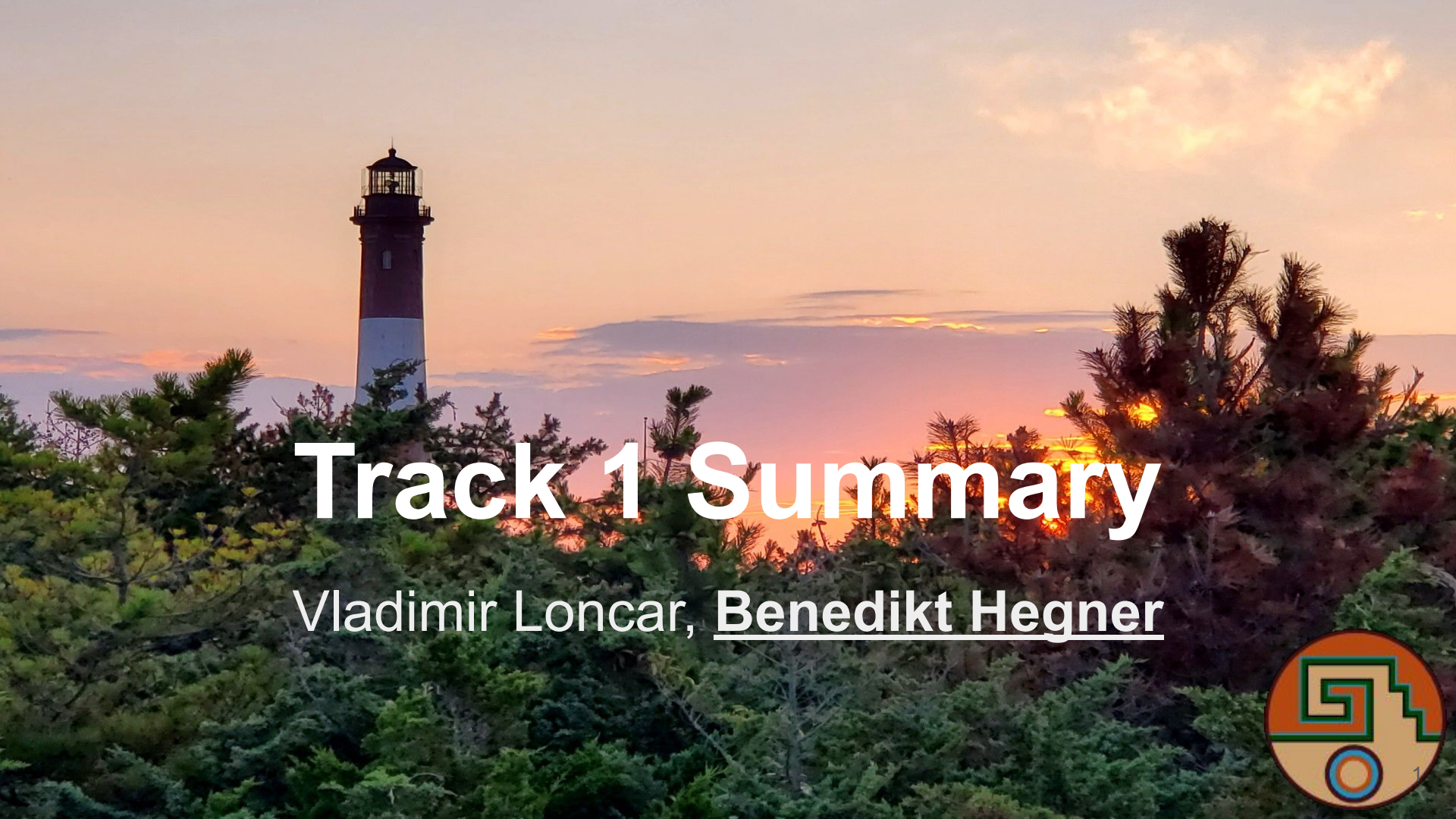


Track 1 Summary

Vladimir Loncar, **Benedikt Hegner**

Track 1 overview

