

Education and Training @ LRZ

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SuperMUC-NG Status and Results Workshop, 9 – 11 May 2023

Outline



- Education and Training at LRZ
- Offerings within GCS, PRACE and EuroCC
- Statistics
- Course Formats
- Upcoming Courses and Workshops

Education and Training at LRZ



- We regularly offer education and training on topics such as Application Software, Data Analytics, Deep Learning and AI, HPC, Optimisation, Programming Languages and Quantum Computing.
- In this area LRZ collaborates with the partners within the **Gauss Centre for Supercomputing (GCS)**.
- At European level, LRZ as part of GCS was one of 14 **PRACE Training Centres (PTC)** from 2012-2022.
- Since September 2020, LRZ as part of GCS is also a **National Competence Centre (NCC)** within the framework of the EuroCC project and its continuation EuroCC-2 since January 2023.



Collaborations in Education and Training



Discover our Education and Training Programme

GCS and its member centres provide first-class training opportunities for the national and European HPC communities. More than 50 highly qualified scientists work as trainers for over 100 courses, which positions GCS as one of the leading training institutions in all of Europe.

We cover a wide range of areas – from general HPC topics to data management, machine learning and AI techniques as well as special community-oriented topics such as CFD. Our training landscape offers a mixture of on-site courses, online workshops as well as hybrid events.



We are looking forward to meeting you at one of our future GCS training events. For a full list of training courses offered, please visit:



GCS **HLRS** **JSC** **LRZ**

Funding for GCS HPC resources is provided by:



<https://www.gauss-centre.eu/trainingsworkshops>

PRACE Training Centres



LRZ as part of the Gauss Centre for Supercomputing (GCS) was one of the 14 **PRACE Training Centres** 2012-2022:

- Barcelona Supercomputing Center (Spain)
- CINECA Consorzio Interuniversitario (Italy)
- CSC – IT Center for Science Ltd (Finland)
- EPCC at the University of Edinburgh (UK)
- Gauss Centre for Supercomputing (Germany)
- Maison de la Simulation (France)
- GRNET – Greek Research and Technology Network (Greece)
- ICHEC – Irish Centre for High-End Computing (Ireland)
- IT4I – National Supercomputing Center VSB Technical University of Ostrava (Czech Republic)
- SURFsara (The Netherlands)
- TU Wien – VSC Research Center (Austria)
- University ANTWERPEN – VSC & CÉCI (Belgium)
- University of Ljubljana – HPC Center Slovenia (Slovenia)
- Swedish National Infrastructure for Computing (SNIC) (Sweden)



Mission: Serve as **European hubs and key drivers of advanced high-quality training** for researchers working in the computational sciences.

<http://www.training.prace-ri.eu/>

Former PTC Training Continued



- **Deep Learning and GPU Programming Workshop**
3 – 4 days, 3 LRZ NVIDIA certified lecturers (11. –13.7.2023 @ HLRS)
- **OpenMP Programming Workshop**
3-days, 2 members of the OpenMP ARB (27. – 29.9.2023)
- **Advanced Fortran Topics**
4 days, 3 LRZ lecturers (Q4 2023)
- **Node-Level Performance Engineering**
3 days, 2 NHR@FAU lecturers (4. – 6.12.2023)
- **HPC Code Optimisation Workshop**
3 days, 6 LRZ + 1 NHR@FAU lecturer (tba)
- **VI-HPS Tuning Workshop**
5-days, ~12 VI-HPS lecturers (2024)



EuroCC – German National Competence Centre (NCC)



One of currently
32 National
Competence Centres

Financed by EuroHPC
JU (50%) und BMBF
(50%)

Run-time:
EuroCC/EuroCC-2
2020-2025

German Partners:
GCS, HLRS, JSC,
LRZ, SICOS BW
GmbH

Goals:

- Provision of a **broad service portfolio including training** tailored to the needs of various user groups: industry, academia and public administration.
- Catalogue and increase national **HPC, High-Performance Data Analytics (HPDA)** and **Artificial Intelligence (AI)** competences.
- Foster each NCC as a **single point of contact** towards the world of HPC in the respective states and the EU.



