Dr. Patrick Diehl

Curriculum Vitæ

Research experience

06/24–current	**Research scientist**, *Applied Computer Science (CCS-7)*, Los Alamos National Laboratory, Los Alamos, NM, USA
05/22–current	**Adjunct faculty**, *Department of Physics & Astronomy*, Louisiana State University, Baton Rouge, LA, USA
10/18–06/24	**Research scientist**, *Center for Computation & Technology*, Louisiana State University, Baton Rouge, LA, USA
02/17–09/18	**Postdoctoral fellow**, *Laboratory of Multiscale Mechanics*, Polytechnique Montréal, QC, Canada
07/12–03/13	**Research Assistant**, *Institute for Simulation of large Systems*, University Stuttgart, Stuttgart, Germany
10/07–06/12	**Student**, *Computer Science (Major software engineering)*, University Stuttgart, Stuttgart, Germany

Visiting positions

2015	**Guest Research Assistant**, *Center for Computation and Technology*, Louisiana State University

Education

2017	**PhD**, *Applied mathematics*, University of Bonn, Germany
2012	**Diploma**, *Computer Science*, University of Stuttgart, Germany

Awards and Honors

2019	IEEE SCIVIS Contest 2019, First Prize, Visual Analysis of Structure Formation in Cosmic Evolution, Video, Poster, and Short paper

Editorial duties

06/20–current	**Topic editor**, *Computational fracture mechanics, Applied mathematics, C++, asynchronous and task-based programming*, The Journal of Open Source Software
2025	**Topical issue editor**, *Recent advances in Asynchronous Many Task Runtime Systems, SN Computer Science*
2025	**Guest editor**, *Research Software Engineering – Code, Practices, and People, Future Generation Computer Systems*
2024	**Guest editor**, *Research Software Engineering – Software-Enabled Discovery and Beyond, Future Generation Computer Systems*
2023	**Topical issue editor**, *Applications and Frameworks using the Asynchronous Many Task Paradigm, SN Computer Science*
2022	**Guest editor**, *Special issue: Science Gateways: Accelerating Research and Education, Computing in Science & Engineering*
2021	**Guest editor**, *Special issue: Peridynamics and its Current Progress, Computer Modeling in Engineering & Sciences (CMES)*

Research Interests

Computational engineering

- Peridynamics theory for the application in solids, like glassy or composite materials,

- Validation and verification of simulations against experimental data,

- Assembly of experimental data for comparison with simulations,

- Application of machine learning to experiments and simulations.

High Performance Computing

- The C++ Standard Library for Parallelism and Concurrency (HPX),

- Asynchronous many task systems and there application in computational engineering.

- Efficient, performance portable, and scalable High-Performance Parallel Programming using Modern C++.

Open science

- Open Source Software for scientific applications,

- Open data for sharing raw experimental results.

Teaching experience

Instructor

- o Research Technologies and Methods (MEDP 7098), Department of Physics & Astronomy, Louisiana State University, Taught: 2022

- o Parallel computational mathematics (M 4997), Department of Mathematics, Louisiana State University, Taught: 2019, 2020, and 2021

Teaching assistant

- o Einführung in die Numerische Mathematik (Introduction to numerical mathematics), University of Bonn, 2015

- o Algorithmische Mathematik (Mathematical algorithms), University of Bonn, 2013/2014

- o Wissenschaftliches Rechnen 2 (Scientific Computing 2), University of Bonn, 2013

Certificates

Baden–Württemberg Certificate
Certificate for successful completion of the program in higher education pedagogy by the center for educational development of the state of Baden–Württemberg.

Advising and related student services

Co-supervised theses

- o University of Stuttgart:

  - Pfander, David: Eine künstliche Intelligenz für das Kartenspiel Tichu, Studienarbeit Nr. 2398, 2013.
  - Kanis, Sebastian: GPU-based Numerical Integration in the Partition of Unity Method, Diplomarbeit Nr. 3405, 2013.

Graduate Committee Member

- o Master thesis: M. Reeser (LSU, 2020) and C. He (2023)

- o Honors project: J. Trepper (LSU, 2020)

Google Summer of Code

- o University of Bonn: A. Nigam (2016)

- o Polytechnique Montreal: M. Seshadri (2017), G. Laberge and J. Golinowski (2018)

     ○ Louisiana State University: P. Gadika (2020)

Google Season of Docs

     ○ Louisiana State University: R. Stobaugh (2019)

NSF REU

     ○ Louisiana State University: A. Edwards (2021), E. Downing (2022), and N. Tabb (2023).