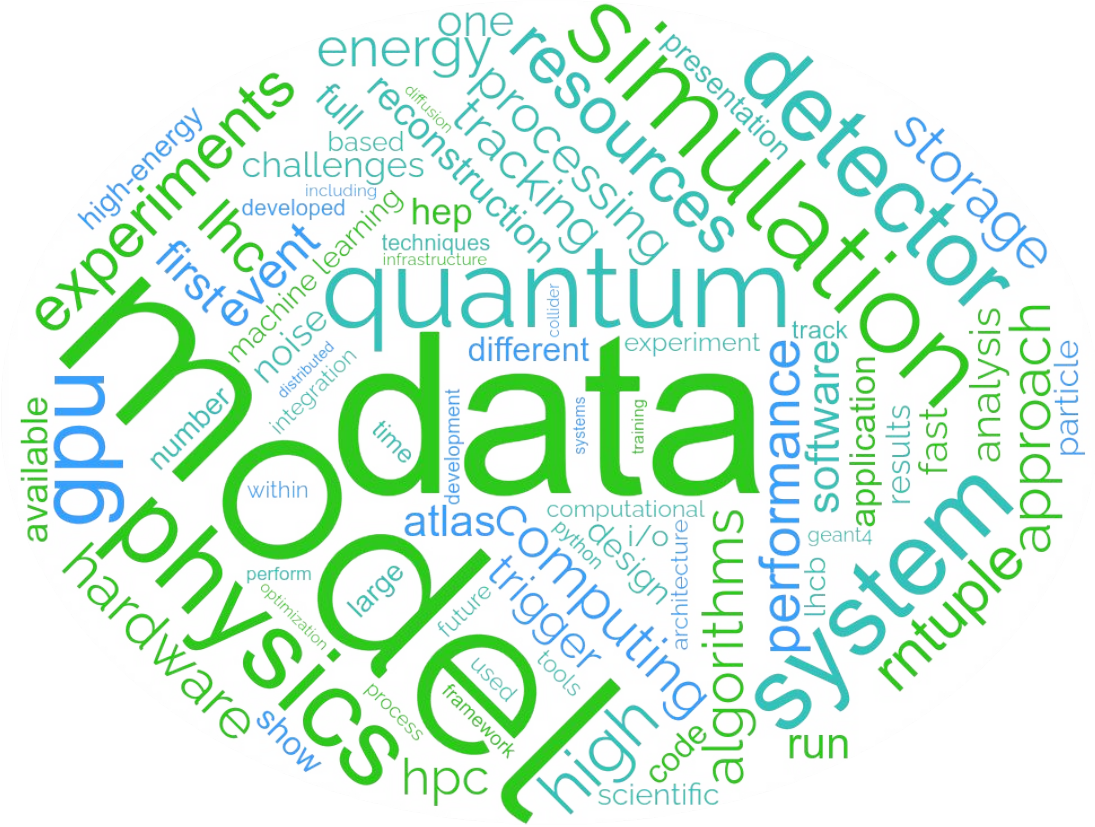
90 contributions received, ~~32 orals~~ **33 orals** selected

