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Prediction of superconducting magnet quenches with machine learning

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Superconducting magnet technology is one of the foundations of large particle accelerator facilities. A challenge with operating these systems is the possibility for the magnets to quench. The ability to predict quenches and take precautionary action in advance would reduce the likelihood of a catastrophic failure and increase the lifetime operability of particle accelerators. We are developing a machine learning workflow for prediction and detection of superconducting magnet quenches. In collaboration with Brookhaven National Laboratory (BNL), our methods for algorithm development will utilize magnet data from test stands and the Relativistic Heavy Ion Collider ring magnets to allow for a robust identification of magnet quenches. Our methods divide the problem into two different aspects. First, we are developing machine learning algorithms for binary and multi-classification of the various types of quench events. Second, our prototype machine learning model will be used to predict a quench event using precursor identification. We plan to integrate and test our monitoring system at the BNL facility to perform quench identification and prediction.

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Footnotes

I have read and accept the Privacy Policy Statement

Yes

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