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“Uncertainty quantication for neutrinoless double-beta decay calculations”

Observation of the neutrinoless double-beta decay will unambiguously establish neutrinos as their own antiparticles, shed light on the mechanism giving them mass, and support leptogenesis scenarios for the matter-antimatter asymmetry in the universe. The uncertainty in the nuclear matrix element (NME) governing this process calculated with diverse nuclear models makes it dicult to plan next-generation experiments in search for the decay and to extract precise information from a potential observation. On the other hand, the computational cost of state-of-the art ab-initio calculations inhibits an assessment of the uncertainty in the resulting NME. Employing a surrogate model to describe the nuclei involved in the decay signi cantly reduces this computational cost, facilitating a study on how the uncertainties in the nuclear forces and transition operator propagate to the NME. The systematic construction of these ingredients in chiral effective field theory and Bayesian uncertainty quantication techniques allow us to access the theoretical uncertainty associated with ab-initio calculations of the NME.