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The automation of SMEFT-assisted constraints on UV-complete models

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The ongoing Effective Field Theory (EFT) program at the LHC and elsewhere is motivated by streamlining the connection between experimental data and UV-complete scenarios of heavy new physics beyond the Standard Model (BSM). This connection is provided by matching relations mapping the Wilson coefficients of the EFT to the couplings and masses of UV-complete models. Building upon recent work on the automation of tree-level and one-loop matching in the SMEFT, we present a novel strategy automating the constraint-setting procedure on the parameter space of general heavy UV-models matched to dimension-six SMEFT operators. A new Mathematica package, match2fit, interfaces MatchMakerEFT, which derives the matching relations for a given UV model, and SMEFiT, which provides bounds on the Wilson coefficients by comparing with data. By means of this pipeline and using both tree-level and one-loop matching, we derive bounds on a wide range of single- and multi-particle extensions of the SM from a global dataset composed by LHC and LEP measurements. Whenever possible, we benchmark our results with existing studies. Our framework realises one of the main objectives of the EFT program in particle physics: deploying the SMEFT to bypass the need of directly comparing the predictions of heavy UV models with experimental data.
Additionally, thanks to upcoming work, this framework allows to easily obtain projected bounds on the same models from HL-LHC, FCC-ee or CEPC projections.
Based on arXiv:2309.04523 and upcoming work.

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