- **HPC and Parallel Programming**
 - Parallel Programming of High Performance Systems (3 days, in cooperation with NHR@FAU)
 - Iterative Linear Solvers (3 days by A. Meister, University of Kassel)
 - Node-Level Performance Engineering (3 days by 2 NHR@FAU lecturers)
 - OneAPI Programming (3 days, in cooperation with Intel)
- **GPU Programming**
 - Deep Learning and GPU Programming Workshops (3 – 4 days in cooperation with NVIDIA)
 - N-Ways to GPU Programming Bootcamp (1.5 days in cooperation with NVIDIA)
- **Programming Languages**
 - Introduction to C++ (3 days)
 - Modern C++ Software Design (3 days, by Klaus Iglberger)
 - Programming with Fortran (3 days)
 - Advanced Fortran-Topics (4 days)
 - Other programming languages like Python, Kokkos, Julia, OpenCL

- **CFD / Community-Targeted**
 - Introduction to LRZ HPC Systems with Focus on CFD Workflows (0.5 day)
 - Introduction to ANSYS CFX on LRZ HPC Systems (6 days, weekly)
 - Introduction to ANSYS Fluent (6.5 days, weekly)
 - Molecular Modelling with Schrödinger-Suite Workshop (2 days)
- **Data Analytics, Machine Learning and AI**
 - AI Training Series on Data Analytics, Big Data & AI (8 modules, twice a year, in cooperation with TUM Data Innovation Lab)
 - Intel AI Workshops (2 days)
 - AI for Science Bootcamp (1.5 days in cooperation with NVIDIA)
 - SciML GPU Bootcamp (1.5 days in cooperation with NVIDIA)
- **Quantum Computing**
 - QMware Training (2 days)
 - Introduction to the Classiq Platform (0.5 days)
 - Working with Noisy Quantum Computers (1 day)

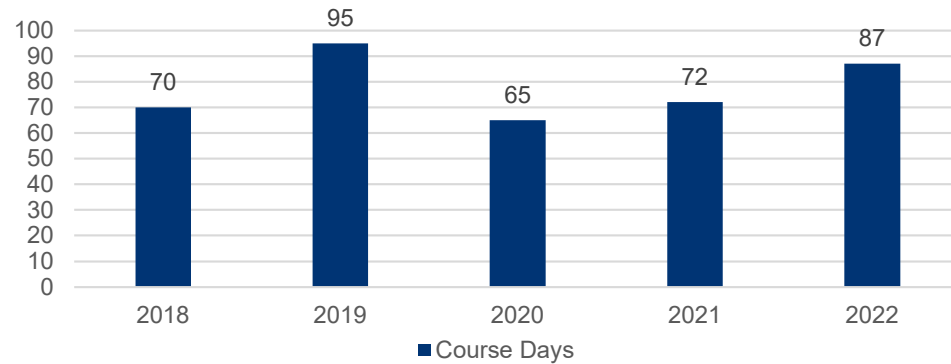


- The **NVIDIA Deep Learning Institute (DLI) @ LRZ** offers hands-on training for developers, data scientists, and researchers looking to solve challenging problems with deep learning.
- **Topics:**
 - Fundamentals of Deep Learning
 - Building Transformer-Based Natural Language Processing Applications
 - Fundamentals of Deep Learning for Multi-GPUs → October 2023
 - Fundamentals of Accelerated Computing with CUDA C/C++
 - Accelerating CUDA C++ Applications with Multiple GPUs
 - Fundamentals of Accelerated Computing with OpenACC
- NVIDIA Certified **University Ambassadors @ LRZ:**
 - Dr. Momme Allalen, PD Dr. Juan Durillo Barrionuevo, Dr. Volker Weinberg
- LRZ lecturers also offered DLI training @ CSC, HLRS, ISC, IT4Innovations, VSC

