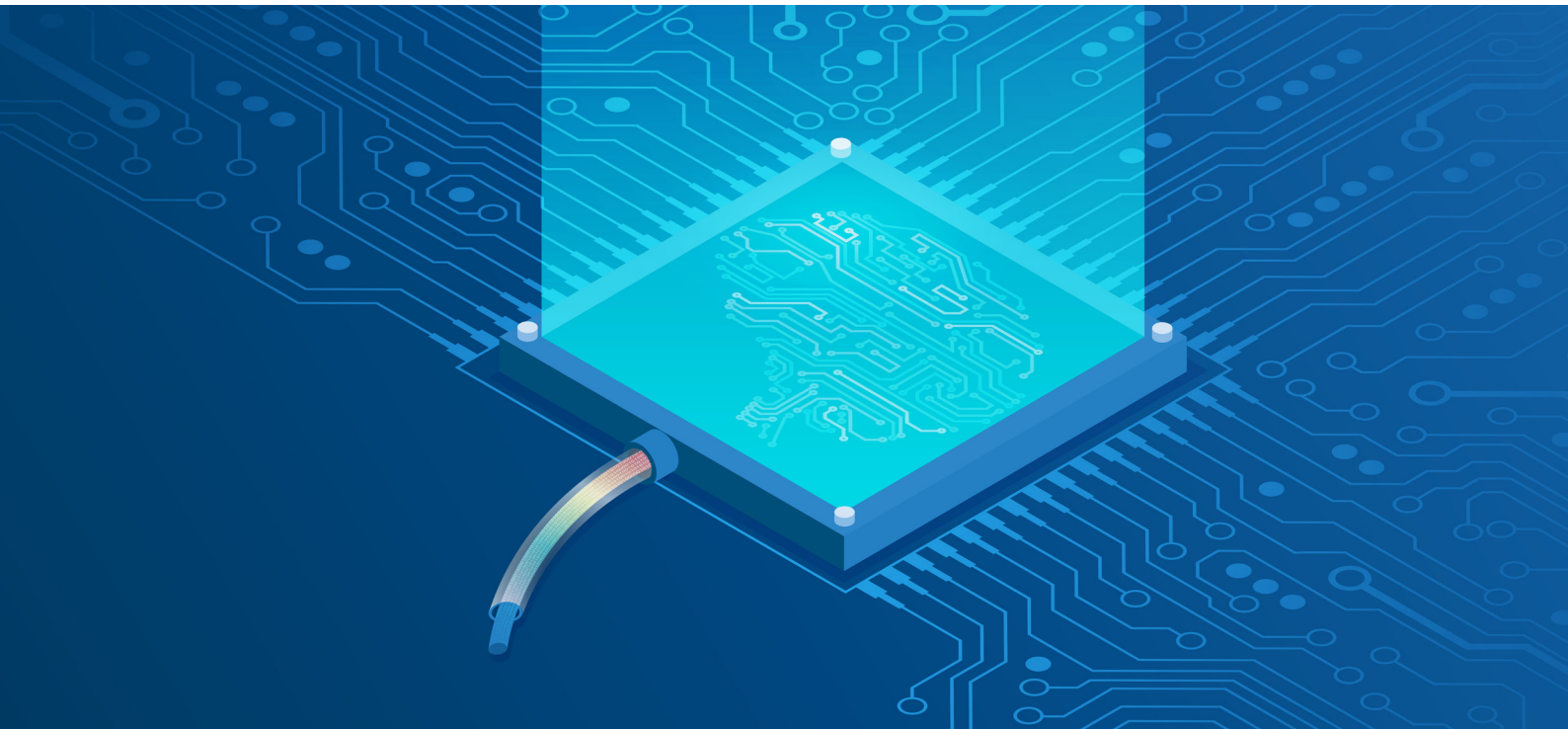


PHOTONIC NEUROMORPHIC COMPUTING FOR HIGH-SPEED OPTICAL NETWORKS



AT A GLANCE

The current trend in communication vertical use-cases is moving towards ultrafast, resilient, energy-efficient, reliable and high-data management systems, autonomous networks, which require a large number of transmission indicators.

Fraunhofer HHI and several industry partners are conducting development of neuromorphic computing concepts on photonic integrated circuits (PICs) for use-cases such as optical modulation format identification in optical transmission systems.

Target Features

- Fully-integrated solution on a PIC
- Smaller footprint with no moving parts
- Trainable for different transmission link scenarios
- Modulation format transparent
- Operable in the optical domain

Possible Applications

- Optical modulation format identification
- Fiber Kerr nonlinearity mitigation
- Symbol rate identification
- OSNR estimation

Technical Background

Photonic neuromorphic computing has recently evolved as a new computing paradigm since it is not limited by the decay of Moore's law. As a photonic-based computing concept, it inherently benefits from advantages such as high-speed processing, inherent parallelism using multiple wavelengths and low power consumption, while it is at the same time released from the obstacle of realizing photonic RAM which is not needed to realize neuromorphic computing architectures.



SOI-based integrated photonic reservoir hardware for smart monitoring of optical modulation formats.

Benefits

The underlying neuromorphic concept and the PIC implementation make the technology low-cost, ultrafast, and beneficial not only for autonomous networks for KPI estimation, but also for receivers in THz networks where data modulation changes depending on weather-dependent link budget.

Target Prototype Specification

- Suitable for high symbol rate data (> 28 GBd)
- Over 97% performance accuracy in up to 100 km SSMF transmission
- Suitable for both single-polarization and dual-polarization data signals
- Real operation in the optical domain

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