Centre de Nanosciences & de Nanotechnologies

Seminar

Wednesday April 20th - 15h00

Amphithéâtre du C2N

"Combining brain-inspired principles and emerging device technologies to build new computing systems."

John Paul Strachan

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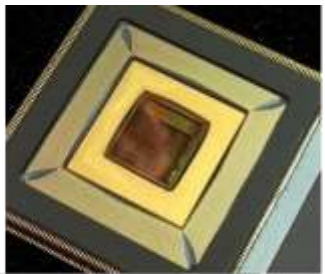
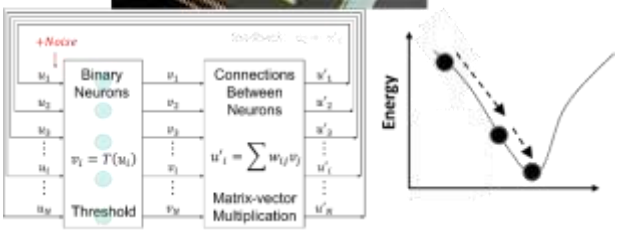
After approximately 100 years of engineering computers, humans have reached performance that rivals biological brains in many ways, while exceeding it in sheer number-crunching capacity. Yet, we took a very different path from biology, and there remains a huge advantage in energy-efficiency for biological information processing systems. I will discuss our work to copy some of biology's tricks to build more efficient computers and tackle some of today's hardest problems. This means re-visiting the design of computers from the bottom (devices) all the way up (algorithms). In one area, we are exploring computers augmented with "associative memories" for storing and retrieving complex patterns at low area and power consumption. Such an alternative to RAM speeds-up operations in genomics, security, and tree-based machine learning. In another area, we use the stochastic analog operations in neural network dynamics to more quickly find the solutions to intractable Optimization problems, forecasting significant improvement over traditional and emerging compute technologies. Finally, if time permits, I will describe the precision challenges that computing in analog systems poses, and the potential for methods such as analog error-correcting coding.





John Paul Strachan directs the Peter Grünberg Institute on Neuromorphic Compute Nodes (PGI-14) at Forschungszentrum Jülich and is a Professor at RWTH Aachen. Previously he led the Emerging Accelerators team as a Distinguished Technologist at Hewlett Packard Labs, HPE. His teams explore novel types of hardware accelerators using emerging device technologies, with expertise spanning materials, device physics, circuits, architectures, benchmarking and building prototype systems. Applications of interest include machine learning, network security, and optimization. John Paul has degrees in physics and electrical engineering from MIT and a PhD in applied physics from Stanford University. He has over 50 patents, has authored or co-authored over 90 peer-reviewed papers. He previously worked on nanomagnetic devices for memory for which he was awarded the Falicov Award from the American Vacuum Society, and has developed sensing systems for precision agriculture in a company which he co-founded.