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

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



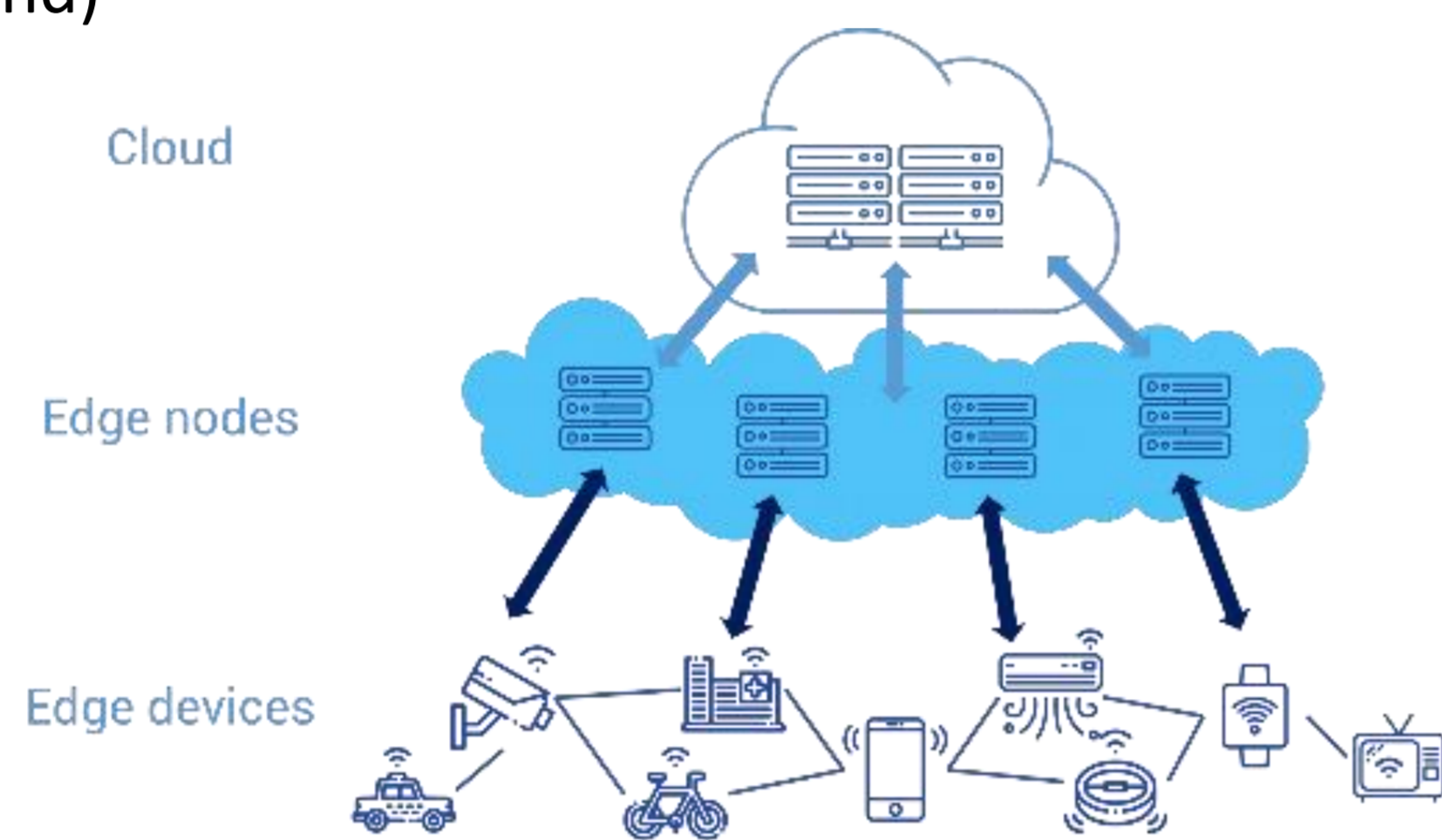
Aida Todri-Sanial ¹, Thierry Gil ¹, Nadine Azemard ¹, Jérémie Salles ¹, Eirini Karachristou ¹, Stefania Carapezzi ¹, Madeleine Abernot ¹, Corentin Delacour ¹, Siegfried Karg ², Elisabetta Corti ², Bernabé Linares Barranco ³, Maria J. Avedillo ³, Teresa Serrano-Gotarredona ³, Juan Núñez Martínez ³, Luis 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, Evgenii Kurylin ⁶, Alexandre Magueresse ⁶, Ahmed Nejim ⁷, Slobodan Mijalkovic ⁷

