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LSTMs for anomaly detection in the magnet power supply temperatures of APS-U

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We present an approach for detection of anomalies in the temperatures of magnet power supplies (PSs) in storage rings. We train a Long Short-Term Memory (LSTM) neural network to predict the temperatures of several components of a PS (heatsinks, capacitors, resistors) based on the PS current, PS voltage, and room temperature. An anomaly is detected when the observed PS temperature starts to deviate significantly from the LSTM prediction. A dedicated test stand has been built with a PS and a PS controller of the same kind that will be used in the Advanced Photon Source Upgrade (APS-U). The PS was modified to be able to programmatically create artificial anomalies in the PS temperature, so that the proposed method can be tested. Additionally, we use this test stand to experiment with more advanced PS temperature monitoring techniques employing infrared cameras, which could be used for all APS-U PSs in the future.

Footnotes

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Primary author: LOBACH, Ihar (Argonne National Laboratory)

Co-authors: EDELEN, Jonathan (RadiaSoft LLC); WOLFINGER, Kathryn (RadiaSoft LLC); BORLAND, Michael (Argonne National Laboratory)

Presenter: LOBACH, Ihar (Argonne National Laboratory)

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