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Probing the heart of the matter with supercomputers

Friday, 27 June 2025 09:30 (30 minutes)

Nucleons (that is, protons and neutrons) are the building blocks of all ordinary matter, and the study of nucleon structure is a critical part of frontier research to unveil the mysteries of the universe and our existence. Gluons and quarks are the underlying degrees of freedom that explain the properties of nucleons, and fully understanding how they contribute to the properties of nucleons (such as mass or spin structure) helps to decode the last part of the Standard Model that rules our physical world. After more than half a century of large-scale experimental efforts, there are still many unknowns concerning the theory quantum chromodynamics (QCD), the branch of the Standard Model describing how gluons strongly interact with themselves and with quarks, binding both nucleons and nuclei. Using supercomputers and a theoretical tool called "lattice QCD", we can simulate the theory that dominates the universe at the femtoscale and unveil its diverse phenomenology, including some properties that are hard to determine in experiments. Few selected recent Lattice-QCD examples and their impacts will be briefly discussed.

Please choose your topic

Other

Primary author: Prof. LIN, Huey-Wen (Michigan State University)

Presenter: Prof. LIN, Huey-Wen (Michigan State University)

Session Classification: Special session