

Fast Perfekt: Regression-based refinement of fast simulation

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As data sets grow in size and complexity, simulated data play an increasingly important role in analysis. In many fields, two or more distinct simulation software applications are developed that trade off with each other in terms of accuracy and speed. The quality of insights extracted from the data stand to increase if the accuracy of faster, more economical simulation could be improved to parity or near parity with more resource-intensive but accurate simulation. We present Fast Perfekt, a machine-learned regression-based model for refining fast simulations that employs residual neural networks. A deterministic network is trained using a unique schedule that combines ensemble-based and pair-based loss functions. We explore this methodology in the context of an abstract analytical model and in terms of a realistic particle physics application based on jet properties in hadron collisions at the Large Hadron Collider.

Track

Detector simulation & event generation

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