- Remaining contributions accepted as posters

9 parallel sessions

- 2 sessions dedicated to quantum computing

Broad range of topics covered

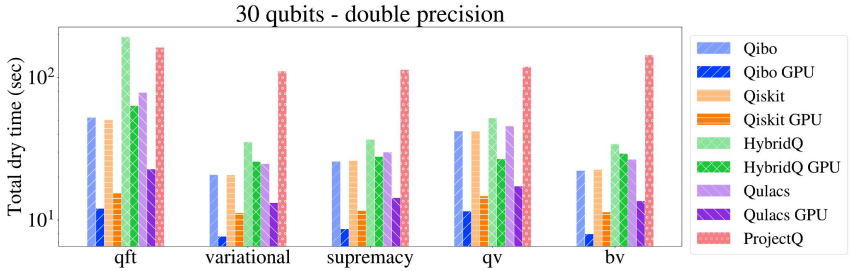


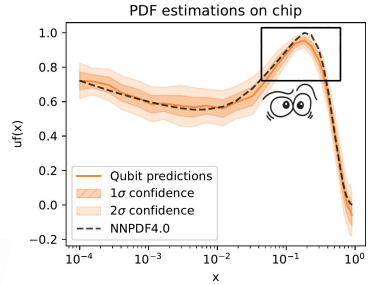
Quantum computing

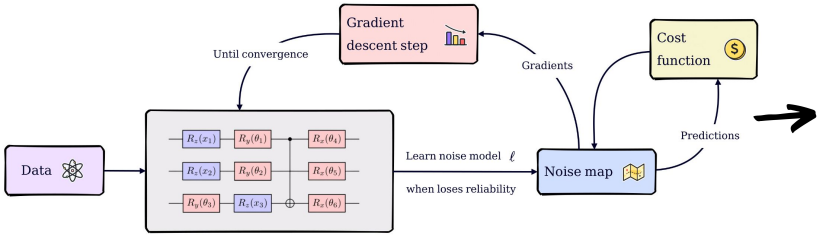
Qibo ecosystem continues to expand

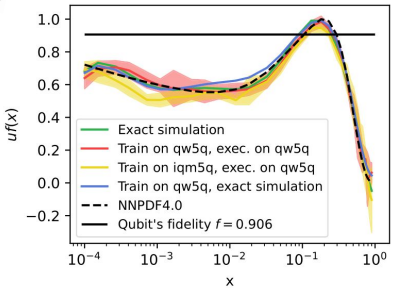
Showcased advances in Quantum Error Mitigation (QEM) during a Quantum Machine Learning (QML) training and quantum simulation with JIT compilation

Talks from Andrea, Matteo and Edoardo







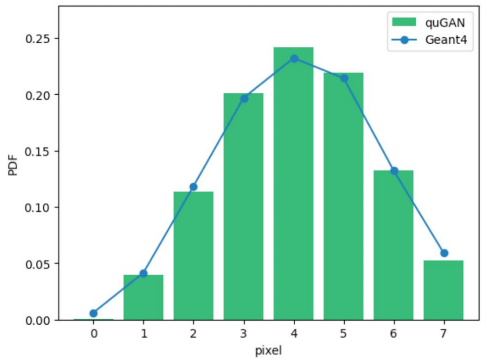


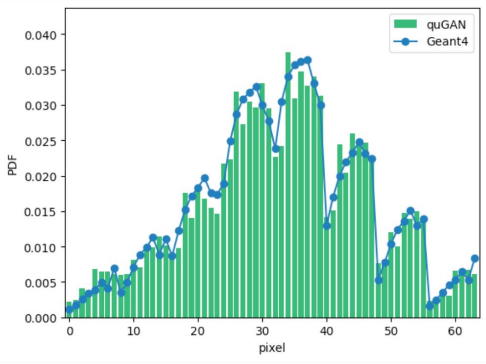
Quantum computing

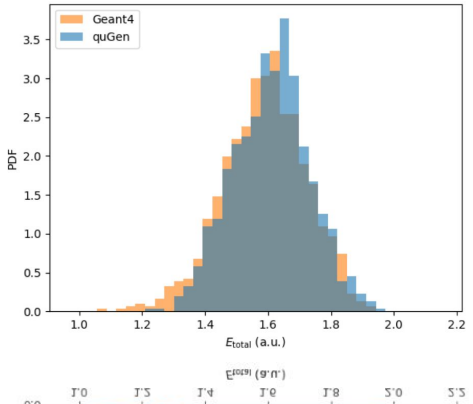
Fast shower simulation with a Quantum GAN

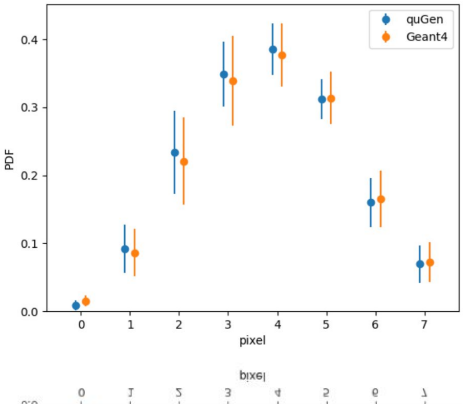
- Quantum generator + classical discriminator

