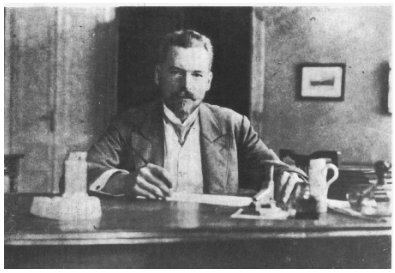

Contribution ID: **32** Type: **Invited talk**

Finding low energy states of low-dimensional spin-glasses via approximate tensor network contractions.

Monday, 19 September 2022 11:15 (45 minutes)

I'll present a deterministic classical algorithm to efficiently sample high-quality solutions of certain spin-glass systems that encode hard optimization problems. It employes tensor networks to represent the Gibbs distribution of all possible configurations. Using approximate tensor-network contractions, we can efficiently map the low-energy spectrum of some quasi-two-dimensional Hamiltonians. Exploiting the local nature of the problems allows computing spin-glass droplets geometries, which provides a new form of compression of the low-energy spectrum. This naturally encompasses sampling, which otherwise, for exact contraction, is $\#P$ hard in general.

I'll discuss the performance of that approach in the context of existing and upcoming quantum annealing devices. I'll also show that inhomogeneous quantum annealing that employs information about the droplets may allow one to reach higher diversity of solutions than the standard homogeneous quantum annealing schedules.

Based on:
[1] M. M. Rams, M. Mohseni, D. Eppens, K. Jałowiecki, B. Gardas, Phys. Rev. E 104, 025308 (2021).
[2] M. Mohseni, M. M. Rams, et. al., arXiv:2110.10560
[3] A. Dziubyna, T. Śmierzchalski, B. Gardas, M. M. Rams, et. al., in prep.

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