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## A new simple PDF parametrisation: improved description of the HERA data

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We consider a new parametrisation for the parton distribution functions (PDFs) that is more flexible in the small- $x$  region. We implement it in the `xFitter` open-source PDF fitting tool, and compare it to the default `xFitter` parametrization, widely used for many PDF studies, and notably for the HERAPDF determination. We find that we can describe the combined inclusive HERA I+II data using NNLO theory with a significantly higher quality than HERAPDF2.0: the  $\chi^2$  is reduced by more than 60 units, having used only four more parameters than in the HERAPDF2.0 parametrisation, and the resulting PDFs are more in line with other mainstream PDF sets. Our results highlight a significant parametrisation bias in the default `xFitter` parametrisation, which would lead to even more dramatic effects when used for higher energy colliders, where the small- $x$  region is more relevant. We also find that the inclusion of  $\log(1/x)$  resummation, that was shown in previous studies to lead to similar improvements in the fit quality, further reduces the  $\chi^2$  by approximately 30 extra units.

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