Contribution ID: **276** Type: **Poster**

Generative Surrogates for Fast Simulation: TPC Case

Friday, 27 May 2022 09:10 (1 minute)

Simulation of High Energy Physics experiments is inevitable for both detector and physics studies. Detailed Monte-Carlo simulation algorithms are often limited in the number of samples that can be produced due to the computational complexity of such methods, and therefore faster approaches are desired. Generative Adversarial Networks (GANs) is a deep learning framework that is well suited for aggregating a number of detailed simulation steps into a surrogate probability density estimator readily available for fast sampling. In this work, we demonstrate the power of the GAN-based fast simulation model on the use case of simulating the response for the Time Projection Chamber in the MPD experiment at the NICA accelerator complex. We show that our model can generate high-fidelity TPC responses throughout the full input parameter space, while accelerating the TPC simulation by at least an order of magnitude. We describe different representation approaches for this problem and discuss tricks and pitfalls of using GANs for fast simulation of physics detectors. We also outline the roadmap for the deployment of our method into the software stack of the experiment.

Collaboration

Primary authors: SUKHOROSOV, Aleksey (HSE University); ZINCHENKO, Alexander (Joint Institute for Nuclear Research); MAEVSKIY, Artem (HSE University); EVDOKIMOV, Dmitriy (HSE University); RATNIKOV, Fedor; RIABOV, Victor (Petersburg Nuclear Physics Institute)

Presenter: RATNIKOV, Fedor

Session Classification: Gas Detectors - Poster session