Academic-related Professional and Public Service

08/25–current	Chair of the USACM Technical Thrust Area (TTA) on Large Scale Structural Systems and Optimal Design (Large-Scale)
08/23–07/25	Vice Chair of the USACM Technical Thrust Area (TTA) on Large Scale Structural Systems and Optimal Design (Large-Scale)
01/213–current	Mentor for the USACM Student Chapter
07/21–07/23	Member-at-Large of the USACM Technical Thrust Area (TTA) on Large Scale Structural Systems and Optimal Design (Large-Scale)
03/20–12/23	Liaison for the Louisiana district of the SIAM Texas-Louisiana Section Duties:

     ○ Making sure that people at universities, research institutions and industry in your district know about our activities and getting their suggestions on what we can do better

     ○ Serving on the organizing committee for the annual meeting

10/17–09/18	ASSEP Labor relations officers for postdoctoral fellows

Organization of Conferences, Workshops, and Symposia

Committee

     ○ Programming Frameworks, Technical Papers, Member

     ○ ChapelCon '25, Program Committee

     ○ AI track of 54th International Conference on Parallel Processing, Program Committee

     ○ 2nd Annual Conference of the US Research Software Engineer Association, Publication chair

     ○ SC25 Reproducibility Challenge, Committee member

     ○ 1st Annual Conference of the US Research Software Engineer Association, Special Issue Editor

○ Science Gateways Conference 2023, Program committee member

○ The First International Workshop on Democratizing High-Performance Computing (D-HPC 2023), Program committee member

○ Science Gateways Conference 2022, Publication chair

○ The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC) 21, AD/AE Appendices

○ Science Gateways Conference 2021, Program committee member

○ The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC) 21, Virtual logistics

Symposia

○ Modeling and Simulation for Complex Material Behavior, 14th U.S. National Congress on Computational Mechanics, Link.

○ Peridynamic Theory and Multiscale Methods for Complex Material Behavior, 14th World Congress on Computational Mechanics (WCCM XIV).

○ Peridynamic Theory and Multiscale Methods for Complex Material Behavior, 16th National Congress on Computational Mechanics.

○ Nonlocal Models in Mathematics and Computation, 3rd Annual Meeting of the SIAM Texas-Louisiana Section, 2020

○ Peridynamic Theory and Multiscale Methods for Complex Material Behavior, 15th World Congress on Computational Mechanics (WCCM XV).

○ Recent Developments in Peridynamics Modeling, 19th U.S. National Congress on Theoretical and Applied Mechanics.

○ Peridynamic Theory and Multiscale Methods for Complex Material Behavior, 9th GACM Colloquium on Computational Mechanics

○ Theoretical and Computational Aspects of Nonlocal Operator, 7th Annual Meeting of SIAM Central States Section

○ Nonlocal Models in Mathematics and Computation, 5th Annual Meeting of the SIAM Texas-Louisiana Section, 2022

○ Recent Developments in Peridynamics Modeling, 17th U.S. National Congress on Computational Mechanics, 2023

○ Nonlocal Modeling, Analysis, and Computation, 10th International Congress on Industrial and Applied Mathematics, 2023

○ Computational and analytical advances in nonlocal modeling, 16th World Congress on Computational Mechanics, 2024

- Recent developments in peridynamics modeling, 16th World Congress on Computational Mechanics, 2024

- Computational and Analytical Advances in Nonlocal Modeling, SIAM Conference on Mathematical Aspects of Materials Science, 2024

- Peridynamic Theory and Multiscale Methods for Complex Material Behavior, 18th National Congress on Computational Mechanics, 2025

Mathematisches Forschungsinstitut Oberwolfach

- Fracture as an Emergent Phenomenon, 7 January - 12 January 2024 (Co-Organizers: Anna Pandofi, Robert Lipton, and Thomas Wick)

Workshop

- Workshop on Experimental and Computational Fracture Mechanics: Validating peridynamics and phase field models for fracture prediction and experimental design, Link. Sponsored by
  - US Association for Computational Mechanics,
  - Center for Computation & Technology at Louisiana State University,
  - Oak Ridge National Laboratory,
  - Society for Experimental Mechanics,
  - U.S. National Committee on Theoretical and Applied Mechanics (AmeriMech)

