Contribution ID: **337** Type: **Parallel session talk**

Charged particle tracking with quantum graph neural networks

Friday 19 July 2024 17:53 (17 minutes)

Tracking charged particles in high-energy physics experiments is a computationally intensive task. With the advent of the High Luminosity LHC era, which is expected to significantly increase the number of proton-proton interactions per beam collision, the amount of data to be analysed will increase dramatically.

Traditional algorithms suffer from scaling problems. We are investigating the possibility of using machine learning techniques in combination with quantum computing.

In our research, we represent particle trajectories as a graph data structure and train a hybrid graph neural network with classical and quantum layers. We present recent results on the application of these methods, focusing on the computational aspects of code development in different programming frameworks such as Jax, Pennylane and IBM Qiskit.

We also provide insights into expected performance and explore the role of GPUs as computational accelerators in the simulation of quantum computing resources.

Alternate track

1. Detectors for Future Facilities, R&D, Novel Techniques

I read the instructions above

Yes

Primary authors: CAPPELLI, Laura (INFN Ferrara); ARGENTON, Matteo (Universita e INFN, Ferrara (IT))

Co-authors: BOZZI, Concezio (INFN Ferrara); CALORE, Enrico (INFN Ferrara); SCHIFANO, Sebastiano (Universita e INFN, Ferrara (IT)); Dr AMITRANO, Valentina (Università e INFN, Ferrara (IT))

Presenter: ARGENTON, Matteo (Universita e INFN, Ferrara (IT))

Session Classification: Computing and Data handling

Track Classification: 14. Computing, AI and Data Handling