

Benchmarking neutrino interaction models with NUISANCE

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A precise modelling of neutrino-nucleus interactions is of fundamental importance to allow current and future accelerator-based neutrino oscillation experiments to achieve their ambitious goals. However, as it stands, no neutrino interaction model currently implemented in event generators has been shown to offer a quantitatively satisfactory agreement with many (and in some cases, any) modern cross-section measurements. But exactly how bad is the agreement? Which regions of kinematic phase space look better or worse? Does the situation improve when fitting uncertainties within the models? The answer to all these questions can be provided by NUISANCE.

NUISANCE is a widely used tool to synthesise the predictions from all major event generators and to confront them with state-of-the-art cross section measurements. It has been used extensively by the T2K, MINERvA and MicroBooNE collaborations to compare models to measurements and to determine uncertainty parameterisations for neutrino oscillation analyses. NUISANCE is also used by theory groups to compare microscopic models to event generator predictions. In this talk, we first summarise the status and functionalities of NUISANCE, before discussing a number of recent analyses conducted within it. These include an evaluation of the robustness of the “low- ν ” method [arXiv:2203.11821], a benchmarking of the T2K CCQE uncertainty model against cross-section measurements [arXiv:2202.03219] and comparisons of recent CCQE theory calculations (CRPA and RMF) to event generator predictions [arXiv:2207.02086, arXiv:2110.14601].

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