dyn. Syst. Ser. B
- IMA J. Numer. Anal.
- Math. Comput. Simulation
- Netw. Heterog. Media.
- SIAM J. Appl. Math.
- Comput. Chem. Eng.
- ESAIM Math. Model. Numer. Anal.
- Kinet. Relat. Models
- Math. Biosci. Eng.
- SIAM J. Appl. Dyn. Syst
- Z. Angew. Math. Phys.

Publications

Articles in peer-reviewed journals

1. J. Friedrich, S. Schraven, F. Kiessling, M. Herty
Source identification in bioluminescence tomography by consensus-based optimization
Optics Express, 33(16): 33312-33329, DOI:10.1364/OE.546936, 2025
2. F. Chiarello, J. Friedrich, S. Göttlich
A non-local traffic flow model for 1-to-1 junctions with buffer
Netw. Heterog. Media, 19 (1), 405-429, DOI: 10.3934/nhm.2024018, 2024
3. J. Friedrich, S. Göttlich, A. Keimer, L. Pflug
Conservation laws with nonlocal velocity - the singular limit problem
SIAM J. Appl. Math., 84 (2), 497-522, DOI: 10.1137/22M1530471, 2024
4. J. Friedrich, S. Göttlich, M. Herty
Lyapunov stabilization for nonlocal traffic flow models
SIAM J. Control Optim., 61 (5), 2849-2875, DOI: 10.1137/22M152181X, 2023
5. J. Friedrich, S. Sudha, S. Rathan
Numerical schemes for a class of nonlocal conservation laws: a general approach
Netw. Heterog. Media, 18 (3), 1335–1354, DOI: 10.3934/nhm.2023058, 2023
6. J. Friedrich, S. Göttlich, A. Uphoff
Conservation laws with discontinuous flux function on networks: a splitting algorithm
Netw. Heterog. Media, 18 (1), 1–28, DOI: 10.3934/nhm.2023001, 2023
7. A. Bayen, J. Friedrich, A. Keimer, L. Pflug, T. Veeravalli
Modeling multilane traffic with moving obstacles by nonlocal balance laws
SIAM J. Appl. Dyn. Syst., 21 (2), 1495–1538, DOI: 10.1137/20M1366654, 2022
8. J. Friedrich, S. Göttlich, M. Osztfalk
Network models for nonlocal traffic flow
ESAIM Math. Model. Numer. Anal., 56, 213–235, DOI: 10.1051/m2an/2022002, 2022
9. J. Friedrich, E. Rossi, S. Göttlich
Nonlocal approaches for multilane traffic models
Commun. Math. Sci., 19, 2291–2317, DOI: 10.4310/CMS.2021.v19.n8.a10, 2021
10. F. Chiarello, J. Friedrich, P. Goatin, S. Göttlich
Micro-Macro limit of a non-local generalized Aw-Rascle type model
SIAM J. Appl. Math., 80, 1841–1861, DOI: 10.1137/20m1313337, 2020
11. F. Chiarello, J. Friedrich, P. Goatin, S. Göttlich, O. Kolb
A non-local traffic flow model for 1-to-1 junctions
European J. Appl. Math., 31, 1029-1049, DOI: 10.1017/s095679251900038x, 2020
12. J. Friedrich, O. Kolb
Maximum principle satisfying CWENO schemes for nonlocal conservation laws
SIAM J. Sci. Comput., 41, A973-A988, DOI: 10.1137/18m1175586, 2019
13. J. Friedrich, O. Kolb, S. Göttlich
A Godunov type scheme for a class of LWR traffic flow models with non-local flux
Netw. Heterog. Media, 13, pp. 531-547, DOI: 10.3934/nhm.2018024, 2018

Peer-reviewed conference proceedings and book chapters

1. M. Banda, J. Friedrich, S. Göttlich, M. Herty
Multi-scale control concepts for transport dominated problems
accepted book chapter corresponding to DFG-SPP 1962, to appear 2025
2. J. Friedrich, S. Göttlich, A. Keimer, L. Pflug
Conservation laws with nonlocality in density and velocity and their applicability in traffic flow modelling
Hyperbolic Problems: Theory, Numerics, Applications. Volume II. HYP 2022, DOI: 10.1007/978-3-031-55264-9_30, 2024
3. J. Friedrich
Lyapunov stabilization of a nonlocal LWR traffic flow model
PAMM. Proc. Appl. Math. Mech., DOI: 10.1002/pamm.202200084, 2023