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MOTIVATION AND GOALS

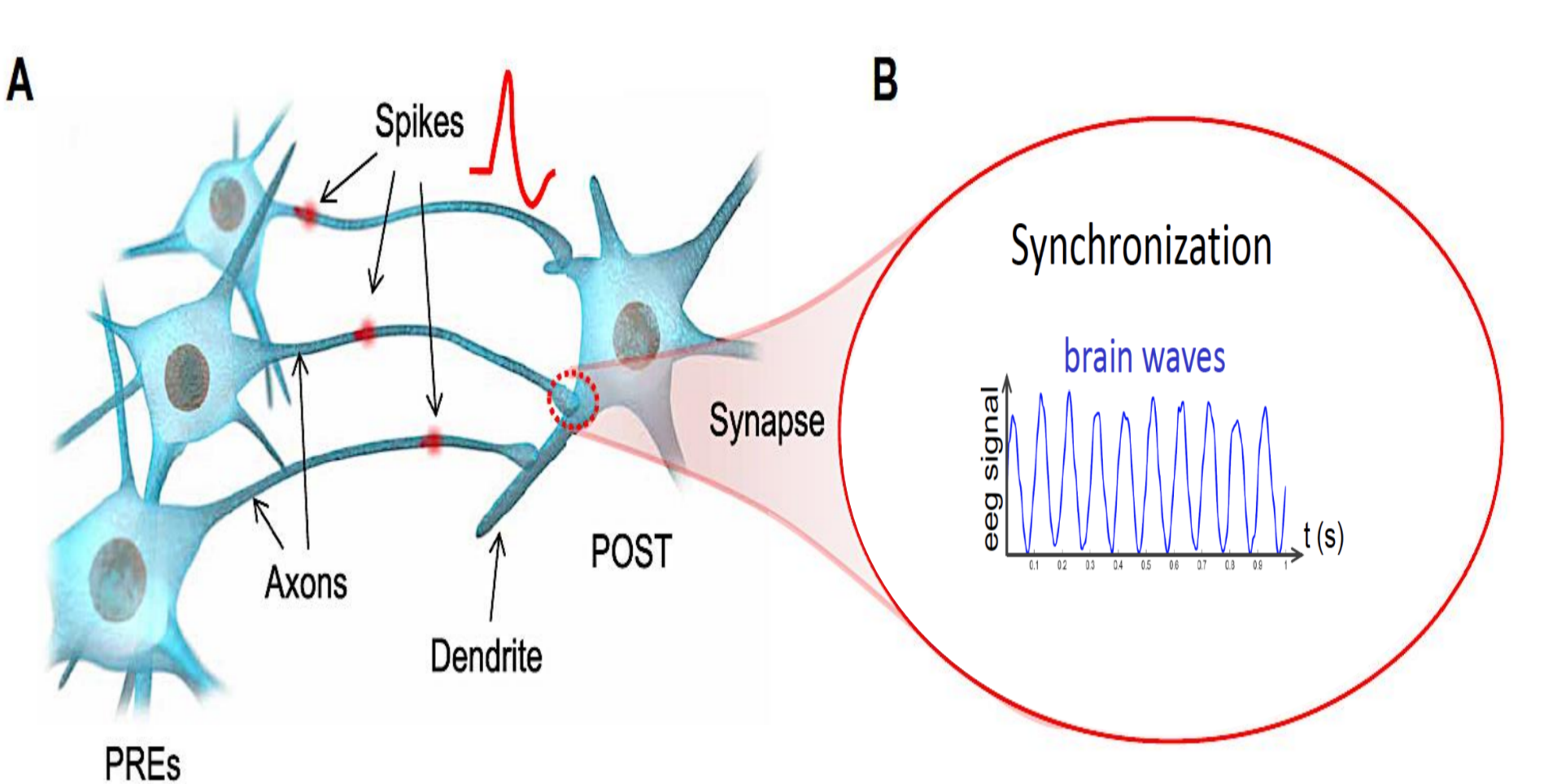
ARTIFICIAL INTELLIGENCE AT THE EDGE

- Bandwidth (inference/second)
- Latency (frames/second)
- Privacy concerns
- Power consumption



