Tensor Networks and Dynamical Quantum Phase Transitions

Tensor Networks has revolutionized condensed matter physics in the last decade. In addition to giving valuable insight about properties such as entanglement in many body systems, it has given rise to numerical techniques that outperforms traditional methods by orders of magnitudes. In this thesis, you will learn about a specific type of tensor network called Matrix Product States [1], and attack the problem of feedback-driven quantum systems. An example of a feedback-driven quantum system is a driven two-level system - a qubit - undergoing spontaneous emission, where the emission comes back and interacts with the qubit at a later time, forming a feedback loop.

More precisely, the goal of the thesis will be to understand wether the feedback-driven system undergoes a phase transition around the feedback time. The project is flexible in the sense that you can choose if the numerical aspects of Matrix Product States or the analytical side of Dynamical Quantum Phase Transitions [2] will be the main focus of the thesis. The work will be conducted in close collaboration with a PhD student in the group of AQP, and provide you with state of the art techniques that would be highly valuable in future doctoral studies.

Does this sound interesting to you? Don't hesitate to contact:

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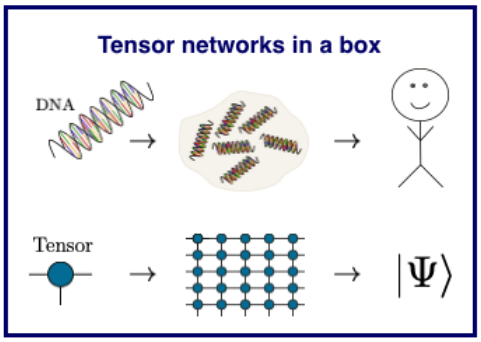

[1] H. Pichler et al. *Photonics Circuits with Time Delays and Quantum Feedback*, 2016, PRL
[2] M Heyl. *Dynamical quantum phase transitions: a review*, 2018, Reports on Progress in Physics