Preprints

- M. K. Banda, J. Friedrich, M. Herty
Boundary stabilization with restricted observability
arxiv:2501.15906, 2025
- S. Sudha, J. Friedrich, S. Rathan
Central schemes for systems of nonlocal balance laws
arxiv:2501.14425, 2025

Academic theses

- J. Friedrich - Traffic flow models with nonlocal velocity, Ph.D Thesis, University of Mannheim, Verlag Dr. Hut, ISBN 978-3-8439-4903-3, 2021, PDF (Researchgate)
- J. Friedrich - Network models and numerical methods for traffic flow with non-local flux terms, Master-Thesis, University of Mannheim, 2017
- J. Friedrich - Szenario-Aggregation für Risikomaße, Bachelor-Thesis (in German), University of Mannheim, 2015

Conferences and Workshops

as Organizer

Recent Trends in Optimization and Control, *Organizing & Scientific Committee*, Follow-up Workshop, Dakar, Senegal, 10/2024
https://www.igpm.rwth-aachen.de/workshop/optcon2024

Recent Trends in Optimization and Control, *Organizing & Scientific Committee*, Short Course und Workshop, Pretoria, South Africa, 09/2023
https://www.igpm.rwth-aachen.de/workshop/optcon2023

SIAM PD 2022, *Co-Chair*, Minisymposium: Nonlocal conservation laws, virtual, 03/2022

DMV-ÖMG Annual Meeting 2021, *Co-Chair*, Minisymposium 13: Nonlocal conservation laws, virtual, 09/2021

13th International Conference on Monte Carlo Methods and Applications, *local Organizer*, virtual, 08/2021

Talks

Oberseminar: Numerical methods in CSE (TU Munich), *Invited speaker: Conservation laws with space-dependent nonlocalities*, Munich, 07/2025

NumHyp 2025, *Maximum principle satisfying CWENO schemes for multidimensional nonlocal conservation laws*, Darmstadt, 06/2025

DataHyKing Workshop, *Invited speaker: High-order schemes for nonlocal balance laws*, Aachen, 04/2025

SPP2410: Annual Status Meeting, *Invited speaker: Balance laws with space-dependent nonlocalities: modeling, simulation, UQs*, Darmstadt, 03/2025

Monthly Lecture Series, Mahindra University, *Invited speaker: Numerical schemes for conservation laws with space-dependent nonlocalities*, Hyderabad, Indien, 02/2025

Numerical Aspects of Hyperbolic Balance Laws and Related Problems, *Invited speaker: Nonlocal balance laws: Numerical schemes and applications to traffic flow*, Ferrara, Italy, 12/2024

Recent Trends in Optimization and Control: Online Lectures, *Source identification by consensus-based optimization*, virtual, 11/2024

Control and Optimization in the Age of Data, *Invited speaker: Source identification via a consensus-based optimization algorithm using different moment hierarchies*, Bayreuth, 09/2024

Nonlocal Modelling in Fluidmechanical Applications, *Invited speaker: Numerical schemes for conservation laws with space-dependent nonlocalities*, Mannheim, 09/2024

HYP 2024, *Lyapunov Stabilization for Nonlocal Traffic Flow Models*, Shanghai, China, 07/2024
financially supported by HYP 2024

Seminar Talk at University of Twente, *Source identification using different moment hierarchies and consensus-based optimization*, Enschede, Netherlands, 06/2024

Recent Trends in Optimization and Control, *Plenary talk: Cell tracking for the radiative transfer equation*, Pretoria, South Africa, 09/2023

16th Hirschegg Workshop on Conservation Laws, *Traffic flow models with nonlocal velocity: The singular limit problem*, Hirschegg, Austria, 09/2023

SIMAI 2023, *Invited speaker: Cell tracking for the radiative transfer equation*, Matera, Italy, 08/2023

