UNIVERSITÄT LEIPZIG

Fakultät für Physik und Geowissenschaften

Physik-Kolloquium

Tuesday, July 7, 2020, 17:00

Dr. Daniel Brunner

Institut FEMTO-ST, UMR CNRS 6174, Besançon, France

Photonic Reservoir Computing

Neural networks have shifted the limits of what is computationally possible by solving complex problems that were out of reach of classical, algorithmic programming. Inspired by the human brain, neural networks mold their neurons' nonlinear transformations into a computational result according to the network's connections.
The hardware equivalent of such computation quite literally is a large network of nonlinear elements, comprising connections modified during a period of learning. Such hardware strongly differs from the von Neumann computing architecture, and integrating the large number of parallel network connections in a physical substrate is a fundamental challenge that remains to be solved. One attractive and high performance 'intermediate' neural network concept is reservoir computing, where training only modifies the weights of the final (readout) layer. Owing to this simplicity, reservoirs are the only neural network concept which has been realized in photonic systems of a size adequate for real-world problems, and I will introduce the concept and the various photonic implementation strategies. One aspect less considered when physically implementing neural networks is that, beyond exceptional performance such as GHz inference rates, many fundamental questions arise and surprising complex system behavior is waiting to be discovered. Finally, I will discuss the general aspects, promises and challenges of next generation neural network computing hardware.

The colloquium will take place via Zoom:
https://uni-leipzig.zoom.us/j/97088268675?pwd=TE5Nbnh6eDk4WFljMVhUektJMlEydz09