Lattice Practices 2015 @ JSC

The 6th training workshop “Lattice Practices” was held at JSC October 14 to 16, 2015. The scope of the Lattice Practices workshops is to provide training in state-of-the-art numerical techniques and the use of information technologies for research in lattice QCD (LQCD). Geared towards PhD students, young researchers, and other interested LQCD practitioners, the workshops feature lectures on technical topics accompanied by hands-on exercises, with strong emphasis on practical training. Furthermore, a variety of recent scientific developments are covered, in order to expose the young researchers and students to potential areas of future research.

This year’s workshop was organized by the Joint SimLab “Nuclear and Particle Physics” of Cyprus Institute, DESY, and JSC. Speakers from the SimLab partners and other European institutions gave technical lectures and hands-on tutorials on topics commonly dealt with in their field of research. The topics covered ranged from data analysis and numerical techniques over optimization strategies and computer architecture to “hot” LQCD, with accompanying hands-on sessions. Here, the participants were given examples on basic techniques such as binning and error and autocorrelation analysis, but also given typical physics tasks they will likely encounter during their own research. A particular emphasis was put on optimal programming, when the course of lectures and exercises went on to introduce the attendees to code optimization techniques and HPC architectures in general. This was completed by an introduction to numerical linear solver techniques and deepened in the accompanying exercises for both topics. Completing this year’s course of lectures were two talks discussing new simulation techniques and LQCD at finite temperature.

This year’s participants came from institutions all over Europe, from Italy to Ireland, but also from as far away as India. This interest demonstrates the need for this series of educational workshops, which was initiated in 2006. A next workshop is planned for spring 2017. The slides of the talks and material of the hands on sessions can be found on the web at: http://www.lqcd-jsc.de

Smart Data Innovation Lab

The significantly growing data economy is driven by slogans like “data is the oil of the 21st century” or “the data speaks for itself”. But in order to achieve “big insights from data”, important research efforts still need to be made, e.g. in terms of parallel, scalable, and even real-time processing of large data quantities (“big data”). Structuring “big data” results in information (called “smart data”) which in turn leads to knowledge advantages which can be used to answer important research questions or that contributed to better decision-making processes.

In order to be able to make fast use of this competitive edge for Europe, partners from industry and research have established the Smart Data Innovation Lab (SDL). The close cooperation between industry and science is intended to improve the conditions for cutting-edge research in the area of data engineering, parallel and scalable machine learning, data mining, and smart data processing. Figure 1 illustrates the conceptual organization of the SDL initiative.
JSC to participate in four Horizon2020 Centres of Excellence

On May 8, the results of a keenly contested call for new “Centres of Excellence” within the EU Horizon2020 E-INFRASTRUCTURES Programme were announced [1]. These new funding instruments are intended to harness computational science and big data expertise in HPC in the promotion of scientific discovery and industrial competitiveness. Out of the 20 submitted proposals, 8 projects were approved for initial funding and 4 of these will include active JSC participation – see Table 1 and Ref. [2] for an overview. These four are: POP - Performance Optimisation and Productivity; MaX – Materials Design at the Exascale; E-CAM – an E-infrastructure for Software, Training and Consultancy in Simulation and Modelling; and EcoCo – an Energy-oriented Centre of Excellence. All projects – subject to final approval by all participants – plan to start in the autumn of this year.

EcoCoE
EcoCoE (“echo”), coordinated by the Maison de la Simulation at CEA, France, received the highest grade of the evaluation, and aims to exploit the prodigious potential offered by the maturing HPC infrastructure to foster and accelerate the European transition to a reliable, low-carbon energy supply. EcoCoE will achieve its goal via targeted support of four distinct renewable energy pillars: Meteorology [Wind], Materials [Earth], Hydrology [Water] and Fusion [Fire], each of which boasts activities with a high reliance on numerical modeling. From the project outset these four pillars will be anchored within a strong transversal multidisciplinary basis providing high-end expertise in applied mathematics and supercomputing science. EcoCoE is structured around a central Franco-German hub coordinating a pan-European network, gathering a total of 9 countries and 23 teams, including 5 separate FZJ units from JSC, IEK and IBG. Its partners are strongly engaged in both the HPC and energy fields, a prerequisite for the long-term sustainability of EcoCoE and also ensuring that it is deeply integrated in the overall European strategy for HPC.

References

Table 1: Summary of approved EU Centres of Excellence.

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<tr>
<th>Coordinator</th>
<th>Partners</th>
<th>Acronym</th>
<th>Proposal Title</th>
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<td>CEA</td>
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<td>EoEGE</td>
<td>Energy oriented Centre of Excellence for computer applications</td>
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<td>MPG</td>
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Figure 3: Brain tissue cutted with 80 micrometer into ~700 layers available as block face images.

As shown in Figure 1, currently four data innovation communities (DICs) are using the platform in different topial areas that offer domain-specific data sources for distinct research projects. Interested organizations from industry and academia are welcome to participate in one of the following four topical areas but are particularly encouraged to participate with ready available data, good analytics algorithms, or interesting research questions.

The DIC Energy is headed by KIT and EnBW and explores important data-driven aspects in the area of energy, such as the demand-driven fine-tuning of consumption rate models based on smart metre generated data. The DIC Smart Cities is headed by fractioner IAS and Siemens explores data-driven aspects of urban life, such as traffic control, but also waste disposal or disaster control. The DIC Industry 4.0 is headed by Bosch and DFKI and explores important data-driven aspects of the fourth industrial revolution (towards Smart Factories), such as proactive service and maintenance of production resources or finding anomalies in production processes. In one of the projects of this particular DIC, Trumpf is working with SAP and KIT on condition-based monitoring of production systems while Trumpf also is starting to work with IBM, KIT and the Jülich Supercomputing Centre (JSC) on optimizations and classification problems for automatically detecting good or bad welding processes of materials.

The DIC Medicine is headed by Forschungszentrum Jülich and Bayer and works on three different research projects. The JSC and Jülich Institute of Neuroscience and Medicine (INM) closely work together on a project about predicting optimal treatment procedures for spinal cord injury patients. In the third project the Ludwig Maximilian University of Munich (LMU) works with JSC and IBM on using machine learning techniques for better supporting the decision-making of doctors when picking patient-specific human eye therapies for patients suffering from eye illnesses such as age-related macular degeneration.

References
[1] Smart Data Innovation Lab Website, Online: http://www.sddl.de/da/ contact: Morris Riedel, m.riedel@fz-juelich.de

1 Jülich Supercomputing Centre (JSC), Germany
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