- Asynchronous Many-Task systems for Exascale 2021 held in conjunction with Euro-Par 2021, Link

- Asynchronous Many-Task systems for Exascale 2022 held in conjunction with Euro-Par 2022, Link

- Workshop on Workshop on Asynchronous Many-Task Systems and Applications 2023, Link Sponsored by
  - Tactical Computing Lab,
  - Center for Computation & Technology at Louisiana State University,
  - HPE Enterprise

- Asynchronous Many-Task systems for Exascale 2023 held in conjunction with Euro-Par 2023, Link

- Workshop on Workshop on Asynchronous Many-Task Systems and Applications 2024, Link

- Workshop on Experimental and Computational Fracture Mechanics, Link.

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- Asynchronous Many-Task systems for Exascale 2024 held in conjunction with Euro-Par 2024, Link

- Workshop on Workshop on Asynchronous Many-Task Systems and Applications 2024, Link

- Workshop on Asynchronous Many-Task Systems and Applications 2025, Link

- Workshop on Asynchronous Many-Task Systems and Applications 2026, Link

Panel

- D-HPC Workshop Panel : S4PST: Stewardship of Programming Systems and Tools, Panelist, International Conference for High Performance Computing, Networking, Storage and Analysis (SC)" 2023

- Joint USACM Large-Scale TTA – EMI Computational Mechanics Committee Career Path Panel, Organizer, Engineering Mechanics Institute Conference 2023

- Joint USACM Large-Scale TTA – EMI Computational Mechanics Committee Career Path Panel, Speaker, Engineering Mechanics Institute Conference 2022

- TBAA: Task-Based Algorithms and Applications, Moderator, "International Conference for High Performance Computing, Networking, Storage and Analysis (SC)" 2020. Link

- AI Ethics/Algorithmic Justice, Organizer, Colloquium on Artificial Intelligence Research and Optimization, Louisiana State University.

Meeting

- 3rd Annual Meeting of the SIAM Texas-Louisiana Section, October 16 - 18, 2020. Link.

- 4th Annual Meeting of the SIAM Texas-Louisiana Section, November, 5 - 7, 2021 Link.

- 5th Annual Meeting of the SIAM Texas-Louisiana Section, November, 4 - 6, 2022 Link.

- 6th Annual Meeting of the SIAM Texas-Louisiana Section, November, 3 - 5, 2023 Link.

Colloquium

- Colloquium on Artificial Intelligence Research and Optimization, Louisiana State University. Link.

- ○ Large-Scale TTA Early-Career Colloquium, USACM. Link
- ○ Large-Scale TTA Industrial Colloquium, USACM. Link
- ○ Applied Computer Science Invited Speaker Series, LANL. Link

Short course

- ○ SC16-001 Advanced Parallel Programming in C++, 16th U.S. National Congress on Computational Mechanics
- ○ Advanced Parallel Programming in C++, 15th World Congress on Computational Mechanics
- ○ SC17-002 Advanced Parallel Programming in C++, 17th U.S. National Congress on Computational Mechanics

Mentoring events

- ○ 18th U.S. National Congress on Computational Mechanics, 2025
- ○ 17th U.S. National Congress on Computational Mechanics, 2023
- ○ 6th Annual Meeting of the SIAM Texas-Louisiana Section, 2023
- ○ 15th World Congress on Computational Mechanics, 2022
- ○ 5th Annual Meeting of the SIAM Texas-Louisiana Section, 2022

Conference and Workshop Grants

2020 **AmeriMech symposium**: Experimental and Computational Fracture Mechanics: Validating peridynamics and phase field models for fracture prediction and experimental design ($4000)

Travel Awards

2023 SIAM Travel Award - 10th International Congress on Industrial and Applied Mathematics (ICIAM) ($1750)

Grant history

Current Research (chronological order; most recent one first)

1. Grant #4000211901 (Hartmut Kaiser)

   Name of Funding Organization: UT-Battelle, LLC

   Amount Awarded: $9,999

   Period of Grant Award: July 15 2022 - April 30 2024

   Title of Project: S4PST, Sustainability for Node Level Programming Systems and Tools

   Role on Project: Senior Personal

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Completed Research (chronological order; most recent one first)

1. Grant #2229751 (Rod Tohid)

   Name of Funding Organization: National Science Foundation

   Amount Awarded: $300,000

   Period of Grant Award: Sept 15 2022 - Oct 31 2023

   Title of Project: POSE: Phase I: Constellation: A Pathway to Establish the STE||AR Open-Source Organization

