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| | **id** | id-5511841006697818787 | **abstract** | Data analysis in science, e.g., high-energy particle physics, is often subject to an intractable likelihood if the observables and observations span a high-dimensional input space. Typically the problem is solved by reducing the dimensionality using feature engineering and histograms, whereby the latter technique allows to build the likelihood using Poisson statistics. However, in the presence of systematic uncertainties represented by nuisance parameters in the likelihood, the optimal dimensionality reduction with a minimal loss of information about the parameters of interest is not known. This work presents a novel strategy to construct the dimensionality reduction with neural networks for feature engineering and a differential formulation of histograms so that the full workflow can be optimized with the result of the statistical inference, e.g., the variance of a parameter of interest, as objective. We discuss how this approach results in an estimate of the parameters of interest that is close to optimal and the applicability of the technique is demonstrated with a simple example based on pseudo-experiments and a more complex example from high-energy particle physics. | | |
| | **abstract** | None | **versions** | | | |
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