### Date: 2025 May 23rd, 2:30pm

Room: 2F DISAT entrance 1

## Streaming:

https://didattica.polito.it/pls/portal30/sviluppo.bbb\_corsi.waitRoom?id=4060&p\_tipo=DOCE NTE

## Title: Physical Neural Networks



## Abstract:

Physical neural networks may be defined as networks of physical components (e.g. mechanical, optical, electrical, quantum) that exhibit non-trivial nonlinear dynamics that bear some resemblance to neuronal dynamics. In this talk, I will discuss how physical neural networks operate in a fundamentally different way from artificial neural networks, which are constructed from abstract mathematical relations. In particular, conservation laws and equations of state that define physical systems place constraints on possible state spaces of physical neural networks. These constraints inevitably result in coupled node-edge dynamics, which is neglected in artificial neural network models and which implies physical neural networks require different learning schemes. I will provide an example of this using nanoelectronic memristive networks, although the principle holds for other physical neural networks.

# Bio:

**Zdenka Kuncic** is a Professor of Physics in the School of Physics at the University of Sydney, Australia. She is a former Fulbright Senior Scholar, Australia-Harvard Fellow and 1851 International Research Fellow in Science and Engineering. She completed her PhD at the University of Cambridge in theoretical astrophysics, and since then, has broadened the scope of her research into interdisciplinary areas including medical imaging physics, radiation biophysics, nanotechnology in medicine and neuromorphic computing.



URL:

https://www.sydney.edu.au/science/about/our-people/academic-staff/zdenka-kuncic.html