hpc
NEWSLETTER 2026/3

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Seminar Series „Computation & Data" and HPC CaN, HT2026

Time	Speakers	Title of Lecture
09.10.2026, Seminar Room B1 - 0308		
14:00-15:00 Scientific Talk	Pat Lemaire, Antonio Ruiz-Martinez	Parallel-in-Time Molecular-continuum Flow Solvers
15:00-15:30 HPC Talk	Robert Stark (bwHPC-S5)	Energy Efficiency
29.10.2026, Seminar Room B1 - 0308		
14:00-15:00 Scientific Talk	Alexander Kalinin (MSCA Fellow II)	Computational Communities of Shape: Multiscale Modeling of High-Performance Interacting Active Matter Systems
15:00-15:30 HPC Talk	Jan Eitzinger (NHR@FAU)	Performance Optimization Software
16.12.2026, Seminar Room B1 - 0308		
14:00-15:00 Scientific Talk	Pat Lemaire, Antonio Ruiz-Martinez	Eficsan goes SUPRENUM
15:00-15:30 HPC CaN	Sascha Hilgenfeldt (bwUniCluster 3.0)	System Administration

Six Months in Perth: Robots That Need to Know What to Do

Research Stay of bwHPC-S5 at University of Western Australia, July 2026 to January 2027

Author: Markus Baier

Since July 2026, I have been spending six months at the University of Western Australia in Perth, in Prof. Thomas Bräunl's Robotics and Autonomous Systems Group. The group is well known for its work on autonomous vehicles and robots and has been developing the open-source software EyeSim for more than 25 years. EyeSim is a simulation and development framework that makes it possible to develop the control system of a robotic vehicle in a realistic virtual environment. The same software can then be transferred to real hardware, so that students can move from simulation to real-world experiments without having to rewrite their code from scratch.

Robots have been researching their own environment for decades. Yet they rarely understand what they are doing. A robot can map a room, recognize objects, and plan a route through it. But it usually has no idea why it is doing any of this. Its goals are given by a human, and its behavior is only as good as the instructions it has been given. That is the gap my research project is trying to close.

The project is called "Robots that Need to Know What to Do". Instead of telling a robot exactly what to do, we want to give it a goal and let it figure out the rest on its own. To do this, we are developing a system that combines two different kinds of reasoning. The first is symbolic reasoning, which is the kind of logical thinking we use when we plan a task step by step. The second is neural reasoning, which is the kind of pattern recognition that large language models are good at. Each of these has strengths and weaknesses on its own, and we believe that combining them can produce robots that are both more capable and more trustworthy.

Figure 1: Robots that Need to Know What to Do

To test this idea, we are using a simulated warehouse environment. A robot is given a list of items that need to be delivered to different locations, and it has to plan its own route, avoid obstacles, and adapt when something unexpected happens. For example, if a shelf is blocked or an item is missing, the robot should be able to reason about the situation and find an alternative solution. We are also testing how well the system can explain its own decisions, because a robot that can justify its actions is much more useful than one that cannot.

Figure 2: Robot Navigation Task

Outside of the lab, Perth has been a wonderful place to live and work. The city sits on the Swan River and is surrounded by beaches, parks, and a surprisingly large amount of wildlife. I have had the chance to see kangaroos in the wild, swim with dolphins, and explore the coastline on weekends. The university campus is also very green and relaxed, which has made it a pleasant place to spend long days at the computer.

Working in a different research group has been a valuable experience. The way people approach problems, run meetings, and collaborate is quite different from what I am used to in Germany. I have also had the opportunity to present my work to the group and receive feedback from researchers with different backgrounds, which has helped me see my own project from new perspectives.

There is still a lot of work ahead. I have about three months left in Perth, and my goal is to have a working prototype of the system by the end of my stay. After that, I will return to Germany and continue writing my thesis. I am grateful to the bwHPC-S5 project for making this research stay possible, and to my colleagues in Perth for welcoming me so warmly into their group.

GPU-Driven Molecular Dynamics Using SimpleMD

Author: Alexander Barth

The MultiT work package been package is to develop a GPU-driven molecular dynamics code tailored well as experimentation platform for the investigation of interfacial fluids. At first, MPEC, a Fortran 90 code developed by Prof. Dr. Jadran Vrabec's group at the University of Paderborn, was used. It is a code bridging flow simulation, coupling continuum and particle domains, and molecular dynamics simulation, for the latter molecular simulations. This allows to analyze molecular processes in nanoscale systems, where the continuum assumption breaks down and molecular effects are more possible. These simulations, for example, are used to investigate evaporation and condensation processes of droplets and vapours. As the computer clusters in the future become more and more heterogeneous, with GPU accelerators in addition to CPUs, a code was created in Fortran changing MPEC. Consequently, the code was named SimpleMD, which can be run by CPU or GPU. The code is open source and can be found on GitHub. Besides the Fortran version, there also distributions for a variety of HPC-Systems. The code is also available as a Python package.

