Tenseurs : information quantique, complexité et combinatoires quantiques

Tensors: Quantum Information, Complexity and Combinatorics

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Machine learning for computing tensor rank

Computing the tensor rank is a "root-node" problem, which is fundamental to many areas of mathematics, computer science and signal processing. Unfortunately, tensor ranks are notoriously hard to compute, even for relatively small tensors. In this talk, I will describe a new approach based on machine learning to compute tensor ranks. The problem of computing tensor ranks is cast as a single-player game, where the player selects at each step a rank-one tensor to subtract from the tensor to decompose. I will describe how we can extend Deep Reinforcement Learning agents, trained to play games such as Chess and Go, to this mathematical problem. I will highlight results in matrix multiplication, where our agent, AlphaTensor, finds new efficient matrix multiplication algorithms.
The talk is based on the following publication: Discovering faster matrix multiplication algorithms with reinforcement learning, Nature, 2022.