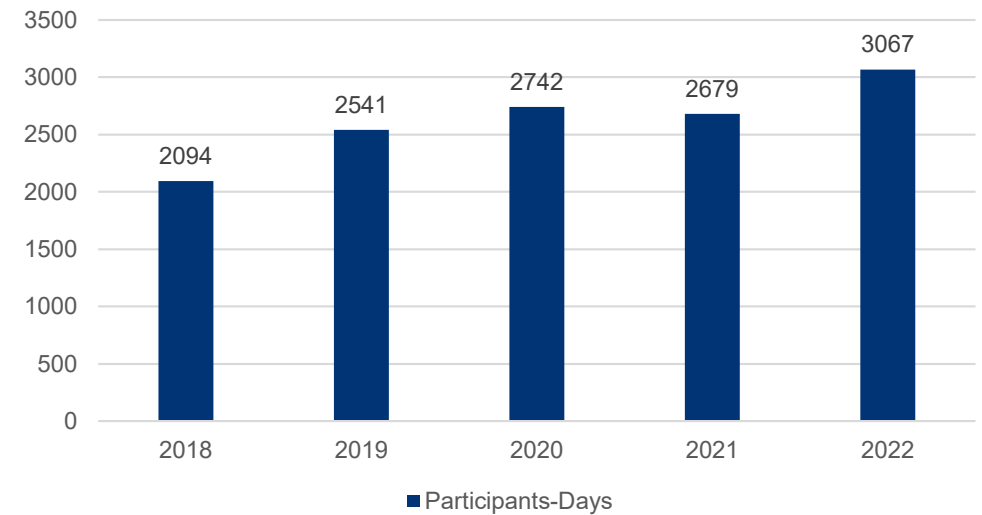
Statistics: LRZ 2018-2022



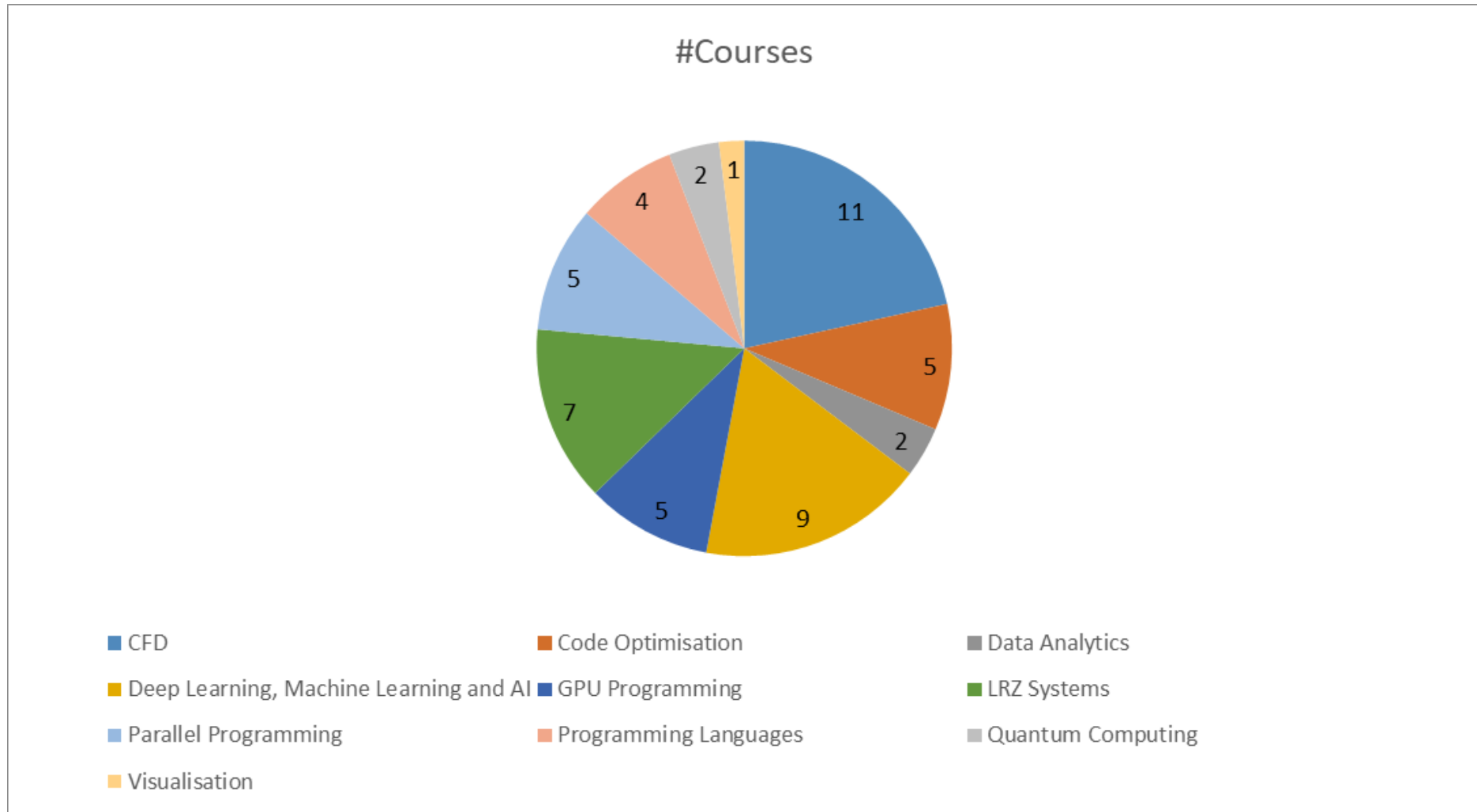
Course-Days 2018-2022



Participants-Days 2018-2022



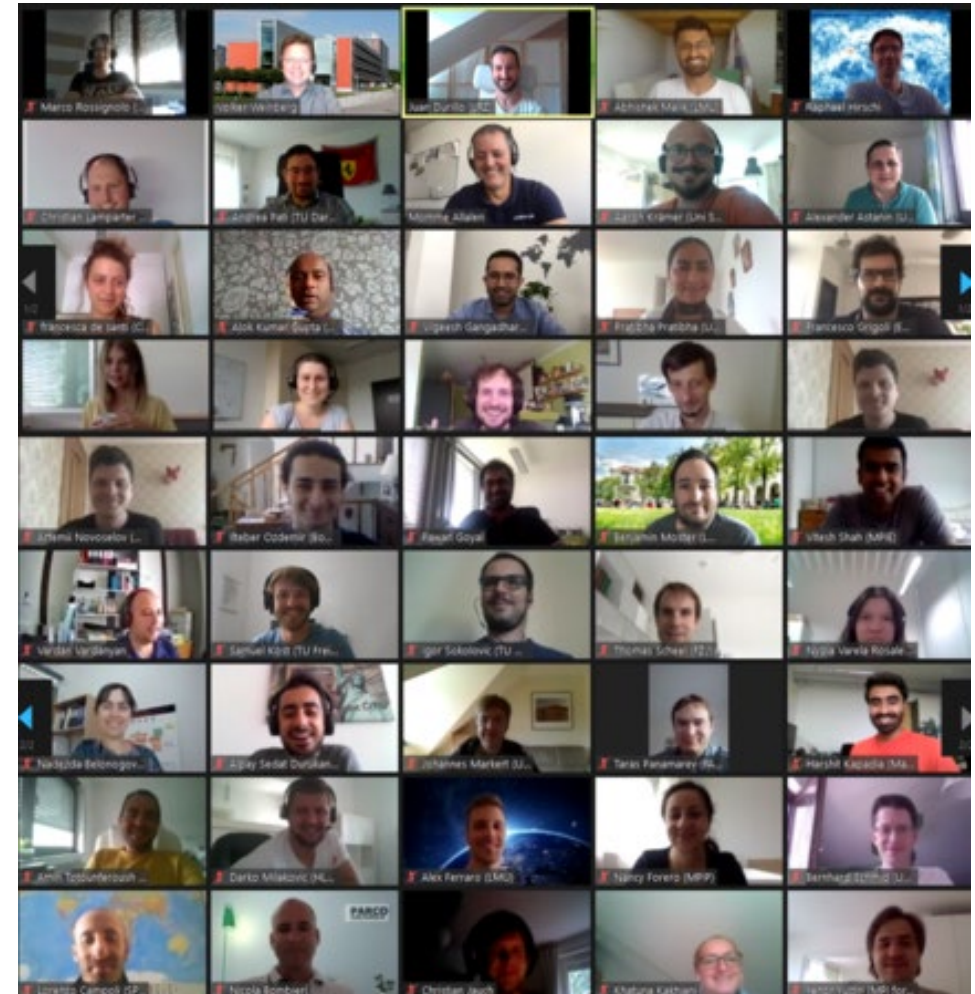
Course Categories 2022



Online Training at LRZ

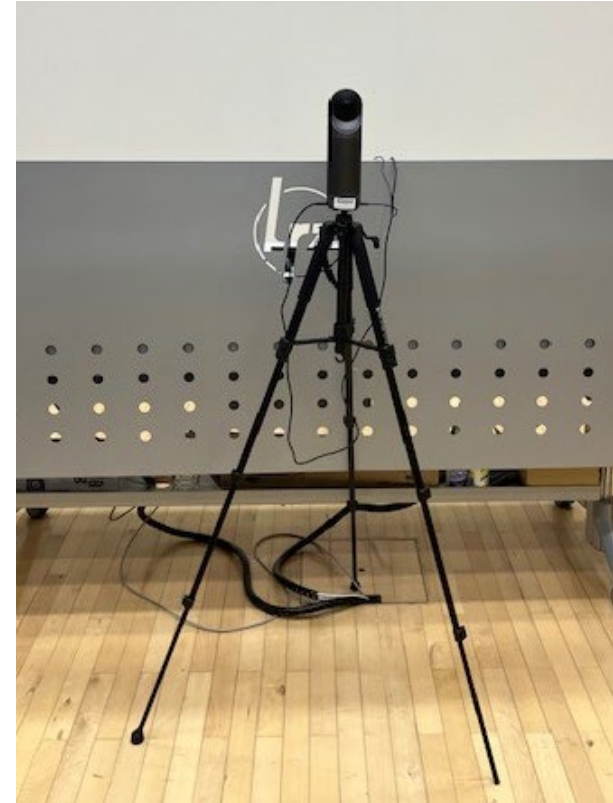


- Since the pandemic hit Germany in March 2020, LRZ virtually offered **93 online courses**.
- Many participants enjoyed participating in training events **without having to travel**, some of the additional trainer costs was recouped by **not paying for trainers' and teachers' accommodation**.
- Online training allowed LRZ to expand its training footprint to HPC professionals in around **40 different countries**, exposing both participants and trainers to a wider range of applications and problems.
- Based on the positive feedback and success of online courses, LRZ envisions **virtual training courses remaining a part of the LRZ training portfolio**.



Hybrid Training at LRZ

- First **on-site courses** at LRZ again since September 2022.
- First **hybrid courses** at LRZ since October 2022.
- **Technical equipment:**
 - 360 degree camera "Kandao Meeting Pro" with integrated microphone arrays, speakers and sophisticated AI for professional hybrid events.
 - Upgrade of course rooms with hybrid video technology planned by Autumn 2024.



Upcoming Courses and Workshops



OneAPI Hybrid Workshop



This course will be organised as a hybrid event with the possibility to attend at LRZ in Garching near Munich or online. On-site attendance will allow for participation in the exercises in the afternoon and for direct interaction with trainers during hands-on and demos. If you prefer to attend online you cannot participate in the exercises. The event will only be streamed in the morning.