Figure 1: Runtime - SimpleMD benchmark on GPU

Scaling performance of the SimpleMD simulation on GPU. With ideal scaling, normalized whose a number of molecules is doubled, the runtime should also double.

Digital Learning Portfolios as Teaching and Research Tools in the Context of AI-Supported Daily Academic Life

Author: Thomas Wunderlich

As part of the DLEARNET project, a web-based learning portfolio system for digital learning portfolios was developed. In addition to the technical design study results, this tool enables students to collect, reflect on, and present their academic and professional development in digital learning and usage practices, as well as to receive feedback from lecturers and peers. Additionally, it enables researchers to study students' action-level fluency in digital learning and usage practices (cf. Wunderlich, 2026).

The longitudinal study's results show that students' digital learning and usage practices vary across its digital technologies, but primarily in terms of their fluency in using them. Here, fluency is understood as the ease with which one is able to mix, effortlessly, critical, and productive practices in digital learning and usage (cf. Wunderlich, 2026). Based on the concept of the elements (Deleuze, 1994), the concept of fluency is understood as a metaphor for the ease with which one can move between different practices in digital learning and usage. Fluency is not to be regarded as part of students' daily digital learning and usage practices, but rather as a process of becoming. Thus, the development of fluency in terms of PDSI etc. (cf. Web 1x) leads to the ability to move between different practices in digital learning and usage. Fluency can be interpreted to promote students' critical and reflective digital learning and usage practices. Fluency can be seen as a process of becoming and can therefore be an incentive for participation in the longitudinal study. Fluency can be understood as a process of becoming in digital learning and usage practices (cf. Wunderlich, in press). Fluency can be seen as a process of becoming in digital learning and usage practices (cf. Wunderlich, in press).

Figure 1: Adding the portfolio to Moodle

Nevertheless, the project is based on a social constructivist understanding of learning and teaching that views digital learning practices as socially embedded and mediated. Digital learning portfolios can therefore be understood here as a constructive learning support. They enable students to collect, reflect on, and present their digital learning practices. Learning portfolios make the emerging, reflexive, and transformative processes visible and thus open them up to discussion. Learning portfolios are investment formats but also as a data source for research. They can be used to collect data on students' digital learning and usage practices. The process that arises during the research and learning process can be made visible and thus open to discussion. Learning portfolios can be used as a data source for research, teaching, and practice in a way that is both reflexive and transformative.

Initial experiences in teaching have produced, among other things, the following insights:

Would you like to learn more about the project or discuss digital learning portfolios? Feel free to contact me.

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hpc.bw @ECER 2026 in Tampere

Author: Hannes Kelling

Part of its 3 August 2026, Rolle Rahmen and 7 Dissertori Kellingl has the opportunity to present the hpc.bw project at the European Conference on Educational Research (ECER), organized by the European Educational Research Association (EERA). The conference was held in Tampere, Finland, under the theme "Education and Society in Times of Transformation: Re-Search for the Future?". Sampling together researchers from across Europe and beyond to discuss the role of research in shaping education systems.

To get a better feeling of what large research projects in Germany look like, I attended the ECER 2026, looking at the longest ECER in history with 1,400 sessions. The conference offered an extensive program with more than 1,000 sessions, the conference offered an extensive program with more than 1,000 sessions. In particular, shared audience interest. As in addition to presentations and discussions, there were also workshops, symposia, and poster sessions. In particular, shared audience interest. As in addition to presentations and discussions, there were also workshops, symposia, and poster sessions. In particular, shared audience interest. As in addition to presentations and discussions, there were also workshops, symposia, and poster sessions.

Figure 1: Tampere Hall

The presentation focused on how learning analytics can be used to support students in their academic and personal development. It explained how learning analytics can be used to support students in their academic and personal development. It explained how learning analytics can be used to support students in their academic and personal development. It explained how learning analytics can be used to support students in their academic and personal development.

The ECER 2026 was a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work.

Figure 2: Kelling at ECER 2026

Overall, ECER 2026 was an impressive conference that offered a wide range of sessions and opportunities for networking and learning. It was a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work.

Last but not least we have some time to explore Tampere. The city is known for its beautiful lakes and its vibrant cultural scene. It was a great opportunity to explore the city and its surroundings. It was a great opportunity to explore the city and its surroundings. It was a great opportunity to explore the city and its surroundings.

