Scientific Computing, AI & Data Management

A Glimpse into DESY Activities

Philipp Neumann, on behalf of DESY/MT-DMA and IDAF

Hamburg, 03 April 2025

HELMHOLTZ

DESY.

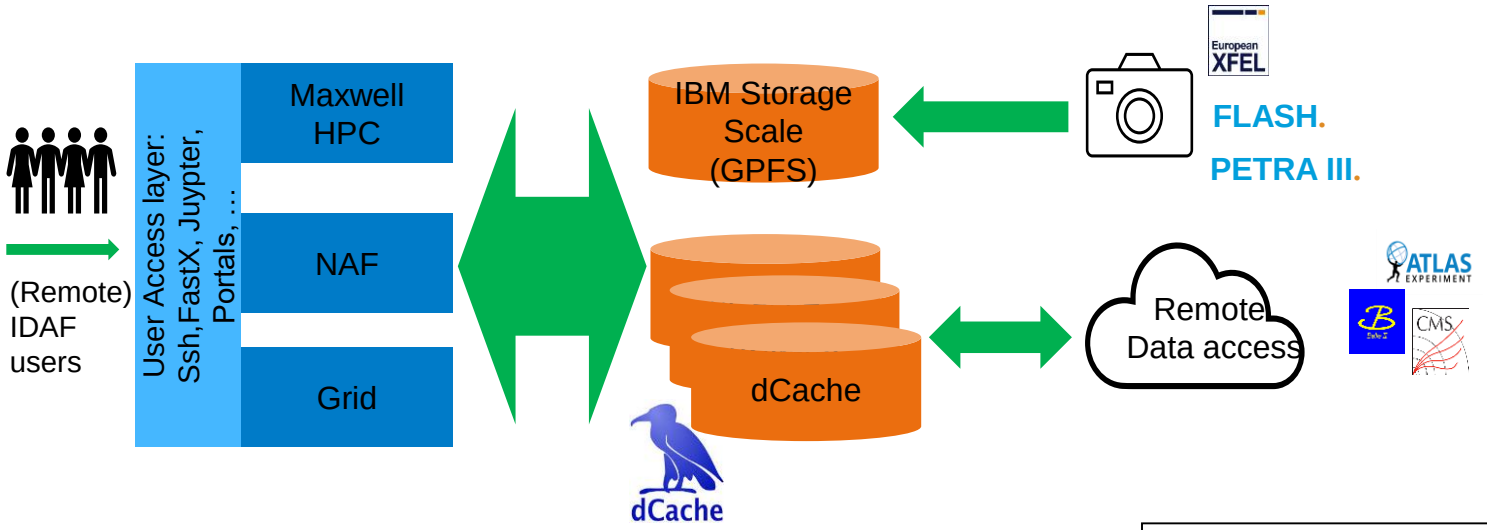
Scientific Computing, AI & Data Management @DESY

DASHH MT IDAF MT DMA

PhD Careers | Infrastructure | Research and Development

Interdisciplinary Data and Analysis Facility

Data-Centric Computing



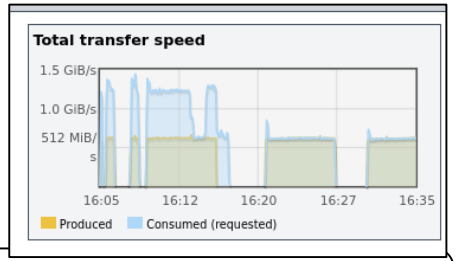
	Interdisciplinary Data and Analysis Facility
Maxwell HPC	**45.000 cores & 400 GPU**
NAF	10.000 cores
Grid	20.000 cores
Node IO	10 Gbit/s (Ethernet) – 200 Gbit/s (InfiniBand)
WAN bandwidth	2x 50 Gbit/s
Internal traffic	**Up to 1 Tbit/s**
dCache storage	**~160 PB on disk**, 150 PB on tape
GPFS storage	**~80 PB**

Photos by G. Sánchez, V. Khodzinskyi and I. Wegmann, Unsplash

Data, My Precious…

Support, Research and Development Along the Data Lifecycle – a Community Effort!

