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Quantum Machine Learning

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Machine learning techniques have become ubiquitous, but often hidden helpmates in our daily life. This includes pattern recognition technologies that have long filtered data in electronic mailboxes and have more recently become powerful enough to identify users by the touch of a button or the scan of a face. In this colloquium, I will briefly review the algorithmic foundations of these machine learning approaches and then turn to their application in the context of statistical physics problems. I will demonstrate that machine learning techniques are capable to discriminate phases of matter by extracting essential features in the many-body wavefunction or the ensemble of correlators sampled for instance in Monte Carlo simulations. Of particular interest are quantum many-fermion problems that have long resisted a thorough numerical understanding — will we be able to guide our understanding of the emergence of superconductivity or topological order in such systems using machine learning approaches?