

SEMINAR: Simulations between classical spin systems: universality and its consequences

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15:00 to 16:00

Blue Lecture Room

Many applications of classical spin systems rely on the idea that fairly simple systems suffice to simulate the low energy behavior of arbitrary complicated ones. For instance, considering quantum annealing, certain Ising systems can be programmed to simulate arbitrary other systems and thereby computing ground states of the Ising systems allows one to solve arbitrary optimization problems.

What is the structure of such simulations between spin systems, how does one best approach the task of constructing simulations of a target system and in particular, under what conditions is one guaranteed that simulating the target system is even possible with the spin systems available?

To address such questions we develop a framework for simulations between classical spin systems. We derive properties of simulations that imply that complicated simulations can be constructed locally, by combining simpler ones. Leveraging these results, we prove a full characterization of those sets of spin systems which are universal, i.e. which suffice to efficiently simulate arbitrary target systems. Since the characterization is constructive, it provides a step-by-step guide to construct arbitrary simulations and hence might be used in all applications that are based on the existence of such.

Hosted by: Prof. Dr. Antonio Acín