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Searching for BSM physics with the MicroBooNE detector

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The MicroBooNE detector is a liquid argon time projection chamber located on the Fermilab campus. It has excellent calorimetric and spatial reconstruction capabilities. Moreover, MicroBooNE is exposed to two neutrino beams, the Booster Neutrino Beam (on-axis) and the Neutrinos at the Main Injector beam (off-axis). These outstanding features make MicroBooNE an ideal experiment to search for beyond the Standard Model (BSM) signatures, such as eV-scale sterile neutrinos, heavy neutral leptons (HNLs), millicharged particles, and light dark matter. Probing the existence of any of these BSM candidates involves using statistical methods such as hypothesis testing and limit setting. Pyhf offers a stand-alone framework that implements many of the statistical methods used in high energy physics. In this talk, we present the experience of MicroBooNE with pyhf in the context of HNL and light-dark matter searches. We highlight the advantages that pyhf offered to both analyses. In addition, we discuss a set of desired features that could be implemented in the framework.

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