Curriculum Vitae

Personal Details

Name:	Daniel Arndt
Homepage:	https://www.ornl.gov/staff-profile/daniel-arndt

Expertise

Internationally recognized C++ expert for scientific software specialized in

- software design across various platforms (CPUs, GPUs) with focus on high-performance computing and finite element simulations demonstrated in multiple open-source software projects and publications
- numerical analysis of mathematical models for computational fluid dynamics internationally recognized through various publications

Open-Source Software Projects

Kokkos: C++ programming model for performance-portability

- relied on by 50+ projects representing more than $250M of DOE investment
- one of the most active contributor since joining the project
- major contribution:
  - leading the SYCL backend for the Aurora Exascale supercomputer
  - supporting the HIP backend for the Frontier Exascale supercomputer

deal.II: state-of-the-art C++ finite element library

- >1000 users, multiple NSF awards, J. H. Wilkinson Prize for Numerical Software
- main developer from 2016, one of the most active contributor since joining the project

ArborX: performance-portable algorithms for geometric search

- major contribution: MPI scalability, interaction with XGC

MFMG: matrix-free algebraic multigrid preconditioner

- major contribution: performance improvements, matrix-free implementation

Work Experience

Oak Ridge National Laboratory

From April 2020 - Present	Large Scale Computational Scientist in the Computing & Computational Sciences Directorate
April 2019 - March 2020	Postdoctoral Research Associate in the Computing & Computational Sciences Directorate

Heidelberg University

April 2018 - March 2019	Research Assistant (PostDoc) for ExaDG (SPPEXA)
October 2017 – March 2018	Substitute Professor
February 2016 – September 2017	Research Assistant (PostDoc) for ExaDG (SPPEXA)

University of Göttingen

October 2013 – January 2016	Research Assistant (PhD student) for SFB 963

Education

PhD thesis	Stabilized Finite Element Methods for Coupled Incompressible Flow Problems
April 2013 – January 2016	Ph.D. at the University of Göttingen (grade "summa cum laude")
Master's thesis	Augmented Taylor-Hood Elements for Incompressible Flow (grade: 1.0)
August – October 2012	JSC Guest Student Programme 2012 (Jülich Research Centre)
October 2011 – March 2013	M.Sc. at the University of Göttingen, minor subject: Physics major filed of study: Numerical Mathematics grade: 1.1 with distinction
From April 2011	Student Assistant (Numerical Mathematics I & II)
Bachelor's thesis	An adaptive multistep-IMEX-method (grade 1.0)
October 2008 – September 2011	B.Sc. at the University of Göttingen, minor subject: Physics major field of study: Numerical Mathematics grade: 1.1 with distinction

Peer-Reviewed Publications (h-index: 14, i10-index: 16, $\geq$ 1900 citations)

[Pro+25] Andrey Prokopenko, **Daniel Arndt**, Damien Lebrun-Grandié, Bruno Turcksin, Nicholas Frontiere, and Michael Buehlmann. "Advances in ArborX to support exascale applications". In: *The International Journal of High Performance Computing Applications* 39.1 (2025), pp. 167–176.

[Afr+24] Pasquale C Africa, **Daniel Arndt**, Wolfgang Bangerth, Bruno Blais, Marc Fehling, Rene Gassmöller, Timo Heister, Luca Heltai, Sebastian Kinnewig, Martin Kronbichler, et al. "The deal. II library, Version 9.6". In: *Journal of Numerical Mathematics* 32.4 (2024), pp. 369–380.

[ALT24] **Daniel Arndt**, Damien Lebrun-Grandie, and Christian Trott. "Experiences with implementing Kokkos' SYCL backend". In: *Proceedings of the 12th International Workshop on OpenCL and SYCL*. 2024, pp. 1–11.

[Arn+23] **Daniel Arndt**, Wolfgang Bangerth, Maximilian Bergbauer, Marco Feder, Marc Fehling, Johannes Heinz, Timo Heister, Luca Heltai, Martin Kronbichler, Matthias Maier, Peter Munch, Jean-Paul Pelteret, Bruno Turcksin, David Wells, and Stefano Zampini. "The deal.II Library, Version 9.5". In: *Journal of Numerical Mathematics* 31.3 (2023), pp. 231–246. DOI: doi:10.1515/jnma-2023-0089. URL: https://doi.org/10.1515/jnma-2023-0089.

