MIM WEBINARS

AN IN-MEMORY COMPUTING SERIES

Next Talk: 05/July/2021, 4-5:30pm CET

IN-MEMORY COMPUTING WITH IMPERFECT OR UNRELIABLE MEMORY DEVICES

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The emergence of novel memories, such as memristors or resistive memory (RRAM), opens the way to highly energy-efficient computation, near- or in-memory. However, this type of computation has to deal with the severe unreliability of these new memories. Conventionally, the industry uses formal error correction codes (ECC) to eliminate the errors of imperfect devices. However, using ECC would ruin most of the benefits of in-memory computation. In this talk, I will present several approaches to compute in-memory with unreliable devices and without ECC, going from relatively conventional approaches to radical ideas exploiting device imperfections. First, I will present a manufactured differential CMOS/RRAM memory architecture, inspired by the architecture of animal brains, and suitable for neural network implementation without formal ECC. Measurements on this array highlight that using highly error-prone programming conditions may only slightly reduce network accuracy while bringing important benefits in terms of energy efficiency. Second, I will present an approach where the variability of memristors, instead of being mitigated, can be fully exploited to implement a type of probabilistic learning. The inherent variability of memristors can naturally implement the sampling step in the Metropolis-Hastings Markov Chain Monte Carlo algorithm. We have, for example, trained an array of 16,384 memristors experimentally to recognize images of cancerous tissues using this technique. These results highlight the interest in fully embracing the unreliable nature of emerging devices in neuromorphic designs.

More information about the event and the speaker:
https://www.ict.tuwien.ac.at/staff/taherinejad/MiM/next.html

Mondays in Memory (MIM) is a free biweekly webinar series open to everyone around the world and dedicated to all aspects and technologies related to in-memory computing (including, in a broader sense, near-memory computing too). MIM will be held on the first and third Monday of each month (starting in May 2021) at 4pm CET (7am Pacific time, and 10pm Beijing time).
Each webinar starts with a 40mins talk by a speaker, followed up with a 40mins questions and discussions with the speaker and two panel members. Dr. Nima Taherinejad hosts the webinars, and together with his team they organize the MiM series.

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Damien Querlioz

is a CNRS Researcher at the Centre de Nanosciences et de Nanotechnologies of Université Paris-Saclay. His research focuses on novel usages of emerging non-volatile memory and other nanodevices, in particular relying on inspirations from biology and machine learning. In 2017, he received the CNRS Bronze medal. He has also been a co-recipient of the 2017 IEEE Guillemin-Cauer Best Paper Award and of the 2018 IEEE Biomedical Circuits and Systems Best Paper Award.

For more information, please see his webpages at
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