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Real-time calibrations for future detectors at FAIR

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The online data processing of the next generation of experiments conducted at FAIR requires a reliable reconstruction of event topologies and, therefore, will depend heavily on in-situ calibration procedures. In this study we present a neural network-based tool designed to provide real-time predictions of calibration constants, which rely on continuously available environmental data. To enhance regularization, we incorporate information about previous environmental states into the Long Short-Term Memory (LSTM) architecture. LSTM is combined with Graph Convolutions to facilitate predictions across multiple channels simultaneously and to account for correlations between the channels. A proof-of-principle of this approach has been demonstrated using data from the Drift Chambers of the HADES detector obtained during the February 2022 experiment. Our method demonstrated the ability to provide fast and stable calibration predictions with a precision comparable to that obtained using traditional offline, time-consuming approaches.

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