



Efficient simulations on GPU hardware

24–27 Oct 2022
ETH Zürich
Europe/Zurich timezone



Overview

Registration

Timetable

Contribution List

Speaker List

My Conference

In view of upcoming exascale supercomputing facilities, programming efficiently high-performance GPU hardware is of increasing importance for each scientific field that relies on compute-heavy simulations, lattice quantum chromodynamics (lattice QCD) being a prominent example. What kind of changes in the popular codebases are required in order to leverage the computational power and throughput of the GPU thoroughly? This workshop aims to discuss recent progress in lattice QCD and HPC community in developing simulation software for various GPU architectures. At the same time, we plan to facilitate exchange between the lattice QCD community and HPC experts from adjacent disciplines and introduce students to challenges in these rapidly developing fields. The workshop includes a dedicated session on machine learning applications as well as talks aimed at a broader HPC audience.

Youtube live stream: <https://www.youtube.com/watch?v=Kfy4FSsFtSw>

Thanks for a big help in organization:

- ❖ Prof. Dr. Niko Beerenwinkel (D-BSSE)
- ❖ Prof. Ana Klimovic (D-INFK)
- ❖ Prof. Luca Benini (D-ITET)
- ❖ Prof. Torsten Hoefler (D-INFK)



ETH zürich



Timetable

[Mon 24/10](#)
[Tue 25/10](#)
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[Thu 27/10](#)
[All days](#)

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Session legend

Contributed talks
Discussion
Q&A

09:00		
10:00	Talk 1: Machine Learning applications to lattice QCD HIT E 51, ETH Zürich Coffee Break	Andrea Shindler 09:30 - 10:15 10:15 - 10:45
11:00	Talk 2: Applications of normalizing flows as generative models for lattice field theory HIT E 51, ETH Zürich Q&A	Javad Komjani 10:45 - 11:30 Miła Lauk, Piotr Korcyl 11:30 - 12:00
12:00	Lunch	12:00 - 13:00
13:00	Discussion HIT E 51, ETH Zürich	Anian Altherz, Tim Hams 13:00 - 13:45
14:00	Talk 3: Machine learning hadron spectral functions in lattice qcd HIT E 51, ETH Zürich Coffee Break	Heng-Tong Ding 13:45 - 14:30 14:30 - 15:00
15:00	Talk 4: Hierarchical autoregressive approach to two-dimensional statistical systems HIT E 51, ETH Zürich	Piotr Korcyl 15:00 - 15:45
16:00	Talk 5: Efficient simulations of ML and LQCD HIT E 51, ETH Zürich	Denis Boyda 15:45 - 16:30

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Contributed talks
Discussion
Q&A
Wrap-up

09:00		
10:00	Talk 6: Real-time techniques and topological data analysis for non-perturbative phenomena in QFT HIT E 41.1, ETH Zürich Coffee Break	Daniel Spitz 09:30 - 10:15 10:15 - 10:45
11:00	Talk 7: tmLQCD on GPUs: minimum effort approach to performance-portability HIT E 41.1, ETH Zürich Q&A	Bartosz Kostrzewa 10:45 - 11:30 Gabriele Pierini, Javad Komjani 11:30 - 12:00
12:00	Lunch	12:00 - 13:00
13:00	Discussion HIT E 41.1, ETH Zürich	Dr Bartosz Kostrzewa, Juan Antonio Fernandez de la Garza 13:00 - 13:45
14:00	Talk 8: ATLAS fast simulation 3 (Atfast3) is a performance-focused variant of the full ATLAS simulation HIT E 41.1, ETH Zürich Coffee Break	Henry Ann Day-Hal 13:45 - 14:30 14:30 - 15:00
15:00	Talk 9: One Code and Four APIs : performance portable software for lattice field theory HIT E 41.1, ETH Zürich	Peter Boyle 15:00 - 15:45
16:00	Talk 10: Experience using MILC and QUDA on various GPU systems HIT E 41.1, ETH Zürich	Steven Gottlieb 15:45 - 16:30

Contributed talks
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Wrap-up

10:00	Talk 11: GPU port of openQCD using CUDA HIT E 41.1, ETH Zürich	Felix Ziegler 09:30 - 10:15
11:00	Coffee Break HIT G-floor, ETH Zürich Talk 12: HILA lattice simulation framework - write once, run everywhere HIT E 41.1, ETH Zürich Q&A	10:15 - 10:45 Kari Rummukainen 10:45 - 11:30 Andrea Shindler, Thea Budde 11:30 - 12:00
12:00	Lunch	12:00 - 13:00
13:00	Discussion HIT E 41.1, ETH Zürich	Felix Ziegler, Paola Tavella 13:00 - 13:30
14:00	Flash-Talk: Perspectives and challenges in studying the properties of strongly interacting matter in lattice qcd calculati HIT E 41.1, ETH Zürich Coffee Break HIT G-floor, ETH Zürich	Jishnu Goswami 13:45 - 14:30 14:30 - 15:00
15:00	Talk 13: Optimized Deep Learning Inference on High Level Trigger at the LHC: Computing time and Resource assessment HIT E 41.1, ETH Zürich Coffee Break HIT G-floor, ETH Zürich	Syed Anwar Ul Hasan 13:45 - 14:30 14:30 - 15:00
16:00	Talk 14: QUDA: Getting more QCD out of your GPU HIT E 41.1, ETH Zürich Talk 15: Simulations of Lattice Quantum Chromodynamics on GPUs HIT E 41.1, ETH Zürich Wrap-up	Mathias Wagner 15:00 - 15:45 Balint Joo 15:45 - 16:30 Marina Krstic Marinkovic 16:30 - 17:00