   Role on Project: Co-PI

2. Grant #524125 (Hartmut Kaiser)

   Name of Funding Organization: Pacific Northwest National Laboratory

   Amount Awarded: $50,000

   Period of Grant Award: June 25 - Oct 31 2020

   Title of Project: High Performance Data Analytics (HPDA) Scalable Second-Order Optimization (SSO)

   Role on Project: Co-PI

Allocations

Current Allocations (chronological order; most recent one first)

1. Project xpress (Alice Koniges)

   Title of Project: HPX and OpenMP

   Amount awarded: CPU node hours 4300 and GPU node hours 1700

   Cluster: Perlmutter @ NERSC

   Role on Project: Senior personal

Completed Allocations (chronological order; most recent one first)

1. Project hp210311 (Patrick Diehl)

   Title of Project: Porting Octo-Tiger, an astrophysics program simulating the evolution of star systems based on the fast multipole method on adaptive Octrees

   Type: Test-bed

   Amount awarded: 21k node hours

   Cluster: Fugaku @ RIKEN Center for Computational Science, Japan

   Role on Project: PI

2. Project PaDi032321F (Patrick Diehl)

Title of Project: Porting Octo-Tiger, an astrophysics program simulating the evolution of star systems based on the fast multipole method on adaptive Octrees

Type: Test-bed

Amount awarded: 10k node hours

Cluster: Ookami @ Stonybrook University, USA

Role on Project: PI

Publications

Preprints

N. Nader, P. Diehl, S. R. Brandt, and H. Kaiser. LLM & HPC:Benchmarking DeepSeek's Performance in High-Performance Computing Tasks. *arXiv preprint arXiv:2504.03665*, 2025, 2504.03665.

A. Mhatre, N. Nader, P. Diehl, and D. Gupta. LLM-GUARD: Large Language Model-Based Detection and Repair of Bugs and Security Vulnerabilities in C++ and Python. *arXiv preprint arXiv:2508.16419*, 2025, arXiv:2508.16419.

S. Gupta, K. Kamalakkannan, M. Moraru, G. Shipman, and P. Diehl. From Legacy Fortran to Portable Kokkos: An Autonomous Agentic AI Workflow. *arXiv preprint arXiv:2509.12443*, 2025, arXiv:2509.12443.

S. R. Brandt, M. Morris, P. Diehl, C. Bowen, J. Tucker, L. Bristol, and G. G. R. III. Locking Down Science Gateways. *arXiv preprint arXiv:2509.18548*, 2025, arXiv:2509.18548.

A. Barai, K. Kamalakkannan, P. Diehl, M. Moraru, J. Dominguez-Trujillo, H. Pritchard, N. Santhi, F. Fatollahi-Fard, and G. Shipman. Bridging Simulation and Silicon: A Study of RISC-V Hardware and FireSim Simulation. *arXiv preprint arXiv:2509.18472*, 2025, arXiv:2509.18472.

Books

P. Diehl, S. R. Brandt, and H. Kaiser. *Parallel C++ – Efficient and Scalable High-Performance Parallel Programming Using HPX*, volume 1. Springer Cham, 2024.

Edited books

J. Singer, Y. Elkhatib, D. B. Heras, P. Diehl, N. Brown, and A. Ilic, editors. *Euro-Par 2022 International Workshops, Glasgow, UK, August 22–26, 2022, Revised Selected Papers*, volume 13835 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2022.

P. Diehl, P. Thoman, H. Kaiser, and L. Kale, editors. *Asynchronous Many-Task Systems and Applications*, volume 13861 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2023.

P. Diehl, J. Schuchart, P. Valero-Lara, and G. Bosilca, editors. *Asynchronous Many-Task Systems and Applications*, volume 14626 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2024.

P. Diehl and S. Gesing, editors. *Editorial: Research Software Engineering – Software-Enabled Discovery and Beyond*, Future Generation Computer Systems. Elsevier, 2025.

P. Diehl and R. F. da Silva, editors. *Science Gateways: Accelerating Research and Education–Part I*, volume 25 of *Computing in Science & Engineering*, Los Alamitos, CA, USA, 2023. IEEE.

P. Diehl and R. da Silva, editors. *Science Gateways: Accelerating Research and Education—Part II*, volume 25 of *Computing in Science & Engineering*, Los Alamitos, CA, USA, 2023. IEEE.

