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ML-based Calibration and Control of the GlueX Central Drift Chamber

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The GlueX Central Drift Chamber (CDC) in Hall D at Jefferson Lab, used for detecting and tracking charged particles, is calibrated and controlled \textit{during} data taking using a Gaussian process. The system dynamically adjusts the high voltage applied to the anode wires inside the chamber in response to changing environmental and experimental conditions such that the gain is stabilized. Control policies have been established to manage the CDC's behavior. These policies are activated when the model's uncertainty exceeds a configurable threshold or during human-initiated tests during normal production running. We demonstrate the system reduces the time detector experts dedicate to calibration of the data offline, leading to a marked decrease in computing resource usage without compromising detector performance.

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