

## **Matrix product states: imposing $SU(2) \times U(1)$ symmetry**

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Many-body problems in quantum mechanics are difficult to solve due to the exponential increase of Hilbert space with system size. Approximative solutions can be found by only scanning the most relevant part of Hilbert space. A matrix product state is a specific wave-function Ansatz with this goal. In this talk, the concept of a matrix product state is introduced. Its advantages and disadvantages are discussed. Imposing  $SU(2) \times U(1)$  symmetry is put forward by means of the one-dimensional Hubbard model. This allows for efficient high accuracy quantum chemistry simulations within the Born-Oppenheimer approximation.