See talk from Xiaozhong





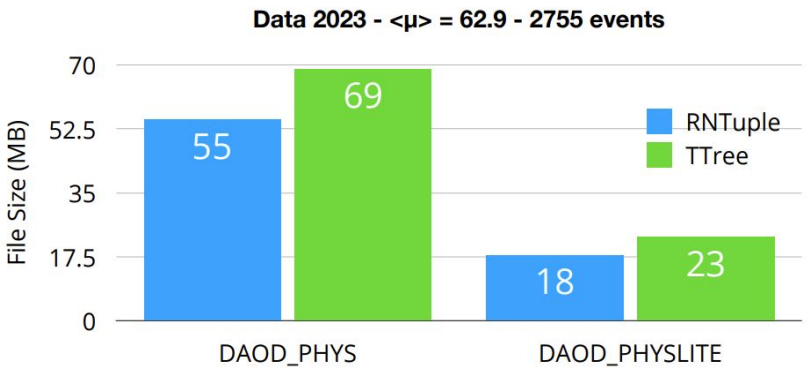




RNTuple

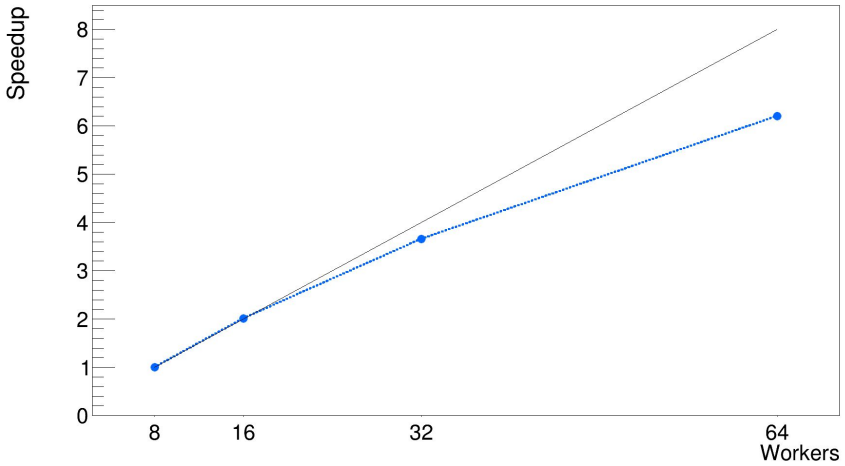
An entire session dedicated to advancement of RNtuple implementation and usage

Amazing progress in the last year



see Alaettin's talk

Analysis Grand Challenge from TTree to RNTuple
Speedup vs number of workers for RNTuple input data



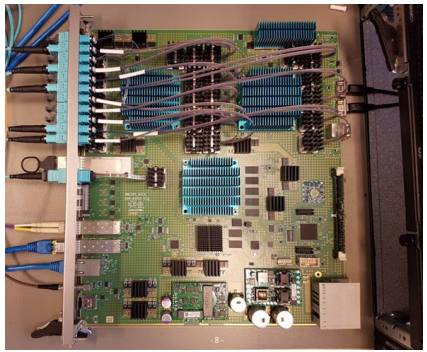
more in Marta's talk

Updates in online data processing

Lots of progress in CLAS12, ATLAS and LHCb presented

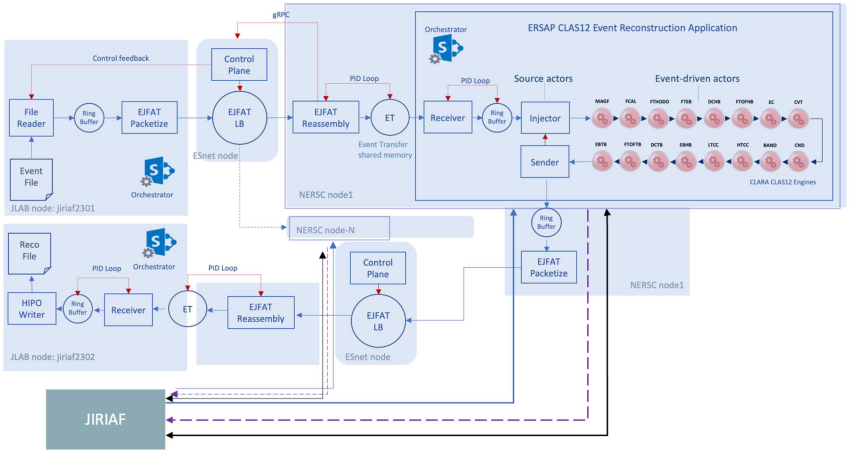
Successful upgrade and future looking efforts

