Energy-Efficient All-Optical Nanophotonic Computing

Tech ID: 28912 / UC Case 2018-049-0

ABSTRACT

Researchers at the University of California, Davis, have developed a new computing and signal processing platform based on nanophotonics and nanoelectronics to decrease power consumption and improve overall computing speed with all-optical inputs and outputs.

FULL DESCRIPTION

Conventional computing, telecom, and signal processing systems utilize technologies that are susceptible to typical electronic pitfalls such as high power consumption and limited operation speed. Although other technologies, like machine learning systems and neuromorphic computing systems, are effective, they are susceptible to these same issues, which continue to reduce overall efficiency.

Researchers at the University of California, Davis have developed a novel computing and signal processing platform to significantly reduce power consumption and overall computing speed. This new method employs nanophotonics integrated with nanoelectronics to allow for all-optical inputs and outputs. By using all optical connections, the platform eliminates the impedance problems caused by electronic circuits. Additionally, the speed of processors and memory is improved while power consumption is reduced by 1000x compared to other electronic approaches.

APPLICATIONS

- Computing, telecom, and signal processing
- Machine learning systems
- Neuromorphic computing systems

FEATURES/BENEFITS

- Reduces power consumption by 1000x compared to electronic approaches
- Improves computing speed
- Used as a building block for future computing, telecom, and signal processing systems
- Avoids need of repeaters

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,144,821	10/12/2021	2018-049

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INVENTORS

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OTHER INFORMATION

KEYWORDS

neuromorphic, signal processing, nanoelectronics, nanophotonics, power consumption, machine learning, computing systems

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Communications**
  - Networking
  - Optical
  - Other
- **Computer**
  - Other

RELATED CASES

2018-049-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Higher-Speed and More Energy-Efficient Signal Processing Platform for Neural Networks
- Crystal Orientation Optimized Optical Frequency Shifter
- Hyperspectral Compressive Imaging
- Athermal Nanophotonic Lasers
- Photonic-Electronic Convolutional Neural Networks

- Ultra-High Resolution Multi-Platform Heterodyne Optical Imaging
- Multi-Wavelength, Laser Array
- Optical Interposers for Embedded Photonics Integration
- Ultrahigh-Bandwidth Low-Latency Reconfigurable Memory Interconnects by Wavelength Routing
- Development of a CMOS-Compatible, Nano-photonic, Laser
- Energy Efficient and Scalable Reconfigurable All-to-All Switching Architecture
- Compressive High-Speed Optical Transceiver
- All-Optical Regenerators
- Tensorized Optical Neural Network Architecture
- Silicon Based Chirped Grating Emitter for Uniform Power Emission
- All-To-All Interconnection With Wavelength Routing Devices
- 3D Photonic and Electronic Neuromorphic Artificial Intelligence
- Adapting Existing Computer Networks to a Quantum-Based Internet Future

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