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# On the simulation of extreme events with neural networks

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## Résumé

This work aims at investigating the use of generative methods based on neural networks to simulate extreme events. Although very popular, these methods are mainly invoked in empirical works. Therefore, providing theoretical guidelines for using such models in an extreme value context is of primal importance. To this end, we propose an overview of some generative methods dedicated to extremes, giving theoretical tips on their tail behaviour thanks to both extreme-value and copula tools. More specifically, we shall focus on a new parametrization for the generator of a Generative adversarial network (GAN) adapted to the heavy tail framework. An analysis of the uniform error between an extreme quantile and its GAN approximation is provided: We establish that the rate of convergence of the error is mainly driven by the second-order parameter of the data distribution. The above results are illustrated on simulated data and real financial data.

**Mots-Clés:** Extreme, value theory, neural networks, generative models

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