[PLA23] Andrey Prokopenko, Damien Lebrun-Grandie, and **Daniel Arndt**. "Fast tree-based algorithms for DBSCAN for low-dimensional data on GPUs". In: *Proceedings of the 52nd International Conference on Parallel Processing*. 2023, pp. 503–512.

[Arn+22] **Daniel Arndt**, Wolfgang Bangerth, Marco Feder, Marc Fehling, Rene Gassmöller, Timo Heister, Luca Heltai, Martin Kronbichler, Matthias Maier, Peter Munch, et al. "The deal. II Library, Version 9.4". In: *Journal of Numerical Mathematics* (2022).

[Arn+21] **Daniel Arndt**, Wolfgang Bangerth, Denis Davydov, Timo Heister, Luca Heltai, Martin Kronbichler, Matthias Maier, Jean-Paul Pelteret, Bruno Turcksin, and David Wells. "The deal. II finite element library: Design, features, and insights". In: *Computers & Mathematics with Applications* 81 (2021), pp. 407–422.

[AK21] **Daniel Arndt** and Guido Kanschat. "A Differentiable Mapping of Mesh Cells Based on Finite Elements on Quadrilateral and Hexahedral Meshes". In: *Computational Methods in Applied Mathematics* 21.1 (2021), pp. 1–11. DOI: doi:10.1515/cmam-2020-0159. URL: https://doi.org/10.1515/cmam-2020-0159.

[Tro+21] Christian Trott, Damien Lebrun-Grandié, **Daniel Arndt**, Jan Ciesko, Vinh Dang, Nathan Ellingwood, Rahulkumar Gayatri, Evan Harvey, Daisy S Hollman, Dan Ibanez, et al. "Kokkos 3: Programming model extensions for the exascale era". In: *IEEE Transactions on Parallel and Distributed Systems* 33.4 (2021), pp. 805–817.

[WAK21] Julius Witte, **Daniel Arndt**, and Guido Kanschat. "Fast Tensor Product Schwarz Smoothers for High-Order Discontinuous Galerkin Methods". In: *Computational Methods in Applied Mathematics* 21.3 (2021), pp. 709–728. DOI: doi:10.1515/cmam-2020-0078. URL: https://doi.org/10.1515/cmam-2020-0078.

[Arn+20a] **Daniel Arndt**, Wolfgang Bangerth, Bruno Blais, Thomas C Clevenger, Marc Fehling, Alexander V Grayver, Timo Heister, Luca Heltai, Martin Kronbichler, Matthias Maier, et al. "The deal. II library, version 9.2". In: *Journal of Numerical Mathematics* 28.3 (2020), pp. 131–146.

[Arn+20b] **Daniel Arndt**, Niklas Fehn, Guido Kanschat, Katharina Kormann, Martin Kronbichler, Peter Munch, Wolfgang A Wall, and Julius Witte. "ExaDG: High-order discontinuous Galerkin for the exa-scale". In: *Software for Exascale Computing-SPPEXA 2016-2019*. Springer, Cham, 2020, pp. 189–224.

[Dav+20] Denis Davydov, Jean-Paul Pelteret, **Daniel Arndt**, Martin Kronbichler, and Paul Steinmann. "A matrix-free approach for finite-strain hyperelastic problems using geometric multigrid". In: *International Journal for Numerical Methods in Engineering* 121.13 (2020), pp. 2874–2895.

[Arn+19] **Daniel Arndt**, Wolfgang Bangerth, Thomas C Clevenger, Denis Davydov, Marc Fehling, Daniel Garcia-Sanchez, Graham Harper, Timo Heister, Luca Heltai, Martin Kronbichler, et al. "The deal. II library, version 9.1". In: *Journal of Numerical Mathematics* (2019).

[Alz+18] Giovanni Alzetta, **Daniel Arndt**, Wolfgang Bangerth, Vishal Boddu, Benjamin Brands, Denis Davydov, Rene Gassmöller, Timo Heister, Luca Heltai, Katharina Kormann, et al. "The deal. II library, version 9.0". In: *Journal of Numerical Mathematics* 26.4 (2018), pp. 173–183.

[Arn+17] **Daniel Arndt**, Wolfgang Bangerth, Denis Davydov, Timo Heister, Luca Heltai, Martin Kronbichler, Matthias Maier, Jean-Paul Pelteret, Bruno Turcksin, and David Wells. "The `deal.II` Library, Version 8.5". In: *Journal of Numerical Mathematics* 25.3 (2017), pp. 137–145. DOI: 10.1515/jnma-2017-0058.

