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Denoising Convolutional Networks to Accelerate Detector Simulation

The high accuracy of detector simulation is crucial for modern particle physics experiments. However, this accuracy comes with a high computational cost, which will be exacerbated by the large datasets and complex detector upgrades associated with next-generation facilities such as the High Luminosity LHC. We explore the viability of regression-based machine learning (ML) approaches using convolutional neural networks (CNN) to "denoise" faster, lower-quality detector simulations, augmenting them to produce a higher-quality final result with a reduced computational burden. The denoising CNN works in concert with classical detector simulation software rather than replacing it entirely, increasing its reliability compared to other ML approaches to simulation. We obtain promising results from a prototype based on photon showers in the CMS electromagnetic calorimeter. Future directions are also discussed.

Significance

References

Speaker time zone

Compatible with America

Primary author: COLLABORATION, CMS

Presenters: COLLABORATION, CMS; PEDRO, Kevin (Fermi National Accelerator Lab. (US))

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