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NeurONN: A Novel Paradigm in Neuromorphic Computing for Artificial Intelligence at the Edge

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The European H2020 NeurONN project (www.neuronn.eu) is dedicated to implementing a novel brain-mimicking paradigm based on Oscillatory Neural Network (ONN) computing systems [1-2]. In the ONN architecture, vanadium dioxide-based oscillators are used to emulate “neurons” and molybdenum disulfide (MoS₂) memristors to emulate “synapses”. The goal is to realize original energy-efficient neuromorphic structures for “Artificial Intelligence at the Edge” devices (e.g. IoT applications, autonomous driving systems, medical implanted devices, robotics, etc....). The innovative computing paradigm with ONN hardware is embodied in the encoding of information in the phase of oscillations rather than in their amplitude, allowing for a remarkable reduction of power consumption.

References:

- [1] F. C. Hoppensteadt and E. M. Izhikevich, Pattern recognition via synchronization in phase-locked loop neural networks, IEEE Transactions on Neural Networks, vol. 11, no. 3, pp. 734-738, 2000.
- [2] D. Wang, D. Terman, Locally excitatory globally inhibitory oscillator networks, IEEE transactions on neural networks, vol. 6, no. 1, pp. 283-286, 1995.