ATLAS preparing for HL-LHC:
System-on-Chip utilization in ATCA format - already in use now



See slides by Aimillanos

Remote data streaming and processing in CLAS12



See slides by Vardan

Machine Learning

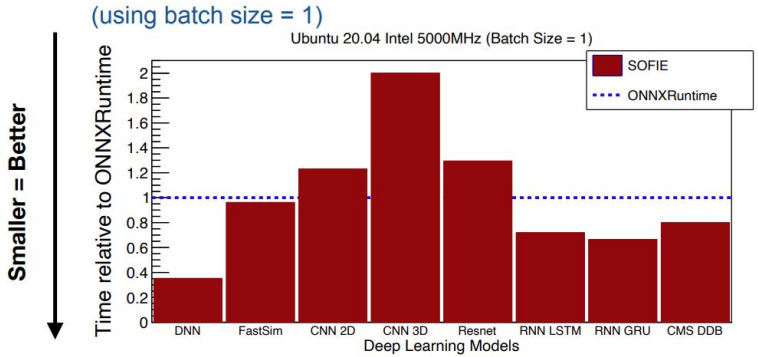
So widely used everywhere that almost every session contained machine-learning

- We have seen heavy, but thorough use of tools
- LLM discussions for now limited to breaks

Lots of good discussions after the presentations

Still many challenges ahead…

see Vincenzo's talk



Machine Learning

[see Vincenzo's talk]

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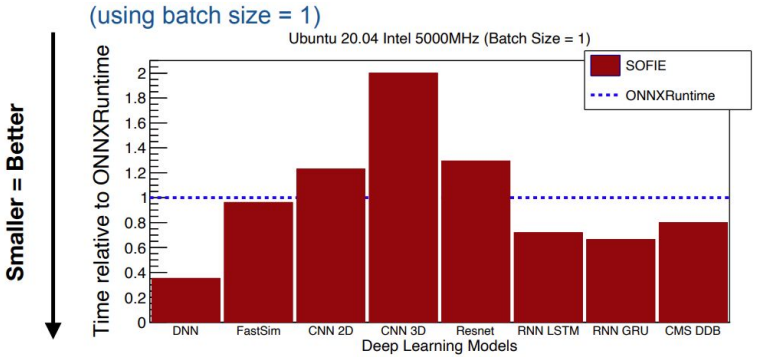
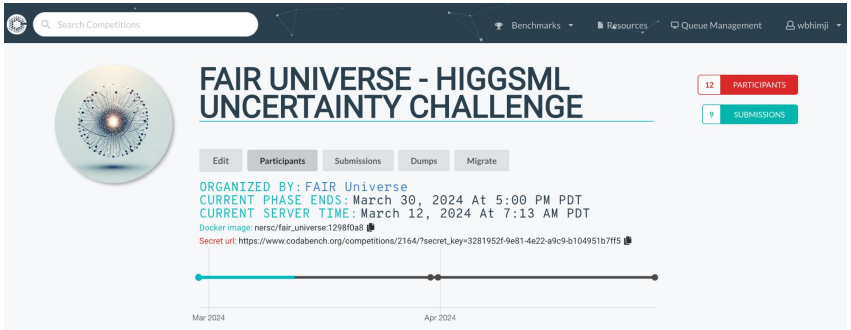
Still many challenges ahead…

