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Gauge invariance for error detection in quantum simulations of the Schwinger model

We use quantum devices from IBMQ to perform digital quantum simulations of the Schwinger model. We work with a quantum link model description of the Schwinger model in its lowest dimensional representation, and use gauge invariance, in the form of the Gauss' law, to enhance quality of data from quantum simulations. One of our goals in this project is to find out if there are advantages of keeping the Gauss' law at the expense of simulating both matter and gauge degrees of freedom. The main ideas here can be extended to other lattice gauge theories or higher dimensional representations of this quantum link model.

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