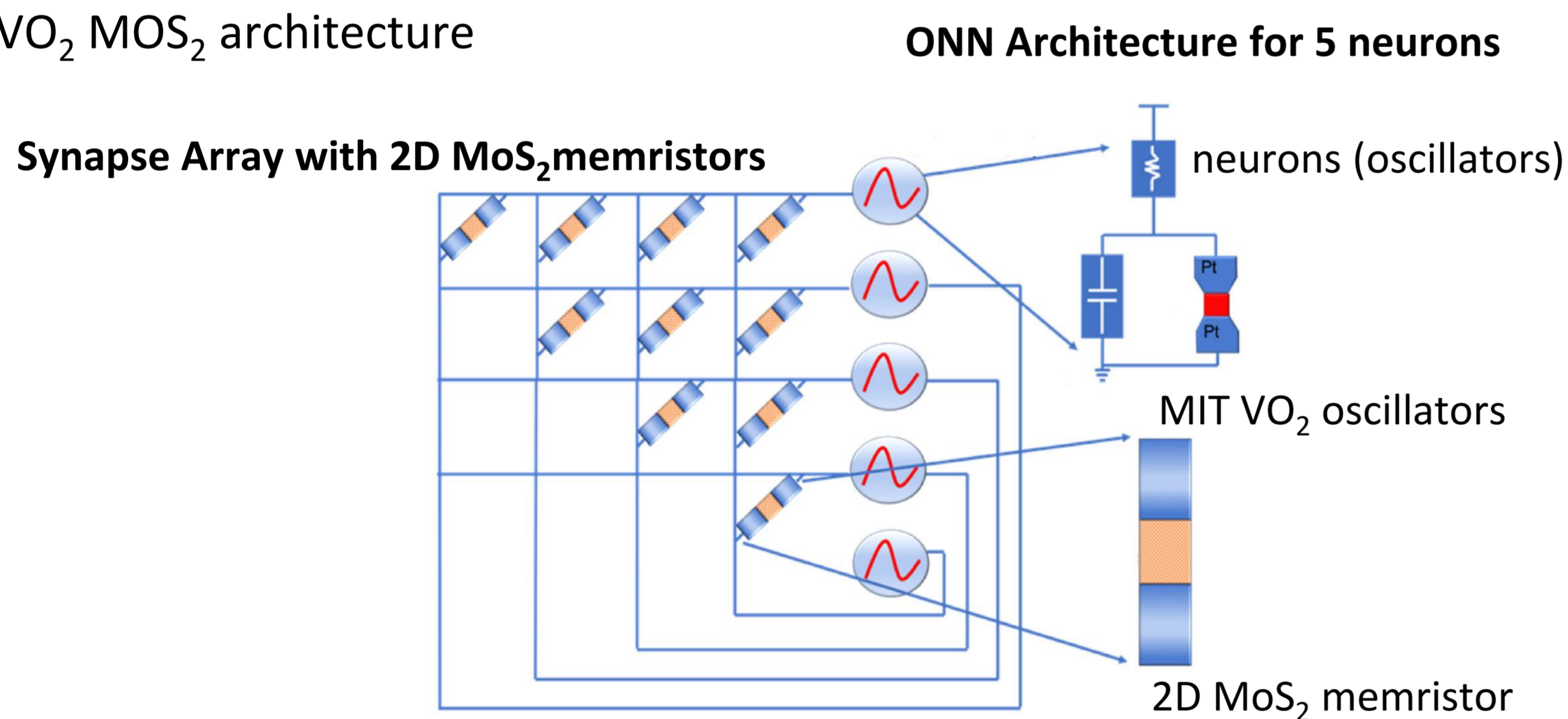
NEUROMORPHIC COMPUTING

- Support online learning
- Excellent inference engine A
- Low power consumption
- Scalable/low cost



