



# Patrick Diehl

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## Résumé

### Research Interests

- Computational engineering
  - o Peridynamics.
  - o Comparison of simulations with experimental data.
- High Performance Computing
  - o Large simulations on hybrid cluster architectures.
  - o The C++ Standard Library for Parallelism and Concurrency (HPX)

### Education

- 2012 **Diploma in Computer Science**, *University of Stuttgart*, Germany.
- 2017 **PhD in Mathematics**, *University of Bonn*, Germany.

### Current Appointment

- 2017–now **Researcher fellow**, *Laboratory of Multiscale Mechanics*, Polytechnique Montréal.

### Professional Experience

- 2012–2013 **Research Assistant**, *Institute for Simulation of large Systems, IPVS*, University of Stuttgart.
- 2013–2017 **Research Assistant**, *Institute for Numerical Simulation*, University of Bonn.

### Visiting positions

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

### 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.

## Publications

### Journal articles

Michael Bußler, Patrick Diehl, Dirk Pflüger, Steffen Frey, Filip Sadlo, Thomas Ertl, and Marc Alexander Schweitzer. Visualization of Fracture Progression in Peridynamics. *Computer & Graphics*, 67:45–57, 2017.

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

### Proceedings

P. Diehl and M. A. Schweitzer. Efficient neighbor search for particle methods on GPUs. In M. Griebel and M. A. Schweitzer, editors, *Meshfree Methods for Partial Differential Equations VII*, volume 100 of *Lecture Notes in Computational Science and Engineering*, pages 81–95. Springer, 2014.

P. Diehl and M. A. Schweitzer. Simulation of wave propagation and impact damage in brittle materials using peridynamics. In Miriam Mehl, Manfred Bischoff, and Michael Schäfer, editors, *Recent Trends in Computational Engineering – CE2014*, volume 105 of *Lecture Notes in Computational Science and Engineering*, pages 251–265. Springer, 2015.

F. Franzelin, P. Diehl, and D. Pflüger. Non-intrusive uncertainty quantification with sparse grids for multivariate peridynamic simulations. In M. Griebel and M. A. Schweitzer, editors, *Meshfree Methods for Partial Differential Equations VII*, volume 100 of *Lecture Notes in Computational Science and Engineering*, pages 115–143. Springer International Publishing, 2014.

Thomas Heller, Hartmut Kaiser, Patrick Diehl, Dietmar Fey, and Marc Alexander Schweitzer. Closing the Performance Gap with Modern C++. In Michaela Taufer, Bernd Mohr, and Julian M. Kunkel, editors, *High Performance Computing: ISC High Performance 2016 International Workshops, ExaComm, E-MuCoCoS, HPC-IODC, IXPUG, IWOPH, P<sup>3</sup>MA, VHPC, WOPSSS, Frankfurt, Germany, June 19–23, 2016, Revised Selected Papers*, volume 9945 of *Lecture Notes in Computer Science*, pages 18–31. Springer International Publishing, 2016.

## Invited talks and Presentations

Patrick Diehl. Efficient k-nearest neighbor search on the GPU. Seventh International Workshop Meshfree Methods for Partial Differential Equations, 09.09-11.09 2013, Bonn, Germany.

Patrick Diehl. Coupling CPU and GPU to simulate efficient dynamic cracks and fractures in solids. 12th U.S. National Congress on Computational Mechanics (USNCCM12), 21.07-25.07 2013, Reilagh, US.

Patrick Diehl. Simulation of high-speed velocity impact on ceramic materials using the Peridynamic technique. III International Conference on Particle-Based Methods. Fundamentals and Applications. Particles 2013, 18.09-20.09 2013, Stuttgart, Germany.

Patrick Diehl. Simulation of wave propagation and impact damage in brittle materials using the peridynamics technique. 11th. World Congress on Computational Mechanics (WCCM XI), 20.07-25.07 2014, Barcelona, Spain.

Patrick Diehl. Sensivity study for wave propagation and impact damage in brittle materials using peridynamics. ASME International mechanical Engineering Congress and Exposition, 14.11-20.11 2014, Montreal, Canada.

Patrick Diehl. Efficient particle-based simulation of dynamic cracks and fractures in ceramic material. GPU Technology Conference 2014, 24.03-27.03 2014, San Francisco, US.

Patrick Diehl. Simulation of wave propagation and impact damage in brittle materials using the peridynamics technique. 3rd Workshop on Computational Engineering, 06.10-10.10 2014, Stuttgart, Germany.

Patrick Diehl. A sensitivity study for critical traction in quasi-static peridynamics simulations. 1st. PAN-American Congress on Computational Mechanics, 27.04-30.04 2015, Buenos Aires, Argentina.



Patrick Diehl. A benchmark study for mode I crack opening for brittle materials. 13th US National Congress on Computational Mechanics (USNCCM), 26.07-30.07 2015, San Diego, US.

Patrick Diehl. Energy equivalence for the horizon independent bond-based peridynamic softening model according to classical theory. The Mathematics of Finite Elements and Applications 2016 (MAFELAP), 14.06-17.06 2016, London, UK.

Patrick Diehl. Numerical Validation of the bond-based Softening Model. SIAM Mathematical Aspects of Material Science 2016, 07.05-12.05 2016, Philadelphia, US.

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

*Département de génie mécanique – C.P. 6079, succ. Centre-Ville  
Montréal (Québec) Canada – H3C 3A7*

✉ [patrick.diehl@polymtl.ca](mailto:patrick.diehl@polymtl.ca) •  [diehlpk](#) •  [diehlpk](#)

Patrick Diehl. Modeling ductile materials with bond-based softening peridynamic model. 12th. World Congress on Computational Mechanics (WCCM XII), 24.07-29.07 2016, Seoul, Korea.

Patrick Diehl. Modeling and simulation of crack and fractures with peridynamics in brittle materials. HIM Junior Seminar, 08.02. 2017, Bonn, Germany.

Patrick Diehl. Experimental validation of elastic state based peridynamic for pmma and epoxy materials. 14th U.S. National Congress on Computational Mechanics (USNCCM14), 17.07-20.07 2017, Montreal, Canada.

## Thesis

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

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

## References

Prof. Dr. Marc Alexander Schweitzer  
Institute for Numerical Simulation  
University of Bonn, Germany  
E-Mail: [schweitzer@ins.uni-bonn.de](mailto:schweitzer@ins.uni-bonn.de)

Prof. Robert Lipton  
Mathematics of Materials Science  
Louisiana State University, USA  
E-Mail: [lipton@math.lsu.edu](mailto:lipton@math.lsu.edu)

Prof. Dr. Daniel Peterseim  
Institute for Numerical Simulation  
University of Bonn, Germany  
E-Mail: [peterseim@ins.uni-bonn.de](mailto:peterseim@ins.uni-bonn.de)

Prof. Martin Lévesque  
Department of Mechanical Engineering  
Polytechnique Montréal, Canada  
E-Mail: [martin.levesque@polymtl.ca](mailto:martin.levesque@polymtl.ca)