Towards solving open problems in quantum field theory: from tensor networks to quantum computing

There are several problems in quantum field theory which cannot be solved by conventional Monte Carlo simulation techniques, i.e. a non-zero baryon density, the matter-antimatter asymmetry of the universe and real time simulations. At the example of 1+1 dimensional benchmark models we will discuss new directions towards overcoming these problems. In particular, we will introduce tensor network techniques which are very successful in low dimensions. As another new direction, we will demonstrate that quantum computing could be a practical way in the future to evaluate these problems through variational quantum simulations.

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