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Flow-based generative models for particle calorimeter simulation

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Simulation is the crucial connection between particle physics theory and experiment. Our ability to simulate particle collision based on first principles allows us to analyze and understand the vast amount of data of the Large Hadron Collider (LHC) experiments. This, however, comes at a cost: A lot of computational resources are needed to simulate all necessary interactions to the required precision. Among these simulations, the interactions of the particles with the detector material, especially the calorimeters, which measure the particles' energies, is the most expensive one.
In recent years, surrogate models based on deep generative models have shown great results for fast and faithful alternatives. Given the constraints that such surrogates have to fulfill on timing and precision, models based on normalizing flows have the best potential to become such alternatives. In my talk, I will review recent progress in normalizing-flow-based alternatives for calorimeter simulation and how they compare in terms of quality and timing.

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