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Efficient Sampling from Bayesian Network Posteriors for Optimal Uncertainties

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Bayesian neural networks are a key technique when including uncertainty predictions into neural network analysis, be it in classification, regression or generation. Although being an essential building block for classical Bayesian techniques, Markov Chain Monte Carlo methods are seldomly used to sample Bayesian neural network weight posteriors due to slow convergence rates in high dimensional parameter spaces. Metropolis-Hastings corrected chains exhibit two major issues: using a stochastic Metropolis-Hastings term and bad acceptance rates. We present solutions to both problems in form of a correction term to the loss objective and novel proposal distributions based on the Adam-optimizer. The combined algorithm shows fast convergence and good uncertainty estimation for physics use cases without dramatically increasing the cost of computation over gradient descent based optimization.

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