

# Dr. Jan Friedrich

## Curriculum Vitae

Technical University of Munich  
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### Personal Data

Date, Place of Birth    October 13, 1991 in Marl  
Nationality            German  
Homepage              <https://janfrie-dev.github.io/home/>

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### Working Experience in Academia

- since 09/2025    **Researcher/Lecturer (Akademischer Rat auf Zeit)**, TU Munich, School of Computation, Information and Technology Department of Mathematics, Chair of Optimal Control, Prof. Dr. Boris Vexler
- Research related to Numerical Analysis, Optimization and Control of partial differential equations
  - Exercise classes for *Nonlinear Optimization: Advanced*
- 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
- 01/2022–08/2025    **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

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## Working Experience outside Academia

- 10/2016–02/2017 **Horváth & Partners Management Consultants, Steering Lab**, Munich, Internship
- Analysis of price elasticities
  - 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

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## 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

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## 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

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## 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 €
  - Due to change to TU Munich the funding remains at RWTH Aachen University
- 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: visits in India 02/2025 and in Germany 05-07/2025
  - own/total Budget for Travel: 3,200 €/9,000 €

- 02/2024 **Indian Institute of Petroleum and Energy**, Funding for a research stay:  $\approx 3,500$  €
- 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 €
  - *Due to change to TU Munich the funding remains at RWTH Aachen University*
- 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 €

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## 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 University

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## Awards

- 10/2018 Werner-Oettli-Award for one of the best Master's theses in 2017/2018
- 06/2011 DMV-Abiturpreis

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## 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*

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## 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>

- 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](https://doi.org/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](https://doi.org/10.1002/pamm.202200084), 2023

## Preprints

- J. Friedrich, M. Herty, C. Nocita  
*Control of conservation laws in the nonlocal-to-Local limit*  
[arxiv:2510.00677](https://arxiv.org/abs/2510.00677), 2025
- M. K. Banda, J. Friedrich, M. Herty  
*Boundary stabilization with restricted observability*  
[arxiv:2501.15906](https://arxiv.org/abs/2501.15906), 2025
- S. Sudha, J. Friedrich, S. Rathan  
*Central schemes for systems of nonlocal balance laws*  
[arxiv:2501.14425](https://arxiv.org/abs/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

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## 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

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## 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

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## 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 **Nonlinear Optimization: Advanced**, *Technical University of Munich*, Winter 2025  
**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