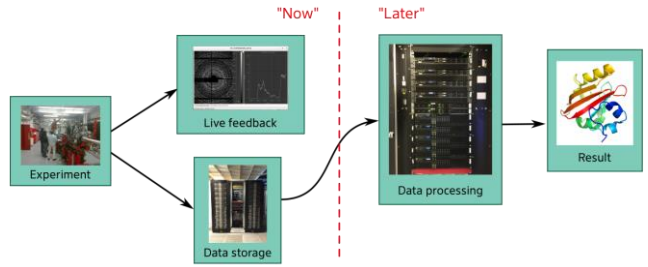
Sustainability
for Data Centers



F.A.I.R and Open Data

OSCARS Open Science Clusters' Action for Research & Society
panosc photon and neutron open science cloud
DAPHNE 4NFDI
eosc
PUNCH 4NFDI

From Beamline to Storage:
Real-time-Gigabit streaming software ASAP::O



DESY Research Data:
From Data Generation to Long-term Preservation

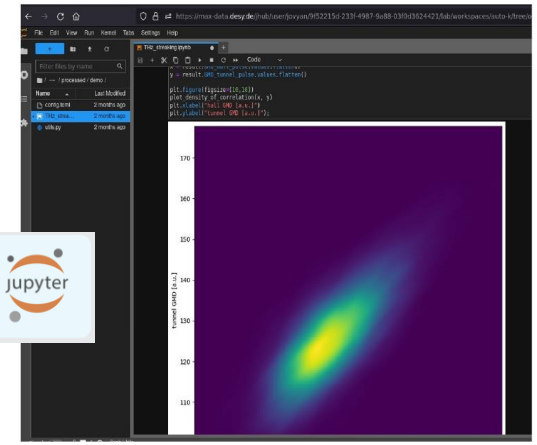
Cross-Community Exabyte-ready Storage: dCache

WLCG Worldwide LHC Computing Grid
HIFIS

Boosting Researcher Productivity:
Interactive HPC data analysis + Open Data

Authentification & Authorization Infrastructure — HELMHOLTZ ID
MetaData Catalogue — SciCat
Research Data — Storage (GPFS, dCache)

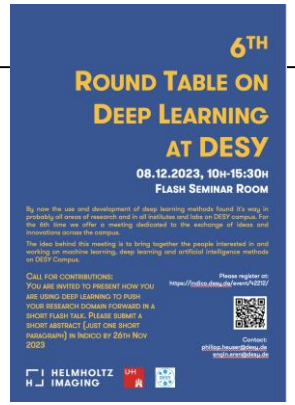
jupyter

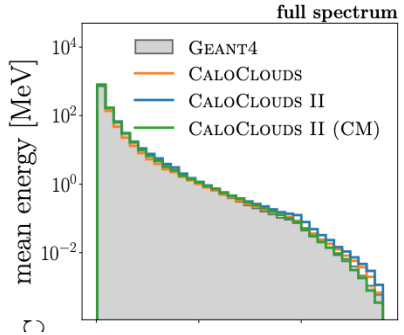


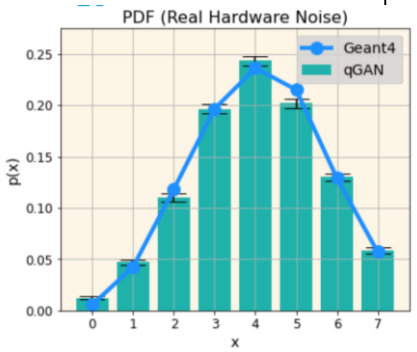
Methods, Algorithms, Software: Outtakes

Machine Learning & AI

- Helmholtz-wide AI activities HELMHOLTZAI
- “LLMs for X”
- Data-driven methods for image reconstruction
- Consulting for Imaging HELMHOLTZ IMAGING
- **Generative ML methods in particle physics (>50x speedup)**
- **Round tables on Deep Learning**
- **…**







…and many more:
software for future colliders, data compression, plasma simulation technology, …

