



Contribution ID: 102

Type: **Parallel Presentation**

Real-Time AI Triggering for Liquid Argon Time Projection Chambers

Thursday, November 21, 2024 1:30 PM (15 minutes)

Modern particle detectors, including liquid argon time projection chambers (LArTPCs), collect a vast amount of data, making it impractical to save everything for offline analysis. As a result, these experiments need to employ data down-selection techniques during data acquisition, referred to as triggering. In this talk, I will present ongoing efforts to provide real-time, intelligent, data-driven triggering for LArTPCs using hardware-accelerated AI algorithms. This approach can be adopted for various off-beam, rare physics searches with LArTPCs, for example the search for beyond-Standard Model (BSM) millicharged particles in SBND, or more broadly for BSM signals in a model-agnostic way, using anomaly detection. Drawing on studies that make use of simulated LArTPC data from the Short Baseline Near Detector (SBND) and the Public Dataset from the MicroBooNE LArTPC, I will discuss the overall performance of such approaches and their potential application in future LArTPC experiments.

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Session Classification: RDC 11 - Fast Timing Parallel Session

Track Classification: RDC Parallel Sessions: RDC11: Fast Timing