High Performance Computational Physics @ **ETH** zürich



S. Matosevic



B. Huber

❖ Muon g-2, lattice QCD+QED, ML



A. Altherr



P. Tavella



J. Komijani



❖ QCD String Breaking



M. Catillo

+ U. Lisbon/
U. Frankfurt
collaborators



M. Lauk

❖ New
fundamental
interactions



M. Shi

❖ Lamb shift
in muonic
hydrogen



A. Strump

❖ Quantizing
NL ELD



G. Pierini

❖ ML the
phase
transitions



Z. Kokalj

❖ At UAM:



A. DeGiorgi

❖ At TCD:



L. Bushnaq

❖ HPC, quantum computing



R. Gruber



J. Fernandez-
de la Garza

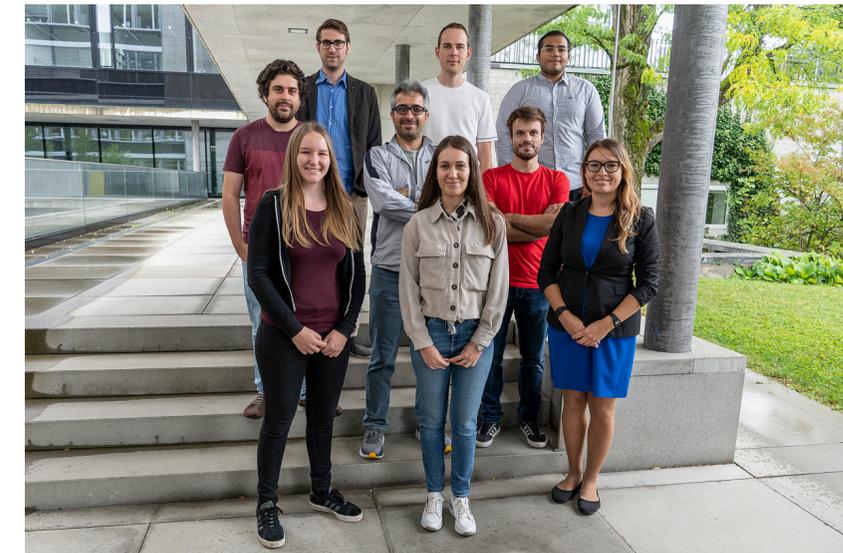


J. Pinto Barros

+ PASC team, (CSCS, Nvidia) ...



L. Segner



❖ HPCP lab, Sep 2022

❖ QED2 quantum simulations



T. Budde



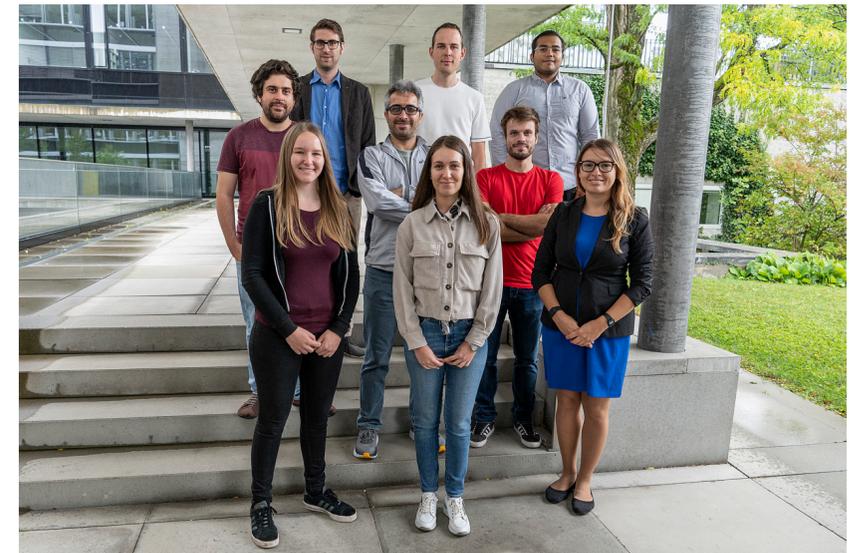
M. D'Anna

High Performance Computational Physics @ **ETH** zürich



M. Marinkovic

❖ HPC, quantum computing



❖ HPCP lab, Sep 2022

❖ Muon $g-2$, lattice QCD+QED, ML



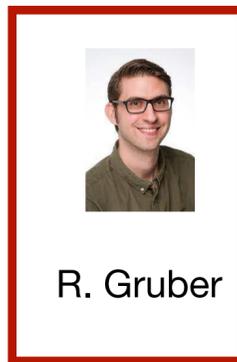
A. Altherr



P. Tavella



J. Komijani



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+ PASC team, (CSCS, Nvidia) ...



L. Segner



T. Budde



M. D'Anna

❖ QED2 quantum simulations

❖ QCD String Breaking



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Z. Kokalj

❖ At UAM:



A. DeGiorgi

❖ At TCD:



L. Bushnaq

+ Crivelli Group, ETH + PSI/JGU Mainz

Thank you!

