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Implementing an emissions model for dual phase xenon TPCs with probabilistic programming

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Traditionally, analysis of data from experiments such as LZ and XENONnT have relied on summary statistics of large sets of simulated data, generated using emissions models for particle interactions in liquid xenon such as NEST. As these emissions models are probabilistic in nature, they are a natural candidate to be implemented in a probabilistic programming framework. This would also allow for direct inference of latent variables that we are interested in, such as energy. In this work, I will describe the challenges faced in creating such an implementation, and the possible applications, such as probabilistic energy reconstruction.

Significance

This presentation will cover a new attempt to implement a liquid xenon emissions model in probabilistic programming, so that a model that was previously a black-box model for inference can have explicit likelihoods without the need for summary statistics. The benefits of this approach would also be discussed.

References

Experiment context, if any

Primary author: Dr QIN, Juehang (Rice University)

Co-author: Prof. TUNNELL, Christopher (Rice University)

Presenter: Dr QIN, Juehang (Rice University)

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