There will be on-site catering service with lunch for free. We also plan to visit a restaurant/ beergarden on the first evening. You have the opportunity to attend a guided tour of the LRZ Computing Cube on the second afternoon. When registering, you can choose between 2 booking options:

- **Participants ONLINE:** If you want to attend remotely. You cannot participate in the exercises.
- **Participants ON-SITE:** If you want to attend at LRZ in Garching near Munich.

On-site participants are expected to bring their own laptops.

Contents

Introduction to the Intel oneAPI Development Environment.

Learn about the modern oneAPI application development concept.

It allows to program enterprise and HPC applications once with just a single source code for mixed architectures (CPU, GPU and others) from multiple hardware vendors.

We welcome you to join us in learning about the oneAPI initiative and how to get on a standards-based path for mixed architectures programming. This 3-day jointly prepared LRZ / Intel hybrid (combined online and onsite) workshop will teach the participants about the latest and expanded features of the Intel oneAPI toolkits.

The presenters will show you how to write applications on heterogenous hardware platforms.

[Register now](#)

Course	OneAPI Hybrid Workshop
Number	hoap1s23
Available places	89
Date	05.06.2023 – 07.06.2023
Price	€ 0.00
Location	HYBRID: ONLINE/LRZ Boltzmannstr. 1 85748 Garching near Munich
Room	Hörsaal
Registration deadline	22.05.2023 23:55
E-mail	education@lrz.de

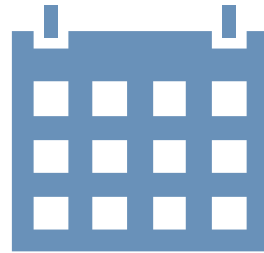


Upcoming Courses and Workshops



OneAPI Hybrid Workshop	05.06.2023 – 07.06.2023	HYBRID: ONLINE/LRZ	0.00 €	92	Register now
Introduction to C++	20.06.2023 – 22.06.2023	ONLINE	30.00 € – 600.00 €	54	Register now
Deep Learning and GPU programming using OpenACC @ HLRS (register via HLRS)	11.07.2023 – 13.07.2023	Universität Stuttgart - Hochleistungsrechenzentrum Stuttgart	0.00 €	32	
Introduction to LRZ HPC Systems with Focus on CFD Workflows	19.07.2023 – 19.07.2023	ONLINE	0.00 €	59	Register now
Iterative Solvers for Linear Systems	05.09.2023 – 07.09.2023	ONLINE	30.00 € – 600.00 €	59	Register now
OpenMP Programming Workshop	27.09.2023 – 29.09.2023	ONLINE	30.00 € – 600.00 €	64	Register now
Introduction to LRZ HPC Systems with Focus on CFD Workflows	18.10.2023 – 18.10.2023	ONLINE	0.00 €	65	Register now
Modern C++ Software Design	25.10.2023 – 27.10.2023	ONLINE	30.00 € – 600.00 €	59	Register now
Node-Level Performance Engineering	04.12.2023 – 06.12.2023	ONLINE	30.00 € – 600.00 €	64	Register now
Introduction to LRZ HPC Systems with Focus on CFD Workflows	13.12.2023 – 13.12.2023	ONLINE	0.00 €	64	Register now

Upcoming Courses and Workshops



- **Information on further courses and workshops:**

- by LRZ: <https://www.lrz.de/education>
- by the Gauss Centre of Supercomputing (GCS): <https://www.gauss-centre.eu/trainingsworkshops>
- by German Centres (collected by the Gauß-Allianz): <https://hpc-calendar.gauss-allianz.de/>
- by the EuroHPC National Competence Centres: <https://www.eurocc-access.eu/services/training/>
- by European Centres and Projects: <https://hpc-portal.eu/upcoming-events-courses>



- **LRZ Newsletter**
 - Subscribe via <https://www.lrz.de/wir/newsletter/> to get the LRZ Newsletter
- **Contact:**
 - education@lrz.de

Thank you for your attention!

We are looking forward to meeting you in a future training event at LRZ!