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Parametrising profiled likelihoods with neural networks

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Full statistical models encapsulate the complete information of an experimental result, including the likelihood function given observed data. Since a few years ago ATLAS started publishing statistical models that can be reused via the pyhf framework; a major step towards fully publishing LHC results. In the case of fast Simplified Model Spectra based reinterpretation we are often only interested in the profiled likelihood given a signal strength. However, their computation using pyhf take the order of seconds per parameter point, slowing down SMS reinterpretation by orders of magnitude. Thus, to fully leverage from the precision obtained from full statistical models without compromising speed, we propose to learn the profiled likelihood functions with Neural Networks (NNs). We show that such functions can be well described with simple NNs, published in the ONNX format, and easily used by different reinterpretation tools.

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