Figure 3: Kelling at Pyynikki

Overall, ECER 2026 was an impressive conference that offered a wide range of sessions and opportunities for networking and learning. It was a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work.

"Strategies of Knowledge and the Future of Teaching. John Educators in Times of Transformation" was the theme of the 2026 ECER conference. It was a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work.

Looking forward, the project will continue to develop its technical implementation in 2026 here. It will also continue to develop its technical implementation in 2026 here. It will also continue to develop its technical implementation in 2026 here. It will also continue to develop its technical implementation in 2026 here.

Last but not least, I would like to express my gratitude to the hpc.bw project for making this opportunity possible. It was a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work. It was also a great opportunity to connect with researchers from different countries and learn about their work.

hpc.bw @WCCM-ECOMAS 2026 in Munich

17th World Congress on Computational Mechanics & 10th European Conference on Computational Mechanics in Applied Sciences and Engineering, ICM 2026International Congress Center Messe München | 19–24 July 2026

Authors: Markus Baier, Markus Blatt, Markus Breig, Oliver Meister, Peter Munch

Figure 1: Markus Baier, Markus Blatt, Markus Breig, Oliver Meister, Peter Munch at the hpc.bw booth

The joint WCCM-ECCOMAS 2026 congress brought together researchers from across computational mechanics, applied mathematics, and engineering practice for a week of plenary lectures, minisymposia, and informal discussions. The hpc.bw booth was staffed by members of the Simulation Technology group from the University of Stuttgart, who used the opportunity to talk to potential users and collaborators about the project.

Our contribution to the minisymposium "Scalable Solvers for Poromechanics" (Monday, 20 July 2026, 13:30–15:30, Room B1) was delivered by Markus Blatt. The talk, titled "Scalable Solvers for Poromechanics with Dune", presented the open-source software framework Dune and its extension modules for the parallel solution of coupled flow and deformation problems in porous media. Dune is a modular C++ framework for the numerical solution of partial differential equations on grid-based discretizations, with support for unstructured and adaptively refined meshes and for parallel execution on high-performance computers. Poromechanics, the coupling of fluid flow and solid deformation in porous media, is a natural application area for such a framework, since it combines a mixed or hybrid discretization of the flow problem with a standard finite element discretization of the mechanics problem, and both must be solved together in a way that remains robust and scalable.

The talk motivated the approach by pointing out that the monolithic coupling of these two discretizations leads to large, indefinite saddle-point systems that are difficult to precondition efficiently, and that the standard remedy, a fixed-stress splitting, can converge slowly or not at all when the material parameters are unfavorable. Markus Blatt then described how Dune's grid interface and its parallel data structures can be used to assemble and solve such systems on distributed-memory machines, and how existing algebraic multigrid and Krylov solvers can be combined with problem-specific preconditioners for the coupled system. Numerical examples were shown to illustrate the parallel scaling behavior and the robustness of the approach with respect to the material parameters.

Figure 2: Markus Blatt presenting "Scalable Solvers for Poromechanics with Dune" at the minisymposium

Besides the talk, the booth was a useful place to meet people working on related problems in different application areas, and to discuss how the Dune ecosystem might be extended to cover their needs. Several visitors asked about the coupling interfaces and about the availability of ready-made discretizations for poromechanics, which pointed to a clear direction for future development work within the project.

Sustainable Research Software @ WCCM & ECCOMAS

Author: Matthias Baer

An open source software being a central artifact in computational science, the Dune project (DUNE) set the SIG for Sustainable Research Software (SRS) at the WCCM-ECCOMAS 2026 in Munich, Engineering (ECCOMAS), the largest WCCM conference to date, with 1,400 attendees.

Sustainable research software (SRS) is a key enabler for reproducible, collaborative, and long-lived computational science. Despite its importance, SRS is rarely treated as a first-class scientific output. Instead, it is often developed under time pressure, maintained by small groups, and poorly supported by existing publication and evaluation practices. This session aimed to address these challenges by bringing together researchers, developers, and practitioners from different communities to discuss practical approaches, shared experiences, and open problems in developing sustainable research software.

The session was organized as a mixed format, combining invited talks with a panel discussion. The invited talks covered a broad range of topics, including community building, software publishing, development practices, and the role of research software as a scientific output. The panel discussion focused on the challenges and opportunities in developing sustainable research software, and on the role of the community in supporting its development.

Invited Presentations: Daniel Arndt (Sandia National Laboratories), Jan-Niklas Grönewald (Forschungszentrum Jülich), Jan Mohrbach (Forschungszentrum Jülich), Jan Philipp Thiele (Forschungszentrum Jülich), Jan Philipp Thiele (Forschungszentrum Jülich), Jan Philipp Thiele