Data-Driven Detection, Isolation, Identification, and Prediction of Accelerator Fault Events*

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Abstract

Particle accelerators represent some of the most complex scientific instruments in operation, comprised of many thousands of components and requiring many interconnected subsystems working together seamlessly. Maintaining high machine availability is the goal of all scientific user-facilities. One of the primary sources of unnecessary down time are machine faults. These failure events can range from rare and catastrophic, to frequent and tolerable. Because accelerators are sources of information-rich data, recent data-driven approaches have been applied to understanding and mitigating fault events. Recent work at Jefferson Lab for locating, classifying, and predicting failure events in superconducting radio-frequency cavities will be used as a case study to highlight the challenges and opportunities to extend this data-driven approach more broadly.

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