Infinite Matrix Product States from Conformal Field Theory

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Abstract

Matrix Product States (MPS) are variational ansatz underlying the Density Matrix Renormalization Group (DMRG) and well describe 1D gapped systems. For 1D critical systems whose entanglement entropy logarithmically increases with the subsystem size, usual MPS are less accurate due to their finite entanglement. To overcome this difficulty, a recent development in this field is the formulation of infinite MPS (iMPS) with infinitely dimensional matrices from conformal field theories.

In this seminar, we illustrate these ideas by presenting a class of iMPS for the SO(n)_1 WZW model. These SO(n) iMPS are equivalent to projected BCS states. In 1D, they belong to SO(n)_1 universality class and their parent Hamiltonians are SO(n) generalizations of Haldane-Shastry models. In 2D, these iMPS are chiral spin liquids and support anyonic excitations. The anyonic properties of these SO(n) states depend on n mod 16, i.e. the sixteen-fold way proposed by Kitaev.

References:

[1] J. I. Cirac and G. Sierra, Phys. Rev. B 81, 104431 (2010).

[2] H.-H. Tu, arXiv: 1210.1481.

About the speaker

Dr Hong-Hao Tu obtained his BSc degree at Wuhan University and PhD degree at Tsinghua University. Currently he is a postdoctoral researcher at the Theory Division of Max-Planck Institute for Quantum Optics. He mainly works on theoretical condensed matter and his research interests include exotic quantum phases of matter, efficient description of many-body systems using tensor network states, exactly solvable models, etc.