

Advanced neuromorphic computing hardware: Towards efficient machine learning (SYNC)

jointly organized by
the Semiconductor Physics Division (HL),
the Thin Films Division (DS),
the Dynamics and Statistical Physics Division (DY), and
the Physics of Socio-economic Systems Division (SOE)

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Recently novel computational approaches such as neural networks are revolutionizing computation. At the same time, we experience that the performance growth of digital microchips is saturating and the energy consumption of classical digital electronic processors is becoming a serious issue. This impasse has re-invigorated learning from the brain with its amazing intelligence-per-watt ratio and the exploration of unconventional physical substrates and nonlinear phenomena.

Our symposium will present the recent progress and future perspectives of neuro-inspired computing based on solid state systems and its relation to machine learning. This includes not only important aspects of novel computational architectures in unconventional substrates but also new theoretical concepts of computing in non-digital, "brain-like" physical substrates.

The chosen topic has highly interdisciplinary as we aim at bringing together researchers from material science, machine learning, computer engineering, nonlinear dynamics with exciting talks of renowned international expertise in the field.

Overview of Invited Talks and Sessions

(Lecture hall HSZ 02)

Invited Talks

SYNC 1.1	Mon	9:30–10:00	HSZ 01	Photonic Reservoir Computing and its Application to Optical Communication — ●INGO FISCHER, APOSTOLOS ARGYRIS
SYNC 1.2	Mon	10:00–10:30	HSZ 01	Metal-oxide resistance switching memory devices as artificial synapses for brain-inspired computing — ●SABINA SPIGA
SYNC 1.3	Mon	10:30–11:00	HSZ 01	Towards brain-inspired photonic computing — ●WOLFRAM PERNICE
SYNC 1.4	Mon	11:15–11:45	HSZ 01	Photonic Recurrent Ising Sampler — ●CHARLES ROQUES-CARMES, YICHEN SHEN, CRISTIAN ZANOCI, MIHIKA PRABHU, FADI ATIEH, LI JING, TENA DUBČEK, CHENKAI MAO, MILES JOHNSON, VLADIMIR ČEPEŘÍČ, JOHN JOANNOPOULOS, DIRK ENGLUND, MARIN SOLJAČIĆ
SYNC 1.5	Mon	11:45–12:15	HSZ 01	Beyond von Neumann systems: Computational memory for efficient AI — ●IREM BOYBAT

Sessions

SYNC 1.1–1.5	Mon	9:30–12:15	HSZ 01	Advanced neuromorphic computing hardware: Towards efficient machine learning
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