universität innsbruck
Forschungsschwerpunkt Physik

Innsbruck
Physics Colloquium

Computing with Complexity: Large-Scale Photonic Machine Learning leveraging Disorder

Colloquium talk
by

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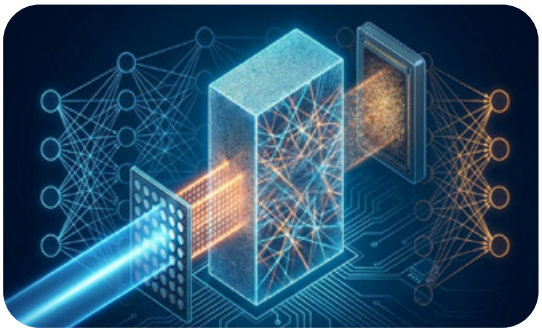
Photonics promises a paradigm shift in information processing, offering ultrafast speeds and low energy consumption. While optical computing has seen a resurgence of interest for machine learning applications, current implementations face a scalability bottleneck: most proof-of-concept devices are restricted to low dimensionalities and shallow, simple architectures.



In this colloquium, I will discuss how we can overcome these limitations by exploiting the physical complexity of light scattering itself. I will demonstrate that multiple scattering in disordered media—usually considered a hindrance to imaging—can be harnessed to perform a critical computational operation: large-scale random matrix multiplication. By mapping input information onto the complex optical transmission matrix of a scattering medium, we can process high-dimensional data at the speed of light and at negligible energy cost. I will present experimental results across various machine learning tasks and discuss the roadmap for extending this concept from single-layer operations to deep, recurrent optical neural networks.

Tuesday, 27 Januar, 16:30

HS C, Victor-Franz-Hess-Haus

Organizers: Katrin Erath-Dulitz, Francine Marleau, Hanns-Christoph Nägerl