

## JSC Guest Student Programme 2015 - GSP rocks JUQUEEN

The Jülich Supercomputing Centre (JSC) is one of Europe's leading HPC centres providing HPC expertise for computational scientists at European universities, research institutions, and industry. A variety of training and educational activities are organised by JSC on a regular basis. One of these activities is the annual Guest Student Programme (GSP) lasting for ten weeks each summer. The participants receive extensive training on cutting edge hardware as well as HPC-related software and algorithms. The acquired theoretical knowledge is turned into hands-on skills by coached work on novel and challenging scientific projects. For many students, the programme has been the foundation of a career in HPC and the basis of fruitful long-term collaborations with their advisers. Some students even return to JSC as PhD candidates focusing on highly parallel applications. Over the past 15 years, 157 students participated in the GSP and this year another 12 got the opportunity to join researchers at JSC. During the highly competitive selection procedure 76 applicants tried to obtain one of the limited number of guest student positions. The selection committee received applications from 24 countries spanning a wide range of scientific domains, e.g. physics, chemistry, computer science, and mathematics.

This year's GSP took place from August 3 to October 9. It was supported by CECAM (Centre Européen de Calcul Atomique et Moléculaire) and sponsored within the IBM University programme. The first two weeks were dedicated to various courses on parallel programming up to advanced level. The lectured HPC techniques range from the usage of MPI on distributed-memory cluster systems to GPGPU programming with CUDA as well as threading via OpenMP. They were complemented by crash courses on LaTeX and revision control techniques with GIT. Equipped with this vital knowledge the participants were ready to focus on the scientific part of the GSP. The range of scientific projects was as diverse as the user community on the hosted supercomputers, covering neuroscience, fluid and molecular dynamics, and safety research. Also represented was fundamental research in elementary particle physics, and mathematical algorithms. The main platforms for code development and simulation were the CPU/GPU system JURECA and the leadership Blue Gene/Q system JUQUEEN. Next year's GSP will start on August 1, 2016. It will be officially announced in January 2016 and is open to students from natural sciences, engineering, computer science, mathematics and the computer science related branches of neuroscience. For applicants it is mandatory, to have received the Bachelor but not yet the Master degree. The application deadline is March 31, 2016. Additional information of the previous years is available online at [www.fz-juelich.de/jsc/gsp](http://www.fz-juelich.de/jsc/gsp).

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## Supercomputing for Neuroscientists: How HPC can help your Neuroscience Projects



Computational neuroscience is developing an interest in problems of increasing complexity and scale, leading to the evolution of projects such as the "Human Brain Project" (HBP) [1] and the "1000 Brains Study" [2] which will include computationally intensive simulations and the analysis of huge data sets. However adapting current software developed for local clusters to the supercomputing environment is often a challenge for the originating labs. The Simulation Laboratory Neuroscience [3] at the Jülich Supercomputing Centre (JSC) aims to bridge the gap between these two environments with a regular series of workshops bringing together HPC experts with computational neuroscientists.

Last year, the SimLab Neuroscience began this process with the "Bernstein Network - Simulation Lab Neuroscience" HPC workshop [4], which led to the

porting of several projects to JSC HPC systems. On November 3 of this year, the SimLab presented Supercomputing for Neuroscientists: How High Performance Computing can help your neuroscience projects, a workshop directed towards the German and European neuroscience communities covering:

- Introduction to HPC
- Current neuroscience projects on supercomputers
- Application process and access to supercomputers
- Participants' projects.

Experts in HPC from the SimLab gave presentations on supercomputer architectures, scaled algorithms and massively parallel algorithms. Other experts from the JSC and Jülich's Institute of Neuroscience and Medicine showcased projects that have already



made use of JSC resources, including large-scale neuronal network simulations such as NEST [5] on the JUQUEEN supercomputer, “Big Data” approaches to experimental electrophysiological analyses, and massive neuroanatomical maps such as the BigBrain [6] using PLI data [7], highlighting issues and opportunities facing neuroscientists as they scale projects up. The computing time application process was explained, the new “preparatory access” model available at the JSC was described, and the HBP HPC Platform as part of the available large-scale neuroscience research infrastructure was introduced. Additionally, participants had an opportunity to show posters and give spotlight talks to catalyze collaboration with HPC experts.

Further details are available at [www.fz-juelich.de/ias/jsc/scn](http://www.fz-juelich.de/ias/jsc/scn).

