

New optoelectronic fusion technology for edge computing





Overview

We have proposed the Fourier domain diffraction neural network, constructed the reconfigurable diffraction computing processor (DPU), developed the all-analog optoelectronic fusion computing chip ACCEL, and the large-scale general-purpose intelligent optoelectronic computing . We present GENIO, a novel platform that integrates edge computing within existing Passive Optical Network (PON) infrastructures. Integrating microelectronics and optoelectronics can harness the mature processes and functions of microelectronics, with the ultra-wideband and low-power benefits of optoelectronics.



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Performance Trade-offs in Optical Edge Detection Filters for

In this study, a co-designed optoelectronic framework for edge detection was proposed. Four optical filters Vortex phase filter (VPF), Gaussian vortex filter (GVF), High-pass filter (HPF) and Laguerre

Building 3D integrated circuits with electronics and

The three-dimensional integration of electronic and photonic integrated circuits could solve critical input/output limitations in existing computing



Full article: Emerging photoelectric devices for

To develop high integration density and high-performance optoelectronic neuromorphic computing systems, optoelectronic synapses must be scaled down



Optoelectronic Devices for In-Sensor Computing

More specifically, we explore the resistive switching mechanisms of optoelectronic devices, classifying them into nonvolatile and volatile devices. Finally, we provide a perspective on



Integrated photonic neuromorphic computing: opportunities and

Neuromorphic photonics is an emerging computing platform that addresses the growing computational demands of modern society. We review advances in integrated neuromorphic

Optoelectronic Devices for In-Sensor Computing

The underlying resistive switching mechanisms of volatile/nonvolatile optoelectronic devices and their processing operations are explored. Finally, a perspective on the future



GENIO: Synergizing Edge Computing with

GENIO is a joint industry-academia R& D project that aims to seamlessly integrate edge computing with PON high-speed broadband networks, overcome existing barriers, and bridge the



Chinese research team proposes "Future" chip:

In this small chip, the Tsinghua University research team creatively proposed an optoelectronic deep fusion computing framework.



Large-scale neuromorphic optoelectronic computing with a

Linear diffractive structures are by themselves passive systems but researchers here exploit the non-linearity of a photodetector to realize a reconfigurable diffractive 'processing' unit

Optical neural networks: progress and challenges

The development of neural network technology relies on massive data, advanced algorithms, high computing power, and contemporary social demands.



2. Imported design is convenient for expansion.

The design of two inlets saves space and allows for rear line entry.

Stacking the future of heterogeneous optoelectronics

Commercial adoption of flatland optoelectronics has already begun, from liftoff GaAs thin-film solar cells to integrated graphene photonic transceivers



Optoelectronic Computing-LIMIT Tsinghua University

Our works opened up new paths for exploring high-performance intelligent computing in the post-Moore era, which would be propelling a range of areas such as autonomous driving, edge



Recent Advances in Optoelectronic Synaptic Devices for

By consolidating recent developments, this paper provides insights into the potential of optoelectronic synaptic devices for next-generation computing

Optical neural networks: progress and challenges

diffractive processing unit (DPU), as shown in Fig. 8a, based on which an optoelectronic fusion computing architecture can be constructed, and this architecture can support different neural



Realizing Photonics-Electronics-Convergence technology! List of

Towards realizing high-density wiring in next-generation data centers As the evolution of optical communication technology accelerates, the demand for higher speeds and larger capacities



Researching , Advances of Optical Computing and Optoelectronic

Interdisciplinary collaborations and investments in cutting-edge technologies are expected to be key in revealing the full potential of optical computing and ushering in a new era of AI.



Photonic chip integrates sensing and computing for

The researchers are now working to improve the sensing-computing OPCA chip to further enhance computational performance while also being

Optoelectronics' quantum leap: Unveiling the breakthroughs driving

This review explores the exceptional growth of optoelectronics and the pivotal breakthroughs that have led to a quantum leap in its capabilities. Novel materials, including two



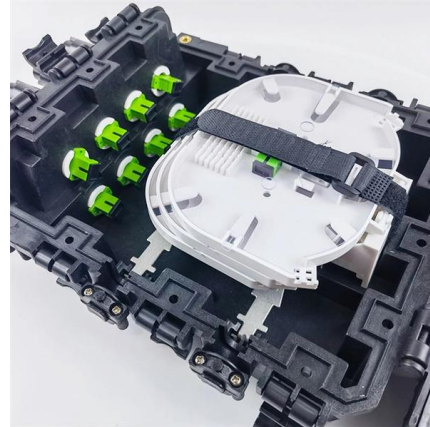
Optoelectronic polymer memristors with dynamic control for power

The continuous advance of edge computing underscores the necessity to construct analogue in-sensor nodes using ultralow-power electronics, combined with recon gurable dynamics and promising



Bio-inspired optoelectronic devices and systems for energy

This review proposes bio-inspired energy-efficient in-sensor computing utilizing emerging optoelectronic memristors, examining neural network architectures (fully connected/convolutional)



GENIO: Synergizing Edge Computing with Optical Network

However, edgecomputing platforms still face challenges relatedto resource constraints, connectivity, and security.We present GENIO, a novel platform thatintegrates edge computing within existing

On-chip optoelectronic logic gates operating in the telecom band

Integrating multiple silicon waveguides with black phosphorus enables the realization of a variety of optoelectronic logic gates operating at 1.55 um.



3D Integration of functionally diverse 2D materials for

In short, we demonstrate the benefits of near-sensor and in-memory computing using 3D architecture for better information processing and for



Photonic edge intelligence chip for multi-modal sensing

Edge devices require real-time processing of high-throughput analog signals. Here, authors present a photonic intelligence chip that fuses multiple analog signal types into optical



Photonic edge intelligence chip for multi-modal sensing

Here, we present a photonic edge intelligence chip (PEIC) that fuses multiple analog modalities--images, spectra, and radio-frequency signals--into broad optical spectra for single-fiber

Micromachines , Special Issue : Optoelectronic Fusion

It will allow for the multi-functional integration of communications, sensing, and computing chips, as well as optoelectronic intelligent chips, promoting innovation



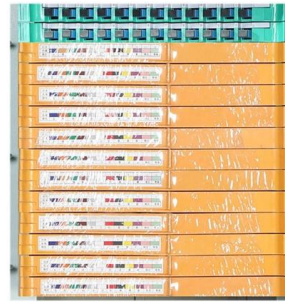
Micromachines , Special Issue : Optoelectronic Fusion

Accordingly, this Special Issue aims to present research papers, communications, and review articles focusing on heterogeneous multi-dimensional fusion



Edge intelligence through in-sensor and near-sensor

Abstract Artificial intelligence technology transforms traditional sensors from passive data collectors into active computing nodes, performing data



Stacking the future of heterogeneous optoelectronics

Layer transfer of functional materials has not only addressed the limitations of heterogeneous integrations in traditional optoelectronics but has

Edge computing technologies: A comprehensive review and future

Edge computing has emerged as a transformative paradigm in the world of computing, offering promising solutions to the ever-increasing demand for low-latency, high-performance, and



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