Generalized Machine-Learning Algorithm for Quantum Teleportation

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The central feature of quantum teleportation is the correlation established between a measurement in a specified basis and the resulting unitary transformation executed to remotely replicate the original input state. Analytical approaches have been described for Bell basis and continuous variable teleportation. However, in general there is a wide range of systems comprising of a finite number of particles or states that are not amenable to these customized schemes. Thus, it is desirable to have an efficient method to establish the correlation between the space of all possible measurements in some specified basis and the space of resultant unitary transformations. We present an optimization and machine learning algorithm that can implement quantum teleportation spanning the entire range from single qubit to large ensembles. The algorithm is shown to have a broad range of applications, including the teleportation of coherent states, Dicke states, states with prior distributions, and states with different numbers of particles. In each case, the resulting fidelity of teleportation is shown to surpass the 'classical' limit wherein quantum entanglement is absent.