

# ML for efficient generation of particle scattering events

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## **Abstract:**

In high energy physics, theory-based predictions come in the form of simulated scattering events. State of the art calculations require significant computation time of which a major part goes into the generation of valid configurations of particle momenta. In this talk I will show how generative models can reduce the computational load and in turn increase the physics reach. Based on an accessible introduction of the underlying physics, I will define the actual sampling problem as a statistical challenge. I will then show how flow-based models can contribute to solving this problem. Recently introduced simulation-free training methods make it possible to train these models at a reasonable cost and reveal interesting connections with diffusion / score-based generative models. Finally, I will show how optimal transport can increase the sampling speed by straightening the flow.