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(I) Enhanced quantum state reconstruction with artificial neural networks

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Over the last years, artificial neural networks have been explored as powerful and systematically tuneable ansatz to represent quantum wave functions. Such numerical models can tomographically reconstruct quantum states and operator expectation values from a finite amount of measurements. At the same time, artificial neural networks can find the ground state wave function of a given Hamiltonian via variational energy minimization.
While both approaches experience individual limitations, combining them leads to significant enhancements in the variational ground state search by naturally finding an improved network initialization from a limited amount of measurement data. Additional specific modifications of the network model and its implementation can further optimize the performance of variational simulations for quantum many-body systems, providing significant insights into their behaviour.
In this talk, I will discuss the representation of quantum states with artificial neural networks and demonstrate achievable enhancements by adapting network models, optimization procedures, and data generation processes.

Keyword-1

Artificial neural networks

Keyword-2

Quantum many-body systems

Keyword-3

Rydberg atom arrays

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