Marc Fehling

Appointments

May 2024 – now **Postdoctoral Research Fellow**, *Department of Mathematical Analysis, Charles University*, Prague, Czech Republic
- Mentor: Prof. Dr. Sebastian Schwarzacher
- Tasks: Research on fluid–structure interaction problems with adaptive refinement, Research on minimization of energy functionals
- Projects: CONTACT, ERC-CZ LL2105, May 2024 – now; MathMAC, UNCE/24/SCI/005, Jan 2025 – now; FerrMion, OP JAK CZ.02.01.01/00/22_008/0004591, Jan 2025 – now

Oct 2020 – Feb 2024 **Postdoctoral Research Fellow**, *Department of Mathematics, Colorado State University*, Fort Collins, USA
- Mentor: Prof. Dr. Wolfgang Bangerth
- Tasks: Research on hp-adaptive finite element methods, Teaching assignments
- Project: CSSI deal.II, NSF OAC-1835673, Oct 2020 – Feb 2024

Nov 2015 – Dec 2019 **PhD Student**, *Institute for Advanced Simulation, Jülich Research Centre*, Germany
- In collaboration: University of Wuppertal, Germany
- Mentor: Prof. Dr. Lukas Arnold
- Tasks: Research on fire simulation with finite elements, Teaching assignments
- Project: ORPHEUS, BMBF 13N13266, Nov 2015 – Jan 2018

Professional Experience

Mar 2021 – now **Principal developer**, deal.II finite element library
- Website: `https://dealii.org`

Awards

Mar 2025 **SIAM/ACM Prize in Computational Science and Engineering**
For the development of the deal.II software
Jointly with other principal developers:
Daniel Arndt, Wolfgang Bangerth, Bruno Blais, Rene Gassmöller, Timo Heister, Luca Heltai, Guido Kanschat, Martin Kronbichler, Matthias Maier, Peter Münch, Jean-Paul Pelteret, Bruno Turcksin, David Wells
Award is for $5,000

Education

Nov 2015 – Jun 2020 **Doctor of engineering, Civil engineering**, *University of Wuppertal*, Germany
- In collaboration: Institute for Advanced Simulation, Jülich Research Centre, Germany
- Grade: summa cum laude (with distinction)
- Dissertation title: Algorithms for massively parallel generic hp-adaptive FEM

Oct 2013 – Jul 2015 **Master of Science, Physics**, *Ruhr-University Bochum*, Germany
- Major field: Plasma physics
- Grade: 1.4 (very good)
- Thesis title: Modeling of plasma-wall interactions in a quasi-neutral hybrid model for the simulation of magnetized plasma discharges

Oct 2010 – Aug 2013 **Bachelor of Science, Physics**, *Ruhr-University Bochum*, Germany
Grade: 1.1 (very good)
Thesis title: Implementation and validation of a three-dimensional, parallel hybrid code for the simulation of plasmas

Aug 2009 – Jul 2010 **Civilian service**, *Protestant Foundation Ludwig-Steil-Hof*, Espelkamp, Germany
Semi-inpatient youth care, day group 'Biberburg'

Aug 2000 – Jun 2009 **Abitur**, *Söderblom-Gymnasium*, Espelkamp, Germany
Grade: 1.6 (good)

Teaching

Aug 2023 – Dec 2023 **MATH 450 Introduction to numerical analysis I**, *Colorado State University*, Fort Collins, USA
Lectures, homework, tests

Aug 2022 – Dec 2022 **MATH 450 Introduction to numerical analysis I**, *Colorado State University*, Fort Collins, USA
Lectures, homework, tests

Aug 2021 – Dec 2021 **MATH 261 Calculus for physical scientists III**, *Colorado State University*, Fort Collins, USA
Lectures, Grading of homework and tests

Apr 2020 – Jul 2020 **Computer science for engineers**, *University of Wuppertal*, Germany
Preparation of exercises, Teaching assistant

Oct 2019 – Apr 2020 **Numerical fire simulation I + II**, *University of Wuppertal*, Germany
Preparation of exercises, Teaching assistant

