Abstract Submitted
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Towards an Interpretable Data-driven Trigger System for High-throughput Physics Facilities[1] CHINMAYA MAHESH, University of Illinois, KRISTIN DONA, DAVID W. MILLER, YUXIN CHEN, CECILIA TOSCIRI, University of Chicago — Data-intensive science is increasingly reliant on real-time processing capabilities and machine learning workflows, in order to filter and analyze the extreme volumes of data being collected. This is especially true at the intensity frontier of particle physics. Data filtering algorithms, or *trigger algorithms*, at the LHC drive the data curation process, funneling event records with certain features into categories that are predefined based on the labels extracted by the trigger algorithms. The design, implementation, monitoring, and usage of these trigger algorithms is resource-intensive and can include significant blindspots. The *menu* of trigger algorithms is manually designed based on domain knowledge (involving ˜100 data filters). In this presentation, we introduce a new data-driven approach for designing and optimizing high-throughput data filtering and trigger systems such as those in use at physics facilities like the LHC. We introduce key insights from interpretable predictive modeling and cost-sensitive learning in order to account for non-local inefficiencies in the current paradigm and construct a cost-effective data filtering and trigger model that does not compromise physics coverage.

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