



The Dresden/Jülich Hackathon—taking place March 5–March 9, 2018 at TU Dresden—as the first in a series of GPU Hackathons planned for 2018. The event was locally organized by ZIH Dresden and Helmholtz Zentrum Dresden Rossendorf (HZDR). More than 50 people from different scientific fields attended, with the goal of accelerating codes using graphics processing units (GPUs).

Teams from all over Europe applied to participate in the hackathon. Eight teams were admitted and participated in an intense week-long event of optimization and conversion about scientific programs. Mentors from academia and industry, all experts in parallel programming, assisted with programming strategies, tools, and consulting on techniques and tools for concurrent programming. Teams could quickly evaluate new ideas while sitting together in one large room and, if necessary, discuss their

thoughts beyond the scope of their team with experts from other groups.

Team Ptycho\_Imaging, for example, attended with an x-ray imaging application written in Matlab that approaches its performance limits quickly. During the hackathon, together with their two mentors, they converted the code base to Python and wrote an interface to C++, from where they call the GPU-accelerated solvers offered by PETSc. During the course of the week, they went from a serial, prototype-like application working on a laptop, to a HPC-level program making use of the massively parallel performance offered by GPUs.

The team LeMonADers from the Leibniz Institute of Polymer Research Dresden was one of several teams, using GPUs for accelerating numerical simulations. Their molecular dynamics application was already ported to the GPU architecture



All participants and mentors that joined the GPU Hackathon.

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prior to the event and optimized thoroughly. During the Hackathon, the team investigated further, low-level optimizations and strengthened their underlying physical simulation by integrating various external libraries. Not all of the evaluated strategies were successful, but testing during the concentrated atmosphere made the team's investigation efficient. The team valued the scientific discourse during the event.

Team McStas-McXtrace optimized a set of physics applications for tracing neutron and x-ray scattering experiments. Their legacy codebase proved hard to accelerate, so the team focused on creating a code generator for a specific function which then contained GPU-accelerated code. They achieved a three-fold speedup for the first GPU version of the application. The main benefit of the hackathon for the team was the ability to jumpstart the modernization of its application with a GPU-parallel backend in mind, allowing them to gain first insights into the ecosystem.

Guido Juckeland, the main organizer, moderated the hackathon. Every day adhered to a certain schedule: Teams meet in the morning and work until lunch, after which every team presents their current status, their successes and failures, and their future plans in a short, two-minute stand-up presentation. Afterwards it is back to hacking away until the evening. Guiding goals were set for each day: At the beginning of the week, it was stock-taking of the current state of the apps. Plans were formulated, first easy-to-attain, then harder ones. Finally, advanced

topics were tackled, like asynchronous execution of functions of the program. At the end of the week, all teams achieved their self-set goals. For many of them it was an achieved net-speedup of their application, now running on GPUs. Others were able to extend the scope of their applications and libraries. All learned valuable software engineering methods along the way and could work together closely with HPC researchers and scientists.

The next GPU hackathon in Europe is at CSCS in Switzerland, October 1–5, 2018. See the official website at <https://www.olcf.ornl.gov/calendar/2018-gpu-hackathons/> for upcoming registration deadlines.

## References

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- [4] <https://twitter.com/search?q=%23gpuhackdd>

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