Apr 2017 – Jul 2017 **Fire and evacuation simulations**, *University of Wuppertal*, Germany
Preparation of exercises, Teaching assistant

Oct 2016 – Feb 2017 **Fire simulation**, *University of Wuppertal*, Germany
Preparation of exercises, Teaching assistant

Apr 2016 – Jul 2016 **Fire and evacuation simulations**, *University of Wuppertal*, Germany
Preparation of exercises, Teaching assistant

Oct 2013 – Jul 2014 **Mathematical methods in physics**, *Ruhr-University Bochum*, Germany
Teaching assistant

Oct 2012 – Jul 2013 **Experimental phyics I + II**, *Ruhr-University Bochum*, Germany
Teaching assistant

Sep 2012 **Introduction to mathematical methods in physics**, *Ruhr-University Bochum*, Germany
Teaching assistant

Mentoring

Supervised Master's Theses

Apr 2017 – Apr 2018 **Michael Krampf**, *University of Wuppertal*, Germany
Thesis title: Characterization of the liftoff phase of particle-based fireballs

Apr 2017 – Nov 2017 **Jana Boltersdorf**, *Aachen University of Applied Sciences*, Germany
Thesis title: Elaboration and comparison of different mesh refinement strategies regarding the parallel performance of a fire simulation program with adaptive mesh refinement

Apr 2016 – Nov 2016 **Pankaj Kumar**, *University of Wuppertal*, Germany
Thesis title: Investigation of density in buoyancy flows using CFD code JuFire

Supervised Student Work

Aug 2017 – Oct 2017 **Duygu Kan**, *Jülich Research Centre*, Germany, Guest Student Program
Work title: Finite element solution for the acoustic scattering problem – Adaptive mesh refinement using deal.II

Oct 2016 – Aug 2017 **Tao Zhong**, *University of Wuppertal*, Germany, Fire simulation course
Work title: Implementation of a Smagorinsky-Lilly LES model in JuPyFDM

Publications

Peer-reviewed Publications

tbd. M. Fehling et al. "Global-coarsening multigrid for hp-adaptive finite element computations". In: *SIAM Journal on Scientific Computing* (tbd.). In preparation.

Feb 2026 W. N. Munshi et al. "A detailed guide to an open-source implementation of the hybrid phase field method for 3D fracture modeling in deal.II". In: *Computer Physics Communications* 319 (Feb 2026), p. 109901. DOI: 10.1016/j.cpc.2025.109901.

Nov 25, 2025 D. Arndt et al. "The deal.II library, version 9.7". In: *Journal of Numerical Mathematics* 33.4 (Nov 25, 2025), pp. 403–415. DOI: 10.1515/jnma-2025-0115.

Nov 26, 2024 P. C. Africa et al. "The `deal.II` Library, Version 9.6". In: *Journal of Numerical Mathematics* 32.4 (Nov 26, 2024), pp. 369–380. DOI: 10.1515/jnma-2024-0137.

Sep 7, 2023 D. Arndt et al. "The `deal.II` Library, Version 9.5". In: *Journal of Numerical Mathematics* 31.3 (Sep 7, 2023), pp. 231–246. DOI: 10.1515/jnma-2023-0089.

Sep 19, 2023 M. Fehling and W. Bangerth. "Algorithms for Parallel Generic hp-adaptive Finite Element Software". In: *ACM Transactions on Mathematical Software* 49.3 (Sep 19, 2023), pp. 1–26. DOI: 10.1145/3603372.

Sep 27, 2022 D. Arndt et al. "The `deal.II` Library, Version 9.4". In: *Journal of Numerical Mathematics* 30.3 (Sep 27, 2022), pp. 231–246. DOI: 10.1515/jnma-2022-0054.

Sep 27, 2021 D. Arndt et al. "The `deal.II` Library, Version 9.3". In: *Journal of Numerical Mathematics* 29.3 (Sep 27, 2021), pp. 171–186. DOI: 10.1515/jnma-2021-0081.

