EU H2020 NEURONN: Two-Dimensional Oscillatory Neural Networks for Energy Efficient Neuromorphic Computing


To cite this version:


HAL Id: lirmm-03024126
https://hal-lirmm.ccsd.cnrs.fr/lirmm-03024126
Submitted on 25 Nov 2020
EU H2020 NEURONN: Two-Dimensional Oscillatory Neural Networks for Energy Efficient Neuromorphic Computing

Aida Todri-Sanial 1, Stefania Carapezzi 1, Corentin Delacour 1, Madeleine Abernot 1, Eirini Karachristou 1, Thierry Gil 1, Nadine Azemard 1, Jérémie Salles 1, Siegfried Karg 2, Elisabetta Corti 2, Bernabé Linarres Barranco 3, Maria J. Avedillo 3, Teresa Serrano-Gotarredona 3, Juan Núñez Martínez 3, Luis A. Camuñas Mesa 3, Jafar Shamsi 3, Manuel Jiménez Través 3, Armin Klumpp 4, Jamila Boudaden 4, 5, Théophile Gonos 6, Tanguy Hardelin 6, Marie Durieu 6, Ahmed Nejim 7, Slobodan Mijalkovic 7

1 Microelectronics Department, LIRMM, University of Montpellier, CNRS, Montpellier, France; 2 Department of Science and Technology, IBM Research–Zurich, 8803 Ruschlikon, Switzerland 3 Instituto de Microelectrónica de Sevilla, IMSE-CNMS (CSIC, Universidad de Sevilla), Sevilla, Spain; 4 Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT, Silicon Technologies and Devices, Munich, Germany; 5 Institute of Electronic and Sensor Materials, TU Bergakademie Freiberg, Freiberg, Germany; 6 A.I.MERGENCE(https://www.ai-mergence.com/fr/); 7 Silvaco Europe, Cambridge, UK

Abstract:
Neuro-inspired computing employs technologies that enable brain-inspired computing hardware for more efficient and adaptive intelligent systems. Mimicking the human brain and nervous system, these computing architectures are excellent candidates for solving complex and large-scale associative learning problems. The EU-funded NeurONN project will showcase a novel and alternative neuromorphic computing paradigm based on energy-efficient devices and architectures.

In the novel neuro-inspired computing architecture, information will be encoded in the phase of coupled oscillating neurons or oscillatory neural networks. The VO$_2$ metal insulator transition devices will emulate biological neurons and are expected to be 250 times more efficient than the state-of-the-art digital CMOS based oscillators.