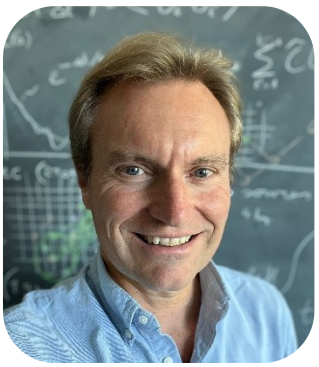
NITheCS
National Institute for
Theoretical and Computational Sciences

MITP
Mandelstam Institute for Theoretical Physics

S E M I N A R

Machine learning renormalisation group transformations for QCD



Prof Urs Wenger
(University of Bern, Switzerland)

ABSTRACT

Simulating the fundamental forces of nature requires discretising spacetime into a lattice, which introduces artifacts and distorts physical results. While renormalisation-group transformations provide a framework for improved discretisations that remove of significantly suppress these artifacts, they are notoriously difficult to implement for practical simulations. In this talk I show how gauge-equivariant convolutional neural networks and machine learning can bridge the gap between the theoretical concept and the practical application for Quantum Chromodynamics (QCD), the SU(3) gauge theory of the strong nuclear force. I demonstrate that this approach achieves a "classically perfect" discretisation free of tree-level lattice artifacts to all orders, enabling the extraction of continuum physics with high precision even on very coarse lattices. Our results on gradient-flow scales, topology and the deconfinement phase transition establish machine learning as a transformative tool for overcoming computational barriers in lattice gauge theory.

Prof Urs Wenger is an Associate Professor of Theoretical Physics at the Albert Einstein Center for Fundamental Physics, University of Bern, Switzerland. His research focuses on theoretical particle physics, particularly lattice field theory, quantum chromodynamics and computational methods, including machine learning for gauge theories. He obtained his PhD at the University of Bern in 2000 and held postdoctoral positions at the University of Oxford, DESY Zeuthen and ETH Zürich before returning to Bern in 2008.

DATE:
Tuesday, 27 October 2026

TIME:
13h15-14h15 SAST

VENUES:

- Honours Presentation Room P213
  2nd floor, School of Physics
  East Campus
  University of the Witwatersrand
- Online

WHO SHOULD ATTEND?
All are welcome.

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