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## Title

Greedy reinforcement learning in large photonic neural networks

## Abstract

We have recently succeeded in the implementation of a large scale recurrent photonic neural network hosting up to 2025 photonic neurons. All network internal and readout connections are physically implemented with fully parallel technology. Based on a digital micro-mirror array, we can train the Boolean readout weights using a greedy version of reinforcement learning. We find that the learning excellently converges. Furthermore, it appears to possess a conveniently convex-like cost-function and demonstrates exceptional scalability of the learning effort with system size.

I will introduce our photonic neural network in detail and give a general motivation of photonic systems for neural network processors. Finally, I will discuss the obtained findings of the learning procedure in light of their relevance for hardware implemented neural networks.

## Biography

I did my undergrad at the Karlsruhe Institute of Technology, Germany, and finished my Master degree at the Heriot-Watt University, Edinburgh, UK. There, I continued as a PhD student studying coherent states in single self-assembled semiconductor quantum dots. From there I significantly switched fields and focused on the implementation of reservoir computing in delay-coupled semiconductor lasers as a Postdoc at the IFISC, Palma de Mallorca, Spain. I am now a permanent CNRS researcher at the FEMTO-ST institute in Besancon, France. Work in my group focuses on the translation of novel computation

concepts into photonic substrates.