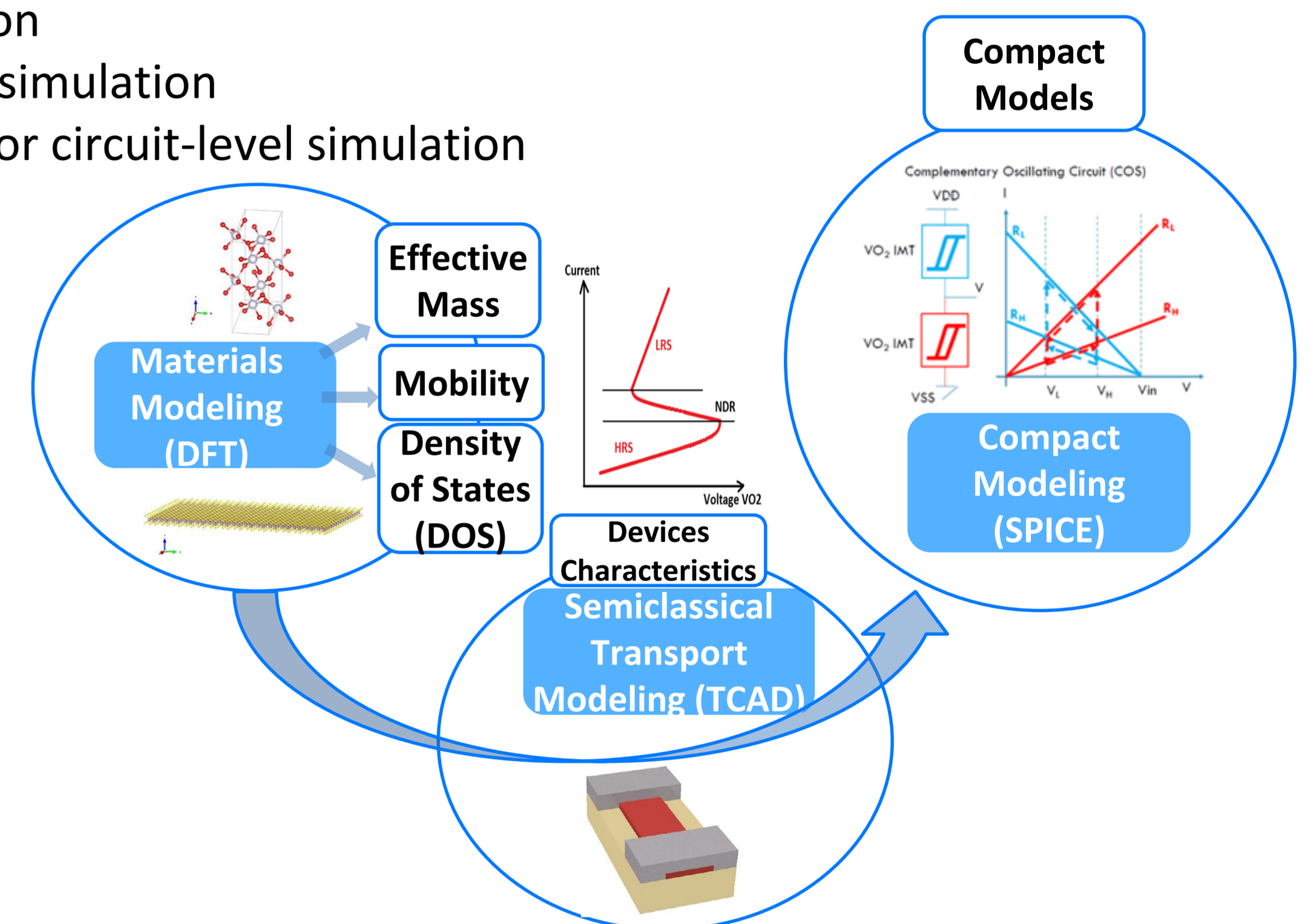
WP1: NOVEL COMPUTING DEVICES AND CIRCUITS

