Nano Seminar Series

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Computation in Memristors: From Device to System

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Abstract: Recently, computation in memory becomes very hot due to the urgent needs of high computing efficiency in artificial intelligence applications. In contrast to von-neumann architecture, computation in memory technology avoids the data movement between CPU/GPU and memory which could greatly reduce the power consumption. Memristor is one ideal device which could not only store information with multi-bits, but also conduct computing using ohm's law. To make the best use of the memristor in neuromorphic systems, a memristor-friendly architecture and the software-hardware collaborative design methods are essential, and the key problem is how to utilize the memristor's analog behavior. We have designed a generic memristor crossbar based architecture for convolutional neural networks and perceptrons, which take full consideration of the analog characteristics of memristors. Furthermore, we have proposed an online leanring algorithm for memristor based neuromorphic systems which overcomes the varation of memristor cells and endue the system the ability of reinforcement learning based on memristor's analog behavior.

Biography: Dr. Huaqiang Wu is presently the deputy director of the Institute of Microelectronics, Tsinghua University, Beijing, China. Dr. Wu is also served as the director of Micro/Nano Fabrication Center of Tsinghua University and director of Beijing Innovation Center for Future Chips. Dr. Wu received his PhD degree in electrical and computer engineering from Cornell University, Ithaca, NY, in 2005. Prior to that, he graduated from Tsinghua University, Beijing, China, in 2000 with double BS degrees in material science & engineering and enterprise management. From 2006 to 2008, he was a senior engineer and MTS in Spansion LLC, Sunnyvale, CA. He joined the Institute of Microelectronics, Tsinghua University in 2009. His research interests include emerging memory and neuromorphic computing technologies. Dr. Wu has published more than 100 technical papers and owns more than 90 US and China patents. Dr. Wu is the PI/Co-PI for more than 20 major national research projects. Dr. Wu has wide collaborations with companies worldwide including Samsung, SK Hynix, Applied Materials, Lam Research, Cisco, SMIC, Gigadevice, etc. Dr. Wu was the recipient of China Industry University Research Cooperation Innovation Award and Beijing Outstanding Young Talent Award.

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