



Contribution ID: 1248 Contribution code: THPL005

Type: **Poster Presentation**

Long short-term memory networks for anomaly detection in storage ring power supplies

Thursday, 11 May 2023 16:30 (2 hours)

We present an approach for detection of anomalous behavior of magnet power supplies (PSs) in storage rings, which may serve as an early indication of an impending PS trip. In this new method, we train a Long Short-Term Memory (LSTM) neural network to predict the temperature of several components of a PS (transistors, capacitors) based on the PS current, PS voltage, room temperature, and cooling water temperature. For training and testing, years of historical data are used from the Advanced Photon Source (APS). The neural network is trained on the data corresponding to the normal operation of the PSs. Anomalous behavior of a PS can be detected when the observed PS temperature starts to deviate significantly from the LSTM prediction. This may allow for preemptive action by the operators or PS group.

Funding Agency

The work is supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

Footnotes

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Session Classification: Thursday Poster Session

Track Classification: MC6: Beam Instrumentation, Controls, Feedback and Operational Aspects: MC6.A27: Machine Learning and Digital Twin Modelling