P. Diehl, Q. Cao, T. Herault, and G. Bosilca, editors. *Asynchronous Many-Task Systems and Applications*, volume 15690 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2025.

R. Chaves, D. B. Heras, A. Ilic, D. Unat, R. M. Badia, A. Bracciali, P. Diehl, A. Dubey, O. Sangyoon, S. L. Scott, and L. Ricci, editors. *Euro-Par 2021: Parallel Processing Workshops (Euro-Par 2021 International Workshops, Lisbon, Portugal, August 30-31, 2021, Revised Selected Papers)*, volume 13098 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2021.

S. Caino-Lores, D. Zeinalipour, T. D. Doudali, D. E. Singh, G. E. M. Garzón, L. Sousa, D. Andrade, T. Cucinotta, D. D'Ambrosio, P. Diehl, M. F. Dolz, A. Jukan, R. Montella, M. Nardelli, M. Garcia-Gasulla, and S. Neuwirth, editors. *Euro-Par 2024: Parallel Processing Workshops (Volume 2)*, volume 15386 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2025.

S. Caino-Lores, D. Zeinalipour, T. D. Doudali, D. E. Singh, G. E. M. Garzón, L. Sousa, D. Andrade, T. Cucinotta, D. D'Ambrosio, P. Diehl, M. F. Dolz, A. Jukan, R. Montella, M. Nardelli, M. Garcia-Gasulla, and S. Neuwirth, editors. *Euro-Par 2024: Parallel Processing Workshops (Volume 1)*, volume 15385 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2025.

D. Blanco Heras, G. Pallis, H. Herodotou, D. Balouek, P. Diehl, T. Cojean, K. Fürlinger, M. H. Kirbey, M. Nardelli, P. Di Sanzo, and e. Zeinalipour, Demetris, editors. *Euro-Par 2023 International Workshops, Limassol, Cypress, 28 August – 1 September, 2023 Revised Selected Papers*, volume 14351 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2024.

D. Blanco Heras, G. Pallis, H. Herodotou, D. Balouek, P. Diehl, T. Cojean, K. Fürlinger, M. H. Kirbey, M. Nardelli, P. Di Sanzo, and e. Zeinalipour, Demetris, editors. *Euro-Par 2023 International Workshops, Limassol, Cypress, 28 August – 1 September, 2023 Revised Selected Papers*, volume 14352 of *Lecture Notes in Computer Science (LNCS)*. Springer, 2024.

Reviews and Surveys

P. Diehl, R. Lipton, T. Wick, and M. Tyagi. A comparative review of peridynamics and phase-field models for engineering fracture mechanics. *Computational Mechanics*, Feb 2022.

P. Diehl, S. Prudhomme, and M. Lévesque. A review of benchmark experiments for the validation of peridynamics models. *Journal of Peridynamics and Nonlocal Modeling*, 1(1):14–35, 2019.

Journal Papers

P. K. Jha, P. Diehl, and R. Lipton. Nodal finite element approximation of peridynamics. *Computer Methods in Applied Mechanics and Engineering*, 434, 2025.

J. Frank, A. Straub, S. Shiber, P. Amini, D. C. Marcello, P. Diehl, T. Ertl, F. Sadlo, and S. Frey. Visualizing the mass transfer flow in direct-impact accretion. *Monthly Notices of the Royal Astronomical Society*, 543(4):4003–4019, 10 2025.

P. Diehl, C. Soneson, R. C. Kurchin, R. Mounce, and D. S. Katz. The Journal of Open Source Software (JOSS): Bringing Open-Source Software Practices to the Scholarly Publishing Community for Authors, Reviewers, Editors, and Publishers. *Journal of Librarianship and Scholarly Communication*, 12, 2 2025.

P. Diehl, N. Nader, M. Moraru, and S. R. Brandt. LLM Benchmarking with LLaMA2: Evaluating Code Development Performance Across Multiple Programming Languages. *Journal of Machine Learning for Modeling and Computing*, 6(3):95–129, 2025.

P. Diehl, E. Downing, A. Edwards, and S. Prudhomme. Coupling Approaches with Non-matching Grids for Classical Linear Elasticity and Bond-based Peridynamic Models in 1D. *Journal of Peridynamics and Nonlocal Modeling*, 7(2), 2025.