- VO₂ oscillator devices emulating neurons
- MoS₂ memristor devices emulating synapses
- Co-integration of VO₂ and MoS₂ devices
- ONN VO₂ MoS₂ architecture



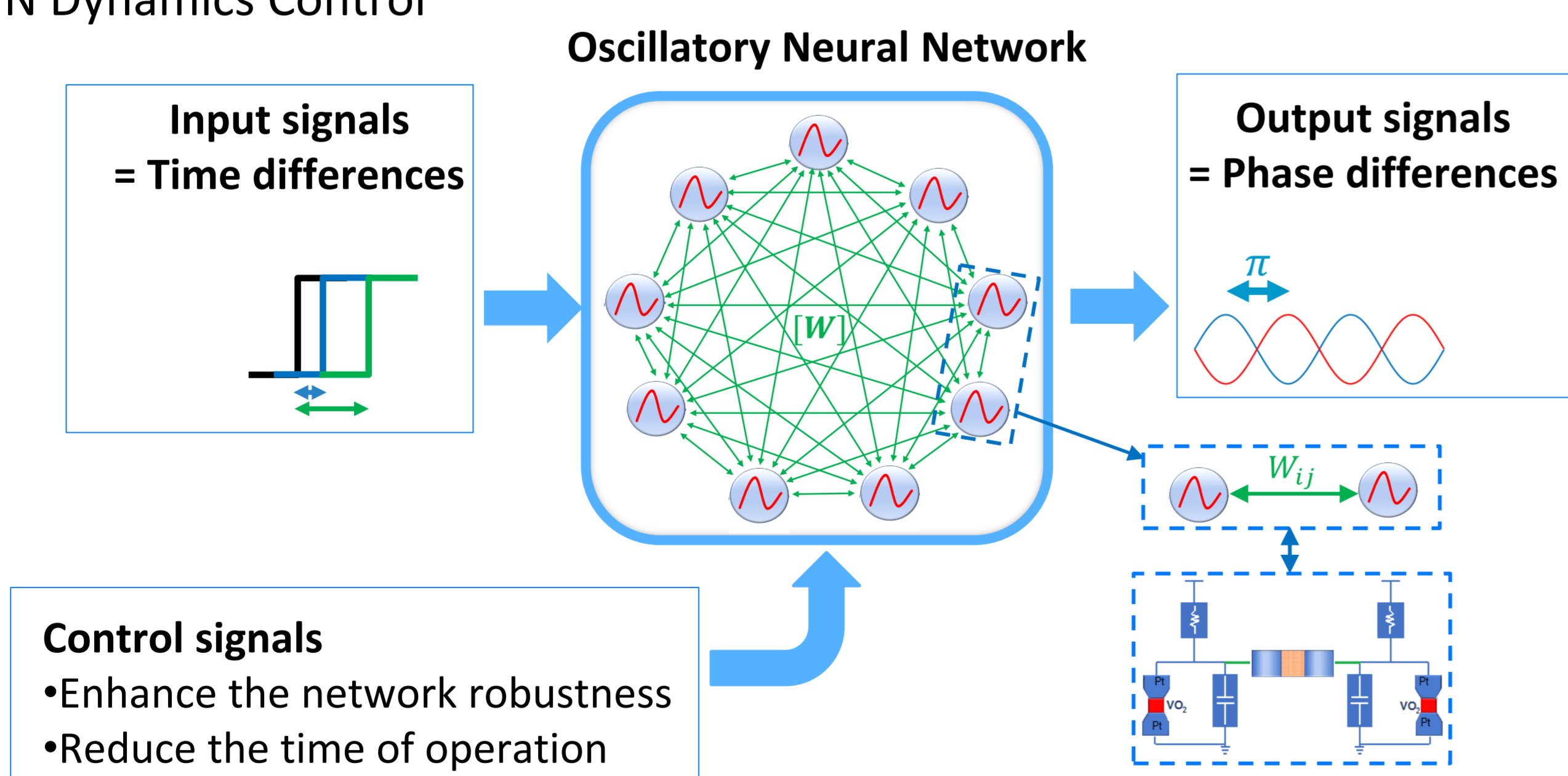
WP2: ADVANCED DESIGN METHODS

- Atomistic simulation
- TCAD device-level simulation
- Compact-models for circuit-level simulation