Sep 25, 2020 D. Arndt et al. "The `deal.II` Library, Version 9.2". In: *Journal of Numerical Mathematics* 28.3 (Sep 25, 2020), pp. 131–146. DOI: 10.1515/jnma-2020-0043.

Dec 18, 2019 D. Arndt et al. "The `deal.II` Library, Version 9.1". In: *Journal of Numerical Mathematics* 27.4 (Dec 18, 2019), pp. 203–213. DOI: 10.1515/jnma-2019-0064.

May 10, 2017 M. Fehling. "Plasma-wall transition in the quasi-neutral region of collisional and stationary plasmas in a magnetic field enclosed by totally absorbing walls". In: *Contributions to Plasma Physics* 57.4 (May 10, 2017), pp. 151–165. DOI: 10.1002/ctpp.201700002.

Other Publications

Oct 14, 2025 D. Arndt et al. *Supporting Computational Science and Engineering: The Creation of Widely Used Software in Industrial and Applied Mathematics*. Oct 14, 2025. URL: https://www.siam.org/publications/siam-news/articles/supporting-computational-science-and-engineering-the-creation-of-widely-used-software-in-industrial-and-applied-mathematics/.

Oct 30, 2018 L. Arnold et al. *Verbundprojekt ORPHEUS: Optimierung der Rauchableitung und Personenführung in U-Bahnhöfen : Experimente und Simulationen: Abschlussbericht des Teilvorhabens: Brand- und Personenstromsimulationen in unterirdischen Verkehrsstationen*. Tech. rep. Oct 30, 2018. DOI: 10.2314/KXP:1667013130.

Theses and Lab Reports

2020 M. Fehling. "Algorithms for massively parallel generic hp-adaptive finite element methods". PhD thesis. Bergische Universität Wuppertal, 2020. URL: https://hdl.handle.net/2128/25427.

2015 M. Fehling. "Modeling of plasma-wall interactions in a quasi-neutral hybrid model for the simulation of magnetized plasma discharges". Master's thesis. Ruhr-University Bochum, 2015. URL: https://marcfehling.github.io/files/master.pdf.

2015 P. Lucke and M. Fehling. "Comparison of several techniques for obtaining the spatially resolved emissivity in low–temperature inductively coupled plasmas". SOWAS lab report. Ruhr-University Bochum, 2015. URL: https://marcfehling.github.io/files/sowas.pdf.

2013 M. Fehling. "Entwicklung und Validierung eines dreidimensionalen, parallelen Hybrid Codes zur Simulation von Plasmen". Bachelor's thesis. Ruhr-University Bochum, 2013. URL: https://marcfehling.github.io/files/bachelor.pdf.

Involvement in the Scientific Community

Presentations in Conferences

Sep 4, 2025 **European Conference on Numerical Mathematics and Advanced Applications (ENUMATH 2025)**, *Heidelberg University*, Germany
Presentation title: Efficient solvers for hp-adaptive FEM computations

Jun 25, 2025 **Brijuni Applied Mathematics Workshop 2025**, *Brijuni National Park*, Croatia
Presentation title: Numerical optimization in nonlinear elasticity

Mar 3, 2023 **SIAM Conference on Computational Science and Engineering (CSE23)**, *RAI Congress Centre*, Amsterdam, Netherlands
Presentation title: Global-Coarsening Multigrid for hp-adaptive FEM Computations

Feb 24, 2022 **SIAM Conference on Parallel Processing for Scientific Computing (PP22)**, Seattle, Washington, USA (online)
Presentation title: *hp*-adaptive FEM for Large-Scale Parallel Computations
together with Prof. Dr. Wolfgang Bangerth

Posters in Conferences

Sep 23, 2024 M. Fehling et al. *Massively parallel hp-adaptive finite element methods*. Poster at Modelling, PDE analysis and computational mathematics in materials science Conference. Sep 23, 2024. URL: https://www.karlin.mff.cuni.cz/~prusv/ncmm/conference/mpde/program.html#data-posters-2.