G. Daiß, P. Diehl, J. Yan, J. K. Holmen, R. Gayatri, C. Junghans, A. Straub, J. R. Hammond, D. Marcello, M. Tsuji, D. Pflüger, and H. Kaiser. Asynchronous-many-task systems: Challenges and opportunities - Scaling an AMR astrophysics code on exascale machines using Kokkos and HPX. *The International Journal of High Performance Computing Applications*, 2025.

S. Shiber, O. De Marco, P. M. Motl, B. Munson, D. C. Marcello, J. Frank, P. Diehl, G. C. Clayton, B. N. Skinner, H. Kaiser, G. Daiß, D. Pflüger, and J. E. Staff. Hydrodynamic simulations of white dwarf-white dwarf mergers and the origin of R Coronae Borealis stars. *Monthly Notices of the Royal Astronomical Society*, 10 2024.

N. Nader, P. Diehl, M. D'Elia, C. Glusa, and S. Prudhomme. ML-based

identification of the interface regions for coupling local and nonlocal models. *Journal of Machine Learning for Modeling and Computing*, 2024.

P. Diehl, G. Daiß, K. Huck, D. Marcello, S. Shiber, H. Kaiser, and D. Pflüger. Simulating stellar merger using HPX/Kokkos on A64FX on Supercomputer Fugaku. *The Journal of Supercomputing*, April 2024.

P. Diehl, S. R. Brandt, and H. Kaiser. Shared Memory Parallelism in Modern C++ and HPX. *SN Computer Science*, 5(5):459, April 2024.

M. Birner, P. Diehl, R. Lipton, and M. A. Schweitzer. A multiscale fracture model using peridynamic enrichment of finite elements within an adaptive partition of unity: Experimental validation. *Mechanics Research Communications*, April 2024.

B. Aksoylu, F. Celker, and P. Diehl. Construction of Nonlocal Governing Operators with Local Boundary Conditions on a General Interval. *Journal of Peridynamics and Nonlocal Modeling*, 2024.

B. Aksoylu, F. Celker, and P. Diehl. Analysis and Implementation of Nonlocal Governing Operators with Local Boundary Conditions on a General Interval. *Journal of Peridynamics and Nonlocal Modeling*, 2024.

D. J. Littlewood, M. L. Parks, J. T. Foster, J. A. Mitchell, and P. Diehl. The Peridigm Meshfree Peridynamics Code. *Journal of Peridynamics and Nonlocal Modeling*, May 2023.

D. Bhattacharya, R. Lipton, and P. Diehl. Quasistatic fracture evolution using a nonlocal cohesive model. *International Journal of Fracture*, Jun 2023.

P. Diehl and S. Prudhomme. Coupling approaches for classical linear elasticity and bond-based peridynamic models. *Journal of Peridynamics and Nonlocal Modeling*, Mar 2022.

P. Diehl and R. Lipton. Quasistatic fracture using nonlinear-nonlocal elastostatics with explicit tangent stiffness matrix. *International Journal for Numerical Methods in Engineering*, May 2022.

P. Diehl and S. R. Brandt. Interactive C++ code development using C++ Explorer and GitHub classroom for educational purposes. *Concurrency and Computation: Practice and Experience*, 2022.

M. Birner, P. Diehl, R. Lipton, and M. A. Schweitzer. A fracture multiscale model for peridynamic enrichment within the partition of unity method. *Advances in Engineering Software*, 176, Nov 2022.

D. C. Marcello, S. Shiber, O. De Marco, J. Frank, G. C. Clayton, P. M. Motl, P. Diehl, and H. Kaiser. Octo-Tiger: a new, 3D hydrodynamic code for stellar mergers that uses HPX parallelisation. *Monthly Notices of the Royal Astronomical Society*, 2021.

P. K. Jha and P. Diehl. Nlmech: Implementation of finite difference/mesh-free discretization of nonlocal fracture models. *Journal of Open Source Software*, 6(65):3020, 2021.

P. Diehl, D. Marcello, P. Armini, H. Kaiser, S. Shiber, G. C. Clayton, J. Frank, G. Daiss, D. Pfl"uger, D. C. Eder, A. Koniges, and K. Huck. Performance Measurements within Asynchronous Task-based Runtime Systems: A Double White Dwarf Merger as an Application. *Computing in Science & Engineering*, 2021.

P. Diehl, G. Daiß, D. Marcello, K. Huck, S. Shiber, H. Kaiser, J. Frank, G. C. Clayton, and D. Pflüger. Octo-Tiger's New Hydro Module and Performance Using HPX+ CUDA on ORNL's Summit. In *2021 IEEE International Conference on Cluster Computing (CLUSTER)*, pages 204–214. IEEE, 2021.

