physikalisches Kolloquium

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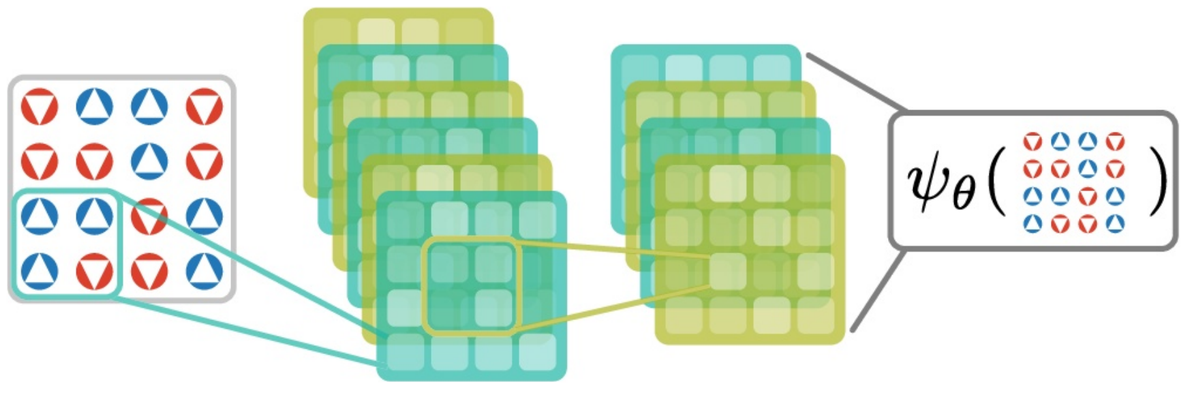
Machine learning in quantum physics

Mo. 21.10.24
16:00 Uhr
Ort: H34

The powerful tools of machine learning are not only revolutionizing our everyday lives, but also the approach to outstanding scientific challenges such as natural language processing or protein folding. With their unprecedented control and highly resolved probes of quantum systems, state-of-the-art experiments and their theoretical description pose key problems, that likewise match the known strengths of machine learning algorithms.

As a concrete example, I will discuss how the capabilities of artificial neural networks in pattern recognition and dimensional reduction can be employed to gain new insights about non-equilibrium quantum matter. Motivated by recent experiments with quantum simulators, we investigated the signatures of dynamical universality induced by driving a system across a phase transition and we revealed additional structure of the resulting wave functions through a novel nonparametric learning approach.

As a second example, I will outline the application of machine learning algorithms for strategy discovery to control and manipulate quantum systems. To this end, especially the emerging quantum computing platforms provide a multi-faceted interface, where quantum-classical feedback plays a technological role or can be investigated from a fundamental perspective.



Schematic of a neural quantum state, which exploits the power of artificial neural networks for efficient wave function representations.