Title

Subtitle

Author 1, Author 2, Author 3,
Author 4, **Presenter**, Author 6

Collaboration

Workshop, November 29, 2021

The DeGeSim Project
HELMHOLTZ AI
ARTIFICIAL INTELLIGENCE
COOPERATION UNIT

RWTH AACHEN UNIVERSITY

JÜLICH Forschungszentrum
JÜLICH SUPERCOMPUTING CENTRE

DESY.

Vision

Save CPU time by using a **Neural Network** to simulate the **HGCAL**.

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Use Graph Neural Networks (‘GNNs’) to deal with sparsity and irregular geometry

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- Q2: How do we continue after the simulation?

Simulation and Machine Learning Frameworks

Integration: Simulate in CMSSW, use the integrated ML software stack.

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The integrated ML tool chain in CMSSW is also widely used in CMS!

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4. (De)Serialize files (from) to disc (`torch.save`)
5. Move to GPU

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Thank you!

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Bibliography I

[1] *Mini-batches*. URL: https://pytorch-geometric.readthedocs.io/en/latest/notes/introduction.html#mini-batches.

[2] *Multiprocessing package*. URL: https://pytorch.org/docs/stable/multiprocessing.html.

Backup

Control data flow with processes pools and queues

```
pseq = Sequence(
ProcessStep(read_chunk, 2),
PoolStep(simhits_to_graph,nworkers=20),
RepackStep(batch_size),
ProcessStep(torch_geometric.data.Batch().from_data_list),
Queue(prefetch_batches)
)
...
pseq.queue_iterable(epoch_chunks)
...
for batch in pseq(filelist):
prediction = model(batch)
...
```

- fast
- limits memory usage
- option to save to disk