New Computing Paradigms

- **Quantum Computing strategy**

DESY. QUANTUM Center for Quantum Technology and Applications

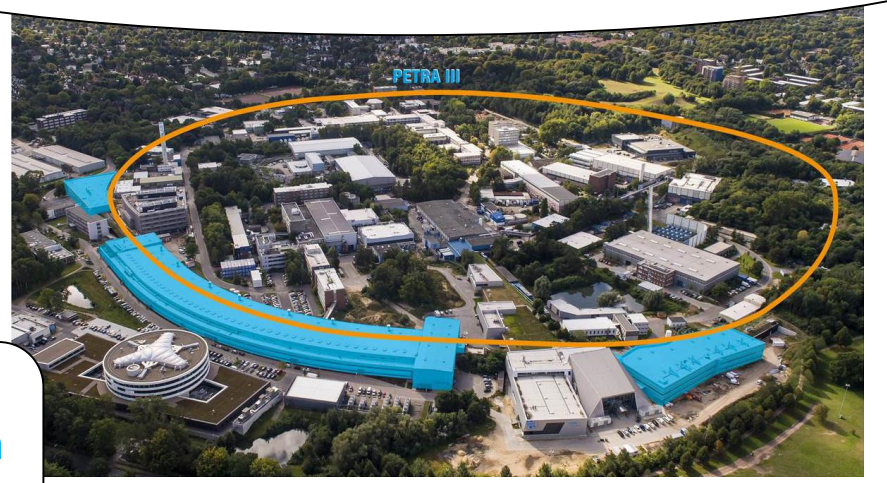
Quantum Computing in Particle Physics in Theory and Experiment.
Novel methods and tools for the 100x100 Challenge→ get ready today !
QC4HEP whitepaper, arXiv:2307.03236
Published in PRX Quantum: https://journals.aps.org/prxquantum/abstract/10.1103/PRXQuantum.5.037001

- **Innovative methods, e.g. Quantum Machine Learning**

Digital Technology for Accelerators

The Link to RL4AA ☺

DESY Research Infrastructures

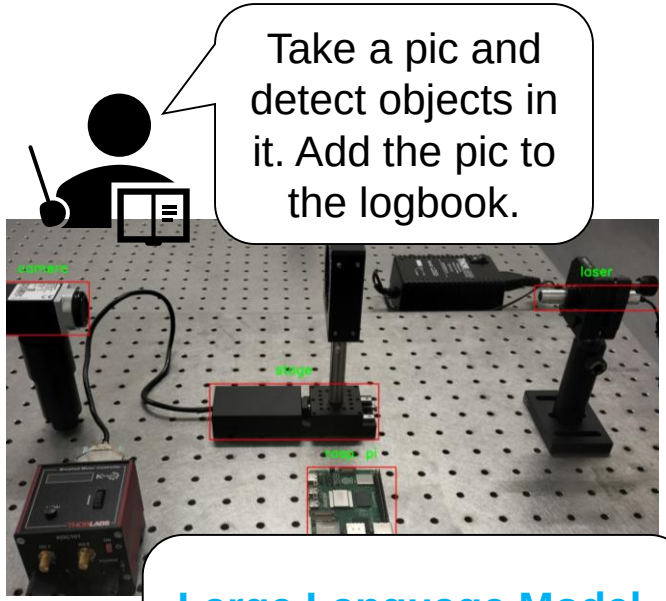


Optimization and Anomaly Detection: Simulation + Reinforcement Learning for beam dynamics

Machine Learning for experiment automation

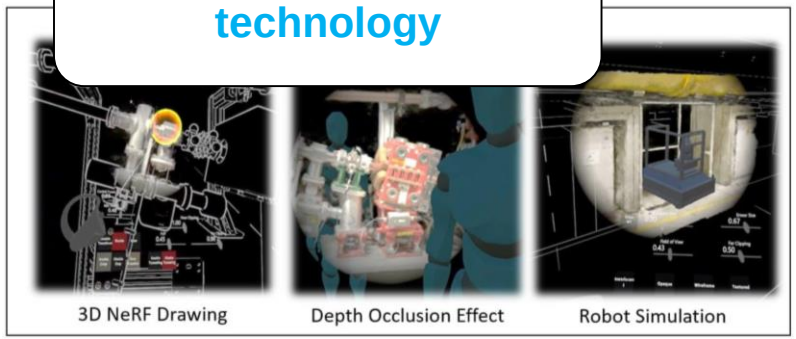
ROCK-IT

Real-time data processing for crystallography



Large Language Model-based Operations Assistance

Mixed reality technology



Thank you

Contact

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