

Neuromorphic computing with NSRAM cells

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The semiconductor industry is experiencing an accelerated transformation to overcome the scaling limits of the transistor and to adapt to new requirements in terms of data storage and computation, especially driven by artificial intelligence applications and the internet of things. Within this process, new materials, devices, integration strategies, and system architectures are being developed and optimized. In this talk, I will present how silicon CMOS transistors operated on the verge of punch-through impact ionization can be used to emulate neural and synaptic behaviours while providing a massive area reduction compared to other solutions. I will also present a 2-transistors cell called Neuro-Synaptic Random Access Memory (NSRAM), which exhibits adjustable neural and synaptic response with a yield of 100% and an ultra-low device-to-device variability, and it represents a short-term solution for the implementation of efficient artificial neural networks. More information can be found in our recent publication: S. Pazos et al. **Nature** 640, 69–76 (2025), <https://doi.org/10.1038/s41586-025-08742-4>.