

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



Enter your search term

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High Performance Computational Physics @ ETH zürich

Started at ETHZ in February 2021

Muon g-2, lattice QCD+QED, ML



- * Lattice gauge theories(LGT), <u>high performance computing (HPC)</u>, <u>machine</u> learning(ML), quantum computing
 - HPC, quantum computing



R. Gruber



J.Fernandezde la Garza



QCD String Breaking



M. Catillo

+ U. Lisbon/ **U.Frankfurt** collaborators



M. Lauk

* New fundamental interactions



M. Shi

 Lamb shift in muonic hydrogen



A. Strump



+ Crivelli Group, ETH + PSI/JGU Mainz





- A. Altherr
- P. Tavella





J. Komijani









L.Segner



- HPCP lab, Sep 2022
- QED2 quantum simulations **



T. Budde



M. D'Anna

 Quantizing NL ELD



G. Pierini

 ML the phase transitions



Z. Kokalj

* At UAM:



A. DeGiorgi





L. Bushnaq









Physics (Theory&Experiment)







Lattice QCD

0

 $\bullet \longrightarrow \bullet \longrightarrow \bullet \longrightarrow \bullet$ mirror lattice

Machines



Timetable

< Mon 24	/10 Tue 25/10 Wed 26/10 Thu 27/10 All days	>	< Mon 24	/10 Tue 25/10 Wed 26/10 Thu
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		Session legend		
			Cor	tributed talks 😑 Discussion 💿 Q&A
Cor	ntributed talks Oiscussion Q&A	×		
			09:00	
09:00				
				Talk 6: Real-time techniques and topologi
	Talk 1: Machine Learning applications to lattice QCD	Andrea Shindler		
			10:00	HIT E 41.1, ETH Zürich
10:00	HIT E 51, ETH Zürich	09:30 - 10:15		Coffee Break
	Coffee Break			
		10:15 - 10:45		Talk 7: tmLQCD on GPUs: minimum effort
	Talk 2: Applications of normalizing flows as generative models for lattice field theory	Javad Komijani	11:00	
11:00				HIT E 41.1, ETH Zürich
	HIT E 51, ETH Zürich	10:45 - 11:30		Q&A
	Q&A	Mika Lauk, Piotr Korcyl		HIT E 41.1, ETH Zürich
	HIT E 51, ETH Zürich	11:30 - 12:00	12:00	Lunch
12:00	Lunch			
				HIT, ETH Zürich
		12:00 - 13:00	13:00	Discussion
13:00	Discussion	Anian Altherr, Tim Harris		
				HIT E 41.1, ETH Zürich
	HIT E 51, ETH Zürich	13:00 - 13:45		Talk 8: ATLAS fast simulation 3 (Atlfast3) Henry Ann Day-Hall
	Talk 3: Machine learning hadron spectral functions in lattice qcd	Heng-Tong Ding	14:00	
14:00		-		HIT E 41.1, ETH Zürich
	HIT E 51, ETH Zürich	13:45 - 14:30		Coffee Break
	Coffee Break		15:00	HIT E 41.1, ETH Zürich
		14:30 - 15:00	20.00	Talk 9: One Code and Four APIs : perform
15:00	Talk 4: Hierarchical autoregressive approach to two-dimensional statistical systems	Piatr Korcyi		
				HIT E 41.1, ETH Zürich
	HIT E 51, ETH Zürich	15-00 - 15-45	16:00	Tark 10: Experience using MILC and QUD
	Talk 5: Efficient simulations of ML and LOCD	Denis Boyda		LITE ALL PROPERTY.
16:00				Wrapup
	HIT E 51 ETH Zurich	15:45 - 16:20		HIT F 41.1 FTH Zurich
	nn E sa, E m zwith	10.40 - 10.30	17:00	111 E 42.2, ETT 20101



10 Thu 27/10 All days	< Mon 24	/10 Tue 25/10 Wed 26/10 Thu 27/10 All days	>
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Q&A Wrap-up X	Co	tributed talks 😑 Discussion 💿 Q&A 🔵 Wrap-up	×
	09:00		
d topological data analysis for non-perturbative phenomena in QFT Daniel Spitz		Talk 11: GPU port of openQCD using CUDA	Felix Ziegler
09:30 - 10:15	10:00	HIT E 41.1, ETH Zürich	09:30 - 10:15
		Coffee Break	
10:15 - 10:45			10:15 - 10:45
mum effort approach to performance-portability Bartosz Kostrzewa		Talk 12: HILA lattice simulation framework - write once, run everywhere	Kari Rummukainen
	11:00		
10:45 - 11:30		HIT E 41.1, ETH Zürich	10:45 - 11:30
Gabrele Pienni, Javad Komjani		Q&A	Andrea Shindler, Thea Budde
11:30 - 12:00		HIT E 41.1, ETH Zürich	11:30 - 12:00
	12:00	Lunch	
12:00 - 13:00			
Dr Bartosz Kostrzewa, Juan Antonio Fernandez de la Garza			12:00 - 13:00
	13:00	Discussion	Felix Ziegler, Paola Tavella
13:00 - 13:45			
(Atlfast3) is a performance-focused variant of the full ATLAS simulation			
	14:00		
13:45 - 14:30	21112	LITE ALL ETA TANA	
		Coffee Break	13:00 - 14:30
14:30 - 15:00		HIT G-floor, ETH Zürich	14:30 - 15:00
s : performance portable software for lattice field theory Peter Boyle	15:00	Talk 13: QUDA: Getting more QCD out of your GPU	Mathias Wagney
15:00 - 15:45		HIT E 41.1, ETH Zürich	15:00 - 15:45
and QUDA on various GPU systems Steven Gottlieb		Talk 14: Simulations of Lattice Quantum Chromodynamics on GPUs	Balint Joo
	16:00		
15:45 - 16:30		HIT E 41.1, ETH Zürich	15:45 - 16:30
16:20 17:00		Wrap-up	
10.30 * 17.00		HIT E 41.1, ETH Zürich	16:30 - 17:00

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)





