



## Seminar/Talk

# Learning without neurons in physical systems

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Host: Carl Goodrich

From electrically responsive neuronal networks to immune repertoires, biological systems can learn to perform complex tasks. In this seminar, we explore physical learning, a framework inspired by computational learning theory and biological systems, where networks physically adapt to applied forces to adopt desired functions. Unlike traditional engineering approaches or artificial intelligence, physical learning is facilitated by physically realizable learning rules, requiring only local responses and no explicit information about the desired functionality. Our research shows that such local learning rules can be derived for broad classes of physical networks and that physical learning is indeed physically realizable, without computer aid, through laboratory experiments. We take further inspiration from learning in the brain and demonstrate the success of physical learning beyond the quasi-equilibrium regime, enabling physical systems to adapt complex dynamical functions. By leveraging the advances of statistical learning theory in physical machines, we propose physical learning as a promising bridge between computational machine learning and biology, with the potential to enable the development of power-efficient AI platforms, and new classes of smart metamaterials that adapt in-situ to users needs.

**Thursday, May 7, 2026 11:00am - 12:00pm**

Mondi Seminar Room 2, Central Building



This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.

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<https://ista.ac.at/en/campus/how-to-get-here/> The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.