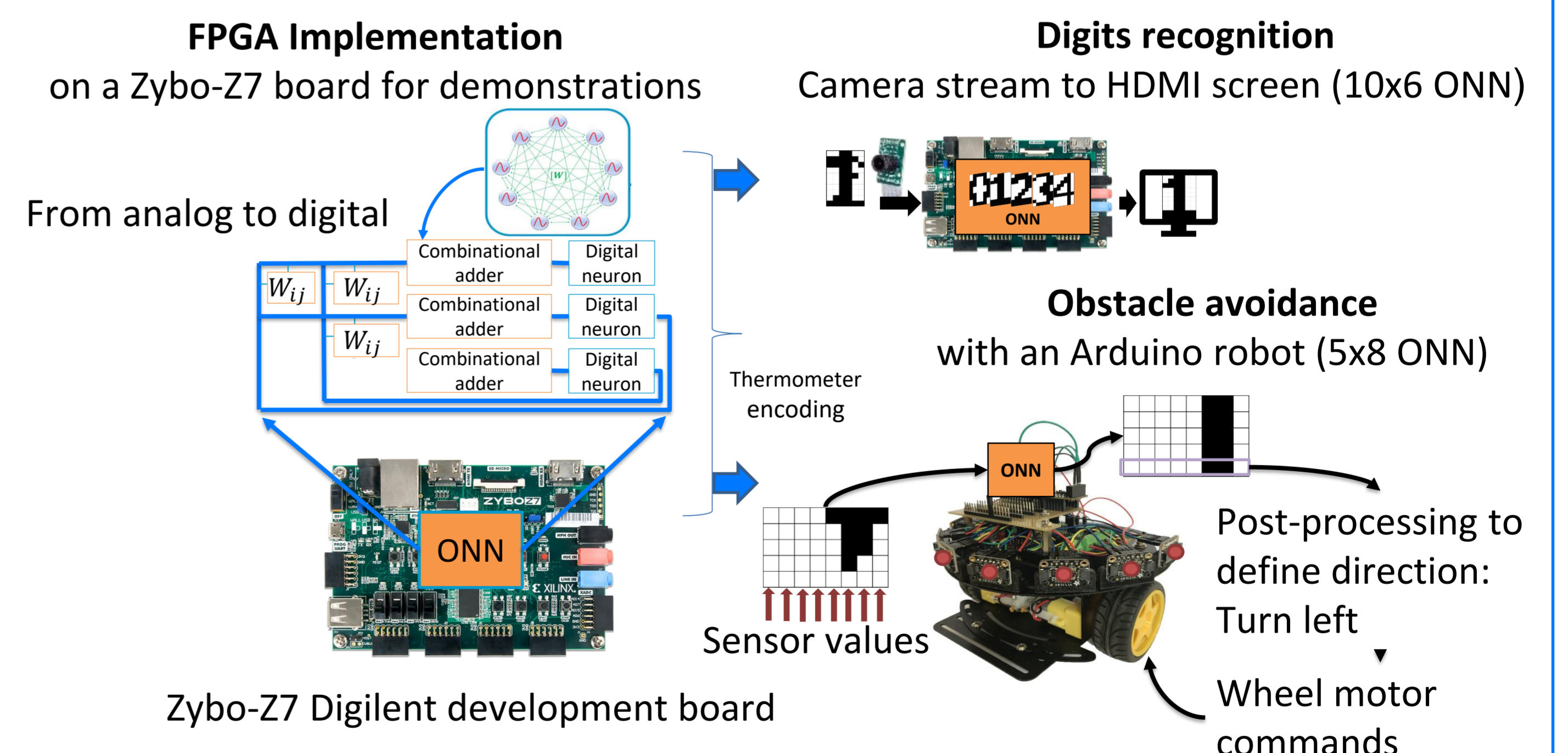
WP3: ARCHITECTURE AND DESIGN SPACE EXPLORATION

- Energy-efficient Analog ONN Architecture Design
- ONN Dynamics Control



WP4: DEMONSTRATOS AND USE CASES

- Digital ONN Implementation on FPGA



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