plasmoniac.eu

Consortium

10 partners

7 countries

4 universities

2 R&D centers

4 companies

energy- and size-efficient ultra-fast plasmonic circuits for neuromorphic computing architectures

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Factsheet

Grant agreement: 871391
Programme: Horizon 2020
Work Programme 2018-2020
Information and Communication Technologies
Unconventional Nanoelectronics
Duration: 01/01/2020 – 31/12/2022 (36 Months)
Budget: Overall Cost: € 4,114,926.25
EU Contribution: € 3,999,458.75
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Consortium:
Aristotle University of Thessaloniki (GR)
University of Southampton (UK)
Swiss Federal Institute of Technology in Zurich (CH)
University of Burgundy - Franche-Comté (FR)
French National Center for Scientific Research (FR)
Interuniversity Microelectronics Centre IMEC (BE)
IBM Research GmbH (CH)
AMO GmbH (DE)
Mellanox Technologies Ltd (IL)
VPIphotonics GmbH (DE)

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Horizon 2020
EU Funding Programme

ICT-Leadership in
Enabling and Industrial Technologies
LEIT Work Programme

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energy- and size-efficient ultra-fast plasmonic circuits for neuromorphic computing architectures

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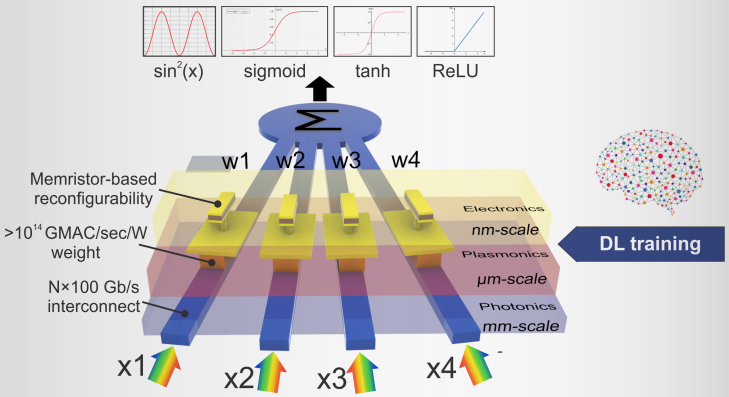
about

concept & vision

plasmoniAC invests in neuromorphic computing towards sustaining processing power and energy efficiency scaling, adopting the best-in-class material and technology platforms for optimizing computational power, size and energy at every of its constituent functions.



mission & aim

plasmoniAC aims to take advantage of **plasmonics**, a natural platform for synergizing photonic-level bandwidths with electronic-level sizes within an ultra-high energy efficiency envelope, towards deploying and demonstrating a **neuromorphic platform** with unprecedented performance.

The goal of plasmoniAC is to release a whole new class of energy- and size-efficient **feed-forward** and **recurrent** artificial **plasmonic neurons** operating at up to 100 GHz clock frequencies and with up to 1 and 6 orders of magnitude better energy- and footprint-efficiencies comparing to the current electronics-based state-of-the-art, embracing them into a properly adapted Deep Learning training model suite and ultimately employing in IT security-oriented applications.

objectives

hardware

plasmoniAC targets to:

→ develop a powerful 3D co-integration platform blending:
- photonics for interconnections;
- CMOS-compatible plasmonics for computation;
- non-volatile memristor-based weights;

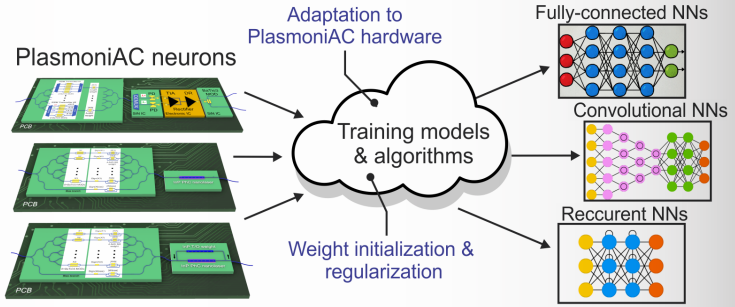
→ fabricate 100 Gb/s linear plasmonic neurons;

→ deploy a whole new class of activation modules;

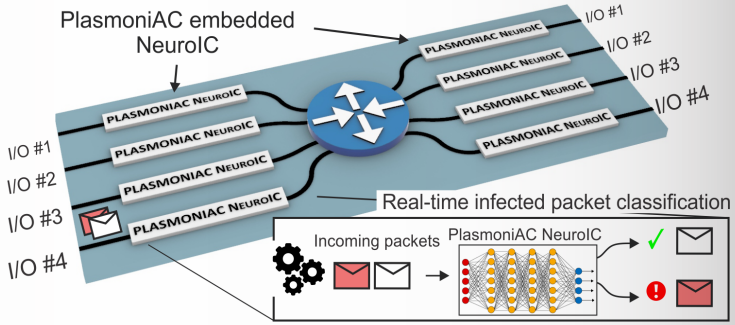
→ demonstrate a full-set of sin²(x), ReLU, sigmoid and tanh plasmonic feed-forward and recurrent neurons;

→ deliver a neuromorphic plasmonic software design library.

software & training



application

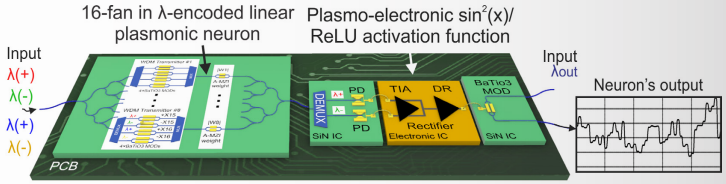


validation

feed-forward WDM-accelerated sin²(x) & ReLU plasmo-electronic neuron

target

operating frequency	100 GHz
energy-efficiency	1.7×10³ GMAC/s/W
footprint-efficiency	10⁸ MMAC/s/cm²



Feed-forward sigmoid & tanh(x) and recurrent plasmo-photonic neuron

target

operating frequency	50 GHz
energy-efficiency	9×10³ GMAC/s/W
footprint-efficiency	7×10⁸ MMAC/s/cm²