Jul 25, 2022 W. Bangerth, T. Heister, and M. Fehling. *CSSI Frameworks: Future Proofing the Finite Element Library deal.II - Development and Community Building*. Poster at NSF Cyberinfrastructure for Sustained Scientific Innovation (CSSI) Principal Investigator Meeting. Jul 25, 2022. DOI: 10.5281/zenodo.6626469.

Jun 14, 2017 M. Fehling, J. Boltersdorf, and L. Arnold. "Towards smoke and fire simulation with grid adaptive FEM: Verification of the flow solver". In: *Book of Abstracts, Poster, 12th International Symposium on Fire Safety Science*. Poster. Jun 14, 2017, P43. URL: `https://iafss2017.files.wordpress.com/2017/06/book-of-abstract-posters-klar.pdf`.

Presentations in Seminars

Dec 17, 2025 **MathMAC Seminar**, *Charles University*, Prague, Czech Republic
Presentation title: Numerical optimization in nonlinear elasticity

Nov 28, 2025 **Seminar of Numerical Mathematics**, *Charles University*, Prague, Czech Republic
Presentation title: Numerical optimization in nonlinear elasticity

Mar 5, 2025 **MathMAC Seminar**, *Charles University*, Prague, Czech Republic
Presentation title: hp-adaptive finite element methods

Aug 14, 2024 **11th deal.II Users and Developers Workshop**, *Colorado State University*, Fort Collins, USA
Presentation title: Global-coarsening multigrid for hp-adaptive FEM

Jul 20, 2023 **Prague Workshop on Numerical Mathematics**, *Charles University*, Prague, Czech Republic
Presentation title: deal.II showcase – A general library for adaptive finite element codes

Apr 6, 2023 **Postdoc Seminar**, *Colorado State University, Department of Mathematics*, Fort Collins, USA
Presentation title: Adaptive methods for finite elements

Aug 9, 2022 **Fire Research Seminar**, *National Institute of Standards and Technology (NIST)*, Gaithersburg, Maryland, USA (online)
Presentation title: Adaptive methods and their application with finite elements

Aug 18, 2021 **9th deal.II Users and Developers Workshop**, *Colorado State University*, Fort Collins, USA (online)
Presentation title: Parallel hp-FEM: hp-adaptive, hybrid-GMG, MatrixFree

Dec 3, 2020 **PhD Students' Seminar on Fire Safety Science**, *University of Chemistry and Technology*, Prague, Czech Republic (online)
Presentation title: Algorithms for massively parallel generic hp-adaptive FEM

Nov 9, 2020 **Postdoc Seminar**, *Colorado State University, Department of Mathematics*, Fort Collins, USA (online)
Presentation title: Algorithms for massively parallel generic hp-adaptive FEM

Nov 29, 2019 **PhD Students' Seminar on Fire Safety Science**, *Institute of Building Materials, Concrete Construction and Fire Safety, Brunswick Technical University*, Germany
Presentation title: Massively parallel hp-adaptive finite element methods

Aug 16, 2019 **Boulder Fluid and Thermal Sciences Seminar Series**, *University of Colorado*, Boulder, USA
Presentation title: deal.II showcase – A general library for adaptive finite element codes

Aug 7, 2019 **7th deal.II Users and Developers Workshop**, *Colorado State University*, Fort Collins, USA
Presentation title: Algorithms for massively parallel generic hp-adaptive FEM software

May 6, 2019 **Current Research Projects**, *Institute for Theoretical Physics I, Ruhr-University Bochum*, Germany
Presentation title: deal.II showcase – A general library for adaptive finite element codes

Nov 27, 2018 **PhD Students' Seminar on Fire Safety Science**, *German Federal Institute for Materials Research and Testing*, Berlin, Germany
Presentation title: Parallel hp-adaptive methods for buoyancy-driven flows

Apr 3, 2018 **Applied Math Seminar**, *Department of Mathematics, Colorado State University*, Fort Collins, USA
Presentation title: Fire Simulation with adaptive FEM

Dec 8, 2017 **PhD Students' Seminar on Fire Safety Science**, *University of Wuppertal*, Germany
Presentation title: Towards buoyancy driven flows with FEM