… for example the HiggsML uncertainty challenge





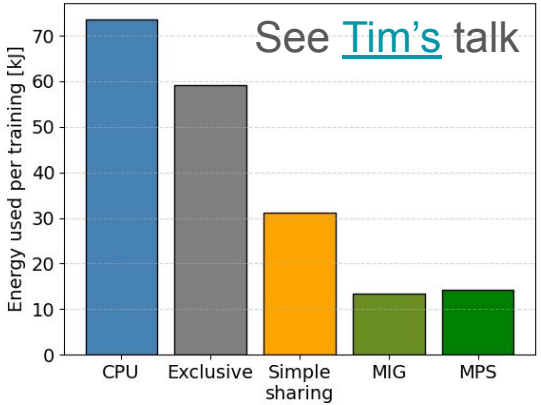
See [presentation] by Wahid

Optimized usage of (heterogenous) resources

CPU- and GPU-resources are physically separate

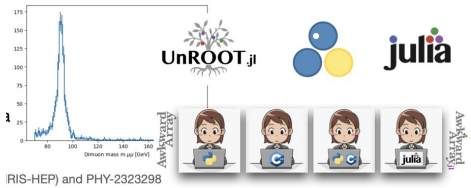
How to enable applications and facilities
to use resources most efficiently…

… and easily



Topics were:

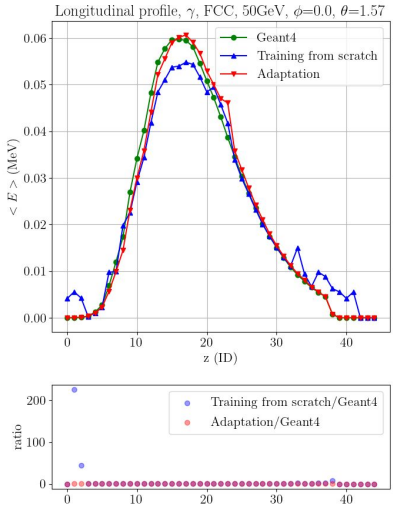
ACTS as a service, slicing of GPU nodes, scheduling, farm management, code optimization, library and language choices



See Iana's contribution

Simulation

20 epochs of adaptation (red) is significantly better than 250 epochs of training from scratch (blue)

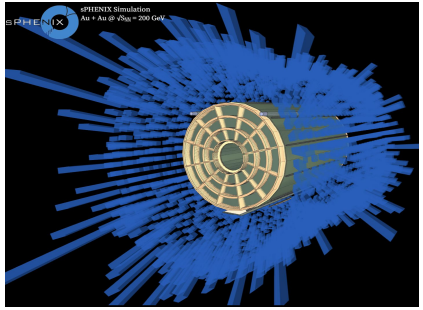


see Piyush's talk

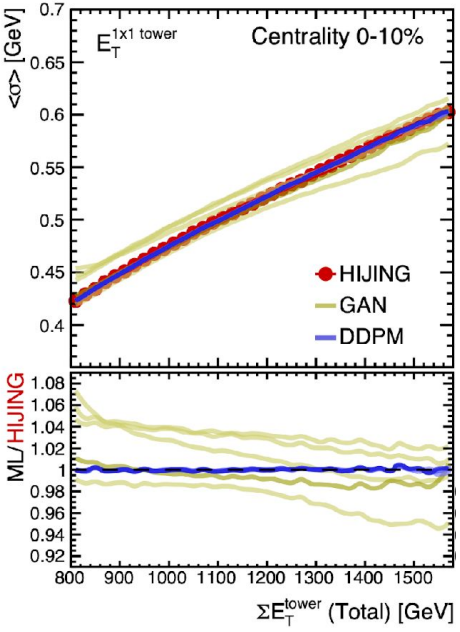
We learnt how to speed up simulation with ML, e.g.

- Pre-trained models and diffusion, or
- Normalizing flows and flow matching
- Diffusion models

And have seen progress in consolidating and improving infrastructures



see Yeonju's talk



Thanks to our session chairs

Herschel Chawdhry

Gordon Watts

Philippe Canal

Vincenzo Padulano

Florine de Geus

And to all the speakers and participants for great presentations and discussions!