Centre de Nanosciences & de Nanotechnologies

Seminar

Wednesday May 4th - 11h00

Amphithéâtre du C2N

"Magnetic Josephson junctions for artificial synapses"

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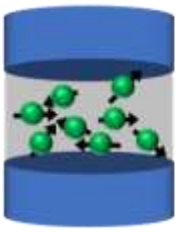
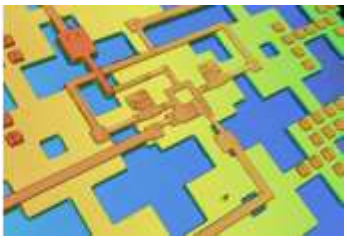
The performance of artificial intelligence (AI) technologies has improved significantly over the last decade in such a way that AI is now everywhere in our daily life via software neural networks. However, this continual growth in computational performance of these networks comes with large increases in the computational time and energy needed to train them. Developing AI at the hardware level has the potential to bend this curve and provide fast and lower energy computing. In this talk, I will present a new hybrid magnetic-superconducting device that can be used as an artificial synapse in neuromorphic circuits. The device is a magnetic Josephson Junction that consists of a barrier of magnetic nanoclusters between two Nb electrodes. The critical current of these junctions can be tuned by varying the magnetic order of the clusters, which can be used to perform synaptic weighting. I will describe the properties of the MJJ and show that its synaptic properties can be obtained in different material systems with an energy cost as low as 10^{-19}J. Finally, I will present circuit simulations where MJJs are included in a neural network for image recognition operating at speeds over 100 GHz, and show some preliminary experimental validation of the simulations..





Dr. Emilie Jué is an Associate of the National Institute of Standards and Technology (NIST) and a Research Associate at the University of Colorado Boulder. She obtained her PhD from the University of Grenoble with SPINTEC in 2013, after which she did a post doc at NIST-Boulder. Her current research focuses on spintronic devices for neuromorphic applications at the hardware level. She is a Senior Member of IEEE and is currently the chair of the IEEE magnetics Rocky Mountain chapter.