S. Prudhomme and P. Diehl. On the treatment of boundary conditions for bond-based peridynamic models. *Computer Methods in Applied Mechanics and Engineering*, 372:113391, 2020.

H. Kaiser, P. Diehl, A. S. Lemoine, B. A. Lelbach, P. Amini, A. Berge, J. Biddiscombe, S. R. Brandt, N. Gupta, T. Heller, K. Huck, Z. Khatami, A. Kheirkhahan, A. Reverdell, S. Shirzad, M. Simberg, B. Wagle, W. Wei, and T. Zhang. HPX - The C++ Standard Library for Parallelism and Concurrency. *Journal of Open Source Software*, 5(53):2352, 2020.

P. Diehl, P. K. Jha, H. Kaiser, R. Lipton, and M. Lévesque. An asynchronous and task-based implementation of peridynamics utilizing HPX—the C++ standard library for parallelism and concurrency. *SN Applied Sciences*, 2(12):2144, 2020.

R. Delorme, P. Diehl, I. Tabiai, L. L. Lebel, and M. Lévesque. Extracting Constitutive Mechanical Parameters in Linear Elasticity Using the Virtual Fields Method Within the Ordinary State-Based Peridynamic Framework. *Journal of Peridynamics and Nonlocal Modeling*, Jan 2020.

I. Tabiai, G. Tkachev, P. Diehl, S. Frey, T. Ertl, D. Therriault, and M. Lévesque. Hybrid image processing approach for autonomous crack area detection and tracking using local digital image correlation results applied to single-fiber interfacial debonding. *Engineering Fracture Mechanics*, 216, 2019.

G. Daiß, P. Amini, J. Biddiscombe, P. Diehl, J. Frank, K. Huck, H. Kaiser, D. Marcello, D. Pfander, and D. Pfüger. From Piz Daint to the Stars: Simulation of Stellar Mergers Using High-level Abstractions. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '19, pages 62:1–62:37, New York, NY, USA, 2019. ACM.

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P. Diehl, I. Tabiai, F. W. Baumann, D. Therriault, and M. Levesque. Long term availability of raw experimental data in experimental fracture mechanics. *Engineering Fracture Mechanics*, 197:21–26, 2018.

M. Bußler, P. Diehl, D. Pflüger, S. Frey, F. Sadlo, T. Ertl, and M. A. Schweitzer. Visualization of Fracture Progression in Peridynamics. *Computer & Graphics*, 67:45–57, 2017.

P. Diehl, F. Franzelin, D. Pflüger, and G. C. Ganzenmüller. Bond-based peridynamics: a quantitative study of Mode I crack opening. *International Journal of Fracture*, 2(201):157–170, 2016.

Series- and conference contributions

S. Atre, C. Taylor, P. Diehl, and H. Kaiser. Closing a source complexity gap between chapel and hpx. In P. Diehl, Q. Cao, T. Herault, and G. Bosilca, editors, *Asynchronous Many-Task Systems and Applications*, pages 31–43, Cham, 2026. Springer Nature Switzerland.

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D. S. Katz, P. Diehl, and W. Gearty. Joss: A journal for open source software that is an open source software project. US Research Software Engineering Conference 2025 (USRSE'25), 6.10-08.10 2025, Philadelphia, USA.

P. Diehl. Asynchronous-Many-Task Systems: Challenges and Opportunities – Scaling an AMR Astrophysics Code on Exascale machines using Kokkos and HPX. Algorithms For Multiphysics Models In The Post-Moore's Law Era, 02.06-13.06 2025, Los Alamos, USA.

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P. Diehl. The Journal of Open Source Software: Developing a Software Review Community. Computer Science Seminar Series at Argonne National Laboratory, 12.11 2024, Virtual event.

P. Diehl. Kokkos Pitch. US-RSE Community Call, 12.09 2024, Virtual event.

P. Diehl. Is RISC-V ready for HPC workloads? (random access talk). Salishan Conference on High Speed Computing, 22.04-25.04 2024, Lincoln Beach, USA.

P. Diehl. HPX with Spack and Singularity Containers: Evaluating Overheads for HPX/Kokkos using an astrophysics application. Workshop on Asynchronous Many-Task Systems and Applications 2024, 14.02-16.02 2024, Knoxville, US.