[DA16] Helene Dallmann and **Daniel Arndt**. "Stabilized Finite Element Methods for the Oberbeck–Boussinesq Model". In: *Journal of Scientific Computing* (2016), pp. 1–30. ISSN: 1573-7691. DOI: 10.1007/s10915-016-0191-z. URL: http://dx.doi.org/10.1007/s10915-016-0191-z.

[ABL15] **Daniel Arndt**, Malte Braack, and Gert Lube. "Finite elements for the Navier-Stokes problem with outflow condition". In: *Numerical Mathematics and Advanced Applications ENUMATH 2015*. Ed. by Karasözen, Bülent and Manguoğlu, Murat and Tezer-Sezgin, Münevver and Goktepe, Serdar and Uğur, Ömür. Vol. 112. Springer, 2015.

[ADL15] **Daniel Arndt**, Helene Dallmann, and Gert Lube. "Local projection FEM stabilization for the time-dependent incompressible Navier–Stokes problem". In: *Numerical Methods for Partial Differential Equations* 31.4 (2015), pp. 1224–1250.

[DAL15] Helene Dallmann, **Daniel Arndt**, and Gert Lube. "Local projection stabilization for the Oseen problem". In: *IMA Journal of Numerical Analysis* (2015). DOI: 10.1093/imanum/drv032.

[LAD15] Gert Lube, **Daniel Arndt**, and Helene Dallmann. "Understanding the limits of inf-sup stable Galerkin-FEM for incompressible flows". In: *Boundary and Interior Layers, Computational and Asymptotic Methods - BAIL 2014*. Ed. by Petr Knobloch. Vol. 108. Lecture Notes in Computational Science and Engineering 1. Springer International Publishing, 2015, pp. 147–169. DOI: 10.1007/978-3-319-25727-3.

[WAL15] Benjamin Wacker, **Daniel Arndt**, and Gert Lube. "Nodal-based Finite Element Methods with Local Projection Stabilization for Linearized Incompressible Magnetohydrodynamics". In: *Computer Methods in Applied Mechanics and Engineering* (2015). DOI: 10.1016/j.cma.2016.01.004.

Non Peer-Reviewed Publications

[Arn16] **Daniel Arndt**. "Stabilized Finite Element Methods for Coupled Incompressible Flow Problems". PhD thesis. Georg-August University Göttingen, 2016.

[ADL16] **Daniel Arndt**, Helene Dallmann, and Gert Lube. "Quasi-Optimal Error Estimates for the Incompressible Navier-Stokes Problem Discretized by Finite Element Methods and Pressure-Correction Projection with Velocity Stabilization". In: *arXiv preprint arXiv:1609.00807* (2016).

[AD15] **Daniel Arndt** and Helene Dallmann. *Error Estimates for the Fully Discretized Incompressible Navier-Stokes Problem with LPS Stabilization*. Tech. rep. Nr. 2015-08. Institute for Numerical and Applied Mathematics, 2015.

[AL15] **Daniel Arndt** and Gert Lube. "FEM with Local Projection Stabilization for Incompressible Flows in Rotating Frames". NAM-Preprint. 2015.

[Arn12] **Daniel Arndt**. "Design and Implementation of an Experimental Finite Element Solver". In: *JSC Guest Student Programme on Scientific Computing* (2012), pp. 83–93.

Reviewer for

- Advances in Computational Mathematics
- Advanced Scientific Computing Research
  - Department of Energy SBIR/STTR
- IMA Journal of Numerical Analysis
- International Journal for Numerical Methods in Fluids
- Journal of Scientific Computing
- zbMATH

Community Support

- Organized 16th European Finite Element Fair 2018
- Mentor for Argonne GPU Hackathon 2021
- Mentor for Brookhaven GPU Hackathon 2022
- Member of the program committee for HiPar22 and HiPar23
- Member of Society for Industrial and Applied Mathematics (SIAM)

Awards

- Clarivate's Web of Science March 2025 hot papers
- 2025 SIAM/ACM Prize in Computational Science and Engineering for deal.II
- 2024 Supplemental Performance Award for contributions to Kokkos and the High Performance Software Foundation.
- 2022 Supplemental Performance Award for contributions to Kokkos
- 2020 Computational Sciences and Engineering Division (CSED) Award (Oak Ridge National Laboratory) for contributions to Kokkos

Language Skills

German	native language
English	fluent
Spanish	basic knowledge

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