ulm university universität ulm

Physikalisches Kolloquium — Physics Colloquium

Einladung — **Invitation**

Monday, 11 November 2019

Lecture Hall N24/H13, 16:15

Coffee and cookies will be served in front of the lecture hall from 16:00

Reservoir computing with a laser and the role of nonlinear dynamics

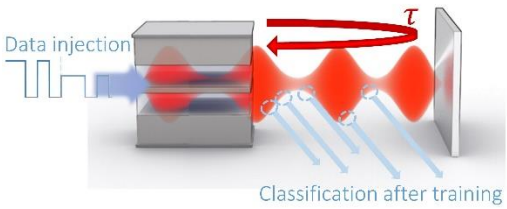
Prof. Kathy Lüdge

Technische Universität Berlin

WEBPAGE

The reservoir computing paradigm is a neuro-inspired machine learning scheme that uses high-dimensional dynamical system driven by an input. In the simplest form of reservoir computing, this dynamical systems is not ‘trained’ during the learning procedure, but acts as a static pool of short-term memory and non-linear transformations. I will highlight the complex relationship between the fields of non-linear dynamics, analogue computing and machine learning. The general properties of reservoir computing will be explored from the perspective of bifurcation and steady-state analysis of the underlying network.

Classifying the transient dynamics of a driven dynamical system, e.g. a laser with input stream, is still an open problem, but a few general rules can be shown. First, the solitary dynamics of the reservoir determines the resulting performance and the underlying bifurcations of the dynamical system is of crucial importance. Second, the implementation details of the information feed-in and read-out mechanism strongly influence the results, so that in-put and read-out cannot be excluded in the modelling. In the context of optical networks, I will show that larger reservoirs, e.g. multiple delay-coupled lasers, tend to perform better which is particularly interesting for all-optical realizations. Especially when based on modern photonic components, there is the possibility to vastly exceed the speed and computational power of digital computers.



Host: Prof. Dr. Ute Kaiser, Electron Microscopy Group of Materials Science

Organisation: Prof. Dr. Fedor Jelezko, Institute of Quantum Optics, fedor.jelezko@uni-ulm.de, +49-731-50-23751