SIAM OP 2023, *Invited speaker: Cell tracking using uncertainty quantification for the radiative transfer equation*, Seattle, USA, 05/2023

SIAM CSE 2023, *Invited speaker: Aspects of nonlocal traffic flow modeling*, Amsterdam, Netherlands, 02/2023

SPP 1962 Annual Meeting 2022, *Lyapunov stabilization for nonlocal traffic flow models*, Berlin, Germany, 10/2022

GAMM 2022, *Lyapunov stabilization for nonlocal traffic flow models*, Aachen, Germany, 08/2022

HYP 2022, *Traffic flow models with nonlocal velocity: The singular limit problem*, Malaga, Spain, 06/2022

Seminar Talk at FAU, *Lyapunov stabilization of nonlocal traffic flow models*, Erlangen, Germany, 06/2022
https://www.math.fau.de/events/vortrag-dr-jan-friedrich/

SIAM PD 2022, *Nonlocal approaches for multilane traffic models*, virtual, 03/2022

DMV-ÖMG Annual Meeting 2021, *Network models for nonlocal traffic flow*, virtual, 09/2021

GAMM Workshop on Numerical Analysis, *Maximum principle satisfying CWENO schemes for non-local conservation laws*, Augsburg, Germany, 10/2018

IFIP TC 7 Conference on System Modelling and Optimization, *Invited speaker: Traffic flow models with non-local flux and approaches for network models*, Essen, Germany, 06/2018

DMV Student Conference, *Network Models and Numerical Methods for Traffic Flow with Non-Local Flux Terms*, Paderborn, Germany, 03/2018

Spring School 2018: From Particle Dynamics to Gradient Flows, *A Godunov type scheme for a class of scalar conservation laws with non-local flux*, Kaiserslautern, Germany, 02/2018

Other

SPP 1962 Young Researchers' Workshop on Deep Learning, Essen, Germany, 03/2023
financed by DFG-SPP 1962

Manage your biases: How to outsmart your own unconscious bias, *Participation in Unconscious Bias Training from* fisch & friends international, online, 03/2023
financed by DFG-SPP 1962

Klartext Workshop on Scientific Communication 2022/2023, *Participation in the workshop from the Klaus Tschira foundation in cooperation with the National Institute for Scientific Communication*, Heidelberg, Germany, 01/2023
financed by the Klaus Tschira foundation

Normandy Meeting on Theoretical and Numerical Aspects Of PDEs, *Poster: A one-to-one junction for a LWR traffic flow model with non-local flux*, Rouen, France, 11/2018
financially supported by Région Normandie and COMUE Normandie Université

Supervision and mentoring

since 06/2024

Anika Beckers, *Numerical methods for nonlocal balance laws in multiple dimensions*, PhD student of Prof. Dr. Michael Herty, RWTH Aachen University
financed by DFG-SPP 2410

Teaching

Lectures

Applications of scalar conservation laws, *RWTH Aachen University*, Winter 2023

Numerical methods for ordinary differential equations, *University of Mannheim*, Winter 2021

PhD course

Applications of scalar hyperbolic conservation laws, *Indian Institute of Petroleum and Energy*, March 2024
10 lectures in English (online), $\approx$ 40 participants

Introductory course

Introduction to `MATLAB`, *University of Mannheim*, Winter 2019 and 2020 (online)
part of the lecture Numerical mathematics

Exercise classes

Mathematics I (for civil engineers), *RWTH Aachen University*, Winter 2022–2024

Mathematics II (for civil engineers), *RWTH Aachen University*, Summer 2022–2025

Numerical methods for partial differential equations, *University of Mannheim*, Summer 2019 and 2020–2021 (online)

Applications of scalar conservation laws, *University of Mannheim*, Winter 2019 and 2020 (online)

Analysis for business informatics, *University of Mannheim*, Summer 2019

Numerical methods for ordinary differential equations, *University of Mannheim*, Winter 2018

Numerical mathematics, *University of Mannheim*, Summer 2015–2016 and 2018

Linear Optimization, *University of Mannheim*, Winter 2017

Analysis 1, *University of Mannheim*, Winter 2015

Seminars **Modeling and simulation**, *University of Mannheim*, Summer 2018 and 2019