## References

- [1] Human Brain Project.  
URL <http://www.humanbrainproject.eu/>
- [2] Institute of Neuroscience and Medicine 1, 2, 4 and 8, Forschungszentrum Jülich and University Duisburg-Essen. 1000BRAINS. URL [http://www.fz-juelich.de/inm/inm-1/EN/Forschung/1000\\_Gehirne\\_Studie/1000\\_Gehirne\\_Studie\\_node.html](http://www.fz-juelich.de/inm/inm-1/EN/Forschung/1000_Gehirne_Studie/1000_Gehirne_Studie_node.html)
- [3] Simulation Laboratory Neuroscience – Bernstein Facility Simulation and Database Technology. URL [http://www.fz-juelich.de/ias/jsc/EN/Expertise/SimLab/slms\\_node.html](http://www.fz-juelich.de/ias/jsc/EN/Expertise/SimLab/slms_node.html)
- [4] Do Lam-Ruschewski, A., Lühns, A., Morrison, A., Orth, B., Peyser, A., Schenck, W.  
Bernstein Network – Simulation Lab Neuroscience, 4–5 June 2014. URL <http://www.fz-juelich.de/SharedDocs/Termine/IAS/JSC/EN/events/2014/bernstein-hpc-2014.html>

- [5] NEST Initiative. NEST (Neural Simulation Tool), 2014.  
URL <https://github.com/nest/nest-simulator>
- [6] Institute of Neuroscience and Medicine 1, Forschungszentrum Jülich and Montreal Neurological Institute (MNI). BigBrain. URL [http://www.fz-juelich.de/inm/inm-1/EN/Forschung/\\_docs/BigBrain/bigbrain\\_node.html](http://www.fz-juelich.de/inm/inm-1/EN/Forschung/_docs/BigBrain/bigbrain_node.html)
- [7] Institute of Neuroscience and Medicine 1, Forschungszentrum Jülich. Polarized Light Imaging. URL [http://www.fz-juelich.de/inm/inm-1/EN/Forschung/\\_docs/PLI/PLI\\_node.html](http://www.fz-juelich.de/inm/inm-1/EN/Forschung/_docs/PLI/PLI_node.html)

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# JSC at the 3rd JLESC Workshop

From June 29 to July 1, the 3rd JLESC workshop took place in Barcelona, organized by Barcelona Supercomputing Center. This event was the first one in 2015 of the biannual meetings of the Joint Laboratory on Extreme Scale Computing (JLESC) and the first one with Jülich Supercomputing Centre (JSC) as full partner of JLESC. The Joint Laboratory brings together researchers from the Institut National de Recherche en Informatique et en Automatique (Inria, France), the National Center for Supercomputing Applications (NCSA, USA), Argonne National Laboratory (ANL, USA), Barcelona Supercomputing Center (BSC, Spain), and, since the beginning of this year, RIKEN AICS (Japan) and JSC. The key objective of JLESC is to foster international collaborations on state-of-the-art research related to computational and data focused simulation and analytics at extreme scales. Within JLESC, scientists from many different disciplines as well as from industry address the most critical issues in advancing from petascale to extreme scale computing. The collaborative work is organized in projects between two or more partners. This includes mutual research visits, joint publications and software releases. Every six months, all JLESC partners meet during a workshop to discuss the most recent results and to exchange ideas for further collaborations. With more than 100 scientists and students from the six JLESC partners, the meeting in Barcelona covered a broad range of topics crucial for today's and tomorrow's supercomputing. Together with the other participants, 19 staff members from JSC could catch up on cutting-edge research from the fields



of resilience, I/O and programming models as well as numerical methods, applications, data analytics and performance tools. 8 scientists and students from JSC and German partner universities presented their research and results during contributed talks and Prof. Thomas Lippert highlighted central HPC aspects of the Human Brain Project in his keynote. Prof. Morris Riedel and his group at JSC and University of Iceland gave insight into their research on data analytics during the associated JLESC summer school “Storage, IO and Data Analytics”. From December 2 to 4, 2015 the 4th JLESC workshop will be organized by JSC at the Gustav-Stresemann Institut e.V. in Bonn, continuing this successful series of internationally recognized and valued meetings. For more information visit the official JLESC website under <http://publish.illinois.edu/jointlab-esc>.

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