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Learning the spectrum with Neural Quantum States

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The quantum many-body problem lies at the heart of a wide spectrum of physical phenomena, ranging from interacting quarks to molecular dynamics, yet it poses a great computational challenge that remains unsolved. Traditional approaches often face a trade-off between accuracy and tractability, due to an underlying issue commonly known as the "curse of dimensionality". In this context, the method of Neural Quantum States (NQS) [1] offers a promising way around these difficulties. The Variational Monte Carlo framework tames the exponentially growing number of states, while the use of neural network ansätze equips it with great representation power. In this talk, I will introduce the core ideas behind NQS and highlight some of their most successful applications, ranging from Quantum Chemistry [2, 3] to ab-initio Nuclear Structure [4-6]. I will also discuss current challenges in the field and outline major research directions shaping the development of NQS methods.

[1] G. Carleo and M. Troyer, Science 355 602-606 (2017)
[2] D. Pfau, J. Spencer et al., Phys. Rev. Research 2, 033429 (2020)
[3] D. Pfau, S. Axelrod et al., Science 385 (2024)
[4] J. Keeble and A. Rios, Phys. Lett. B 135743 (2020)
[5] A. Gnech, B. Fore et al., Phys. Rev. Lett.133, 142501 (2024)
[6] M. Rigo, B. Hall et al., Phys. Rev. E 107, 025310 (2023)

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