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Exemplary usages of GANs in the ATLAS experiment

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Fast simulation will be a crucial tool for all LHC experiments from Run 3 and especially during HL-LHC. The increase in luminosity will not be matched by a similar increase in computing resources, therefore fast simulation will be the only way forward. Fast simulation is already used by the LHC experiments but it will need to be significantly improved to be used by all analyses. A possible way forward is to exploit the generative tool developed by the ML community, in particular GANs.

In this lecture I will present the current state-of-the-art in ATLAS and use it to describe the challenges faced by this approach. Additional examples will be taken from another GAN developed to generate and simulate di-jet and top quark events. While the generation of event is not currently the bottle neck in the MC production chain, it will soon require significant resources as new, more precise but also more complex MC generators will be developed.

Keywords:

fast calorimeter simulation, fast event generation, GAN optimisation, voxalisation, conditioning

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