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Type: **Short talk (15min. + 5 min. Q/A)**

Towards data application of simultaneously calibrating multiple detector effects using differentiable simulation

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Missing correlations and potential biases in detector calibrations are one major challenge mitigating data—simulation differences. To address this, we propose to use gradients, enabled by differentiable simulation, for efficient and effective optimization of the detector physics parameters. We developed an auto-differentiation enabled simulation of a liquid argon time projection chamber using JAX, and applied it on calibrating multiple detector effects simultaneously. This approach allows us to account for the correlations of the detector modeling parameters comprehensively and avoid biases introduced by segmented measurements. In this talk, I will present detector calibration using data-like samples and discuss practical considerations for deploying this method in experimental settings.

Presenter: CHEN, Yifan

Session Classification: AI//ML for Detector Physics Modeling