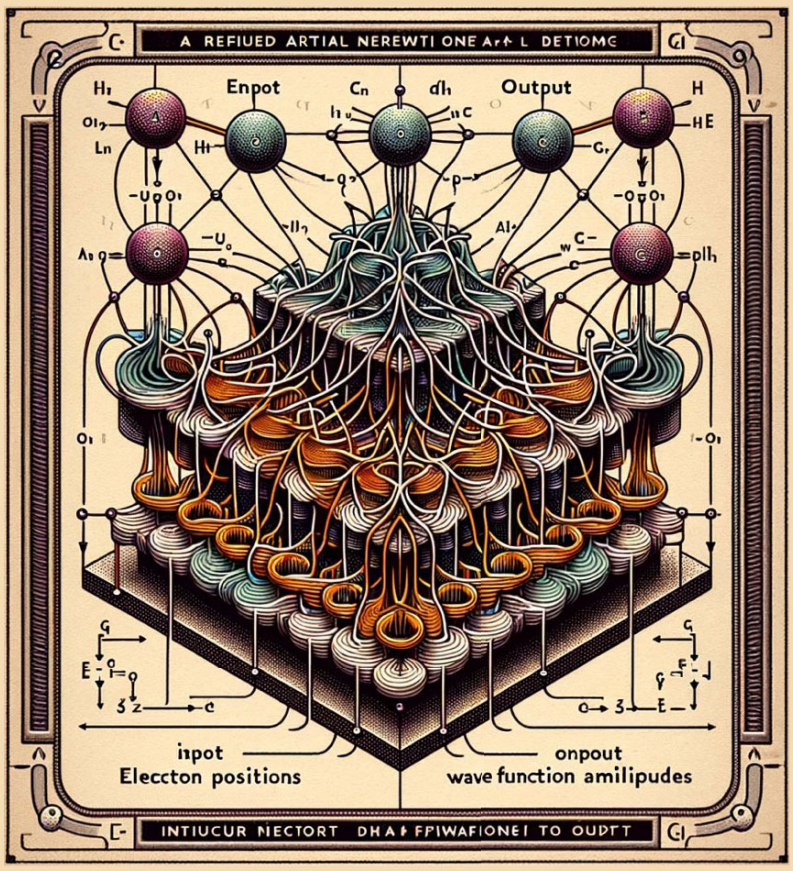
PHYSICSCOLLOQUIA2024



'Machine-learning-based approaches are being increasingly adopted to address fundamental problems in science.
Many-body physics is very much at the forefront of these exciting developments, given its intrinsic "big-data" nature.
In this colloquium I will present selected applications to the quantum realm.
First, I will discuss how a systematic, and controlled machine learning of the many-body wave-function can be realized.
This goal is achieved by a variational representation of quantum states based on artificial neural networks [1].
I will then discuss recent applications in diverse domains, focusing on prototypical open problems in many-body quantum matter.
I will especially focus on the problem of accurately describing interacting fermions,
in Condensed Matter [2], Chemistry [3], and Nuclear Physics [4]
where these approaches have significantly improved over previous variational descriptions.

[1] Carleo and Troyer, Science 355, 602 (2017)
[2] Moreno et al., PNAS 119, e2122059119 (2022)
[3] Hermann et al., Nat Rev Chem 7, 692-709 (2023)
[4] Adams et al., Phys. Rev. Lett. 127, 022502 (2021)

Giuseppe Carleo | École Polytechnique Fédérale de Lausanne (CHE)

CREATING COMPUTATIONAL MACHINES THAT CAN TACKLE QUANTUM MECHANICS

ore 14:30 | **AULA A** | VIA CELORIA 16 MILANO

FEB 16

progetto grafico: roberto perego | www.nonacaso.it

UNIVERSITÀ DEGLI STUDI DI MILANO
DOTTORATO DI RICERCA IN FISICA
ASTROFISICA E FISICA APPLICATA

DIPARTIMENTO DI FISICA
via Celoria 16 | 20133 MILANO
Tel. +39 02 50317740
http://phd.fisica.unimi.it | phd@fisica.unimi.it