P. Diehl. Evaluating HPX and Kokkos on RISC-V using an Astrophysics Application Octo-Tiger. 21th Annual Workshop on Charm++ and Its Application, 25.04-26.04 2024, Champaign, USA.

P. Diehl. Preparing for HPC on RISC-V: Examining Vectorization and Distributed Performance of an Astrophyiscs Application with HPX and Kokkos. International workshop on RISC-V for HPC held in conjunction with the International Conference on High Performance Computing, Network, Storage, and Analysis 2024, 18.11 2024, Atlanta, US.

P. Diehl. Evaluating AI-generated code for C++, Fortran, Go, Java, Julia, Matlab, Python, R, and Rust. Asynchronous Many-Task systems for Exascale (AMTE24) held in conjunction with 30th International European Conference on Parallel and Distributed Computing (EuroPar24), 26.08-30.08 2024, Madrid, Spain.

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P. Diehl. Simulating Stellar Merger using HPX/Kokkos on A64FX on Supercomputer Fugaku. The 24th IEEE International Workshop on Parallel and Distributed Scientific and Engineering Computing (PDSEC 2023), 15.05-19.05 2023, St. Petersburg, USA.

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P. Diehl. Recent developments in HPX and Octo-Tiger. Physics & Astronomy Colloquium, 23.1 2023, Baton Rouge, USA.

P. Diehl. AI-based identification of coupling regions for local and non-local one-dimensional coupling approaches. 17th U. S. National Congress on Computational Mechanics (USNCCM), 23.07-27.07 2023, Albuquerque, US.

P. Diehl. A Fracture Multiscale Model for Peridynamic enrichment within the Partition of Unity Method: Experimental validation. *XVII* International Conference on Computational Plasticity, Fundamentals, and Applications (COMPLAS 23), 05.09-07.09 2023, Barcelona, Spain.

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P. Diehl. Visualization of Fragments, Stress and Fracture Progression in Peridynamics. Isogeometric Analysis and Meshfree Methods, 10.10-12.10 2016, San Diego, USA.

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Posters

P. Diehl and D. S. Katz. JOSS – The Journal of Open Source Software. 2nd Annual Conference of the US Research Software Engineer Association, 15.10-17.10 2024, Albuquerque, US.

P. Diehl. Numerical verification of the bond-based peridynamic softening model against classical theory. Nonlocal Models in Mathematics, Compution, Science, and Engineering, 26.11-28.11 2015, Oak Ridge, US.

P. Diehl. Applying Tools and Techniques from Software Engineering in Computational Mechanics. 12th U.S. National Congress on Computational Mechanics (USNCCM12), 21.07-25.07 2013, Raleigh, US.

Thesis

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P. Diehl. *Modelling and Simulation of cracks and fractures with peridynamics in brittle materials*. Doktorarbeit, University of Bonn, 2017.

P. Diehl. Implementierung eines Peridynamik-Verfahrens auf GPU. Diplomarbeit, Institute of Parallel and Distributed Systems, University of Stuttgart, 2012.

Open source software

○ NLMech - Implementation of finite element and finite difference approximation of Nonlocal models `JOSS 10.21105/joss.03020`

○ HPX - C++ standard library for parallelism and concurrency `JOSS 10.21105/joss.02352`

○ Octo-Tiger - GPU-accelerated astrophysics code to simulate the merging of stars

Raw experimental data

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Professional Organizations

○ Society for Industrial and Applied Mathematics (SIAM)

○ U.S. Association for Computational Mechanics (USACM)

○ Informatik-Forum Stuttgart e. V.

○ Association for Computing Machinery (ACM)

Reviewer

Computational Particle Mechanics, PLOS ONE, International Journal of Mechanical Sciences, Fatigue & Fracture of Engineering Materials & Structures, Computer Physics Communications, International Journal of Fracture, Parallel Computing, International Journal of High Performance Computing Applications, Computer Methods in Applied Mechanics and Engineering, Theoretical and Applied Fracture Mechanics, Mathematics and Mechanics of Solids, Journal of Engineering Mechanics, Computational Mechanics, Mathematical Reviews, Engineering with Computers, Computer Modeling in Engineering & Sciences (CMES), Journal of Peridynamics and Nonlocal Modeling, Engineering Analysis with Boundary Elements, Computers in Biology and Medicine, and Concurrency and Computation: Practice and Experience.

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Last update: November 4, 2025