University of Crete
Department of Physics

Physics Colloquium

Thursday, 8 February 2024 | 17:00 – 18:00, Seminar Room, 3rd floor

Bootstrapping Quantum Theories with Robots

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ABSTRACT

I will introduce a novel research effort that aims to bring together ideas from Artificial Intelligence (AI) and modern Quantum Field Theory (QFT). The primary goal of this work is to develop new methodological tools for strongly interacting, non-perturbative QFTs. After an introduction of some characteristic questions and examples in Physics and AI, I will focus on the special case of Conformal Field theories (CFTs) and the recent impetus of the Conformal Bootstrap programme. I will discuss how a novel AI-powered approach is starting to solve the non-perturbative dynamics of CFTs using a combination of statistical learning methods that include Reinforcement Learning and Neural Operators. I will exhibit the promise of the new approach with some recent results in a specific example of line-defect deformations in a 4-dimensional gauge theory. I will show that we can produce results with an accuracy of up to 7 digits using only machine-precision computations, when standard methods require numerical precision of hundreds or thousands of digits and a more strict set of positivity conditions that are absent in many physical problems.