Random photonic circuits for neuro-inspired and quantum processing

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In recent years, there has been great success in mimicking the human brain functionalities by the use of novel machine learning algorithms to enable computer programs the learning and solving of complex tasks with applications in computer vision, voice/language recognition, autonomous vehicles, smart traffic grids, medical diagnoses and finance. However, such new software requires large data center systems with long calculation times to achieve these results, which is connected to high hardware and energy costs and leads to a large CO2 footprint. Besides contributing immensely to today's energy usage, these computational needs additionally limit the advance and wide-spread use of machine learning concepts, e.g., in remote/offline scenarios and sensor level applications. In this project the scientists will explore integrated nanophotonic random nonlinear networks for the develop a photonic co-processor that operates with light, which will be energy efficient and allows computations at the speed of light. These nanophotonic systems allow scalable access to a rich random multi-scattering nature, which will be studied in this context classically and quantum mechanically. They will exploit a photonic chip platform similar to today's electronic circuits, which thus can be compact, stable and mass-producible.

Projektbeteiligte

Prof. Dr. Michael Kues
Universität Hannover
Institut für Photonik
Hannover

Dr. Yaron Bromberg
The Hebrew University of Jerusalem
Faculty of Physics
Racah Institute
Jerusalem
Israel