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BitHEP –Are 1-Bit Networks all we need?

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With the rise of modern and complex neural network architectures, there is a growing need for fast and memory-efficient implementations to avoid computational bottlenecks in high-energy physics (HEP). We explore the performance of the BITNET architecture in state-of-the-art HEP applications, focusing on classification, regression and generative modeling tasks. Specifically, we apply BITNET to the CaloINN for fast calorimeter shower simulations, MADNIS for neural importance sampling, P-DAT for quark/gluon discrimination, and SMEFTNet for decay plane angle regression. Additionally, we incorporate Bayesian networks to model the uncertainties in BITNET's predictions. Our results demonstrate that BITNET consistently achieves competitive performance across these diverse applications while reducing the computational resources.

Track

Detector simulation & event generation

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