May 17, 2017 **Day of Research and Projects**, *University of Wuppertal*, Germany
Presentation title: Adaptive fire simulations - Verification of the flow solver

Feb 2, 2017 **PhD Students' Seminar on Fire Safety Science**, *European Organization for Nuclear Research (CERN)*, Geneva, Switzerland
Presentation title: Towards smoke & fire simulation with grid adaptive FEM

Dec 13, 2016 **Annual Colloquium at Jülich Supercomputing Centre**, *Jülich Research Centre*, Germany
Presentation title: To be fine or not to be fine - Adaptive mesh refinement in fire simulation

Jun 15, 2016 **Aachen Jülich Mathematics Workshop**, *Jülich Research Centre*, Germany
Presentation title: Fire simulation

Organization of Workshops

Aug 2022 – Feb 2024 **Postdoc Seminar**, *Colorado State University, Department of Mathematics*, Fort Collins, USA
Tasks: Inviting speakers, Planning (schedule and joint lunches)

May 13 – 17, 2019 **2nd Summer School on Fire Dynamics Modeling**, *Jülich Research Centre*, Germany
Tasks: Introduction to HPC-systems, Technical support, Assistance during workshops

Dec 8, 2017 **PhD Students' Seminar on Fire Safety Science**, *University of Wuppertal*, Germany
Tasks: Inviting speakers, Moderation, Planning (schedule and catering), Announcements

Aug 7 – 11, 2017 **1st Summer School on Fire Dynamics Modeling**, *Jülich Research Centre*, Germany
Tasks: Technical support, Assistance during workshops

May 17, 2017 **Day of Research and Projects**, *University of Wuppertal*, Germany
Tasks: Inviting speakers, Planning (schedule), Announcements

Review activity

Apr 2023 – now **ACM Transactions on Mathematical Software (TOMS)**, *Scientific Journal*
Reviewed 1 article

Research Visits

Jul 26 – Aug 12, 2022 **National Institute of Standards and Technology (NIST)**, Gaithersburg, Maryland, USA
Host: Dr. Randall J. McDermott

Jul 23 – Aug 20, 2019 **Colorado State University**, Department of Mathematics, Fort Collins, USA
Host: Prof. Dr. Wolfgang Bangerth

Dec 10 – 14, 2018 **Technical University of Munich**, Department of Mechanical Engineering, Germany
Host: Dr. Martin Kronbichler

Dec 6 – 7, 2018 **University of Erlangen-Nuremberg**, Department of Mechanical Engineering, Germany
Host: Dr. Denis Davydov

Mar 20 – Oct 22, 2018 **Colorado State University**, Department of Mathematics, Fort Collins, USA
Host: Prof. Dr. Wolfgang Bangerth

Trainings

Feb 25 – 26, 2023 **SIAM Hackathon**, *Van der Valk Hotel Amsterdam Zuidas*, Netherlands
Challenge: Kuka

Mar 14 – 17, 2017 **Advanced C++ with Focus on Software Engineering**, *High Performance Computing Center Stuttgart*, Germany
Instructor: Dr. Klaus Iglberger

Jun 27 – 28, 2016 **High-performance scientific computing in C++**, *Jülich Research Centre*, Germany
Instructor: Dr. Sandipan Mohanty

May 30 – Jun 2, 2016 **Programming in C++**, *Jülich Research Centre*, Germany
Instructor: Dr. Sandipan Mohanty

Mar 21 – 24, 2016 **deal.II Users and Developers Training**, *International Centre for Theoretical Physics*, Trieste, Italy
Instructors: Prof. Dr. Luca Heltai, Prof. Dr. Timo Heister

Languages

German Native speaker

English Fluent

Soft Skills

Programming languages Daily use of C++, Python
In-depth knowledge of Matlab, C, Java

Libraries & APIs deal.II, MPI, p4est, Boost

Software FDS, SALOME

Tools LaTeX, pgfplots, tikz, git, slurm, CMake, Unix, docker, github-actions