We develop and implement an adaptive quantum state tomography (QST) scheme that can actively request highly informative measurements and incorporate them into the reconstruction process. QST is highly important for the evaluation of quantum devices and experiments. We investigate the reconstruction of different multi-qubit states with varying degree of entanglement and ground states of a kinetically constrained spin chain with up to 19 qubits. We show that this procedure can highly reduce the number of measurements needed for a good reconstruction compared to existing QST methods.

We develop and implement an adaptive quantum state tomography (QST) scheme that can actively request highly informative measurements. This scheme can reduce the number of measurements for a good reconstruction to only tens to hundreds of samples. Since QST is important for the evaluation of quantum devices, simulators and experiments, we expect that our manuscript significantly advance quantum information science/technology. Furthermore, a substantial connection between quantum physics and machine/active learning is established. With the increasing number of qubits available in experiments since recent years, efficient QST schemes are of high interest and impact across the multidisciplinary quantum information community.