

Tools and Concepts for Neuromorphic Inference Accelerators with Mixed-signal In-Memory Computing

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A major obstacle for the adoption of neural networks at the edge and near the sensors is due to their high computational requirements. The presented approach is based on novel neuromorphic edge-AI accelerators using mixed-signal in-memory-computing. This approach comes with challenges that require hardware/software co-design and a dedicated workflow. For this purpose, we have developed several tools to facilitate design, training and deployment of artificial neural networks in the mixed-signal hardware accelerators. These tools provide hardware-aware training, automatic hardware generation, compilers, estimation of KPIs like energy consumption and latency, and simulation under consideration of the constraints imposed by the targeted hardware implementation and use cases. The development of such a tool chain is a multidisciplinary effort combining neural network algorithm design, software development and integrated circuit design. We show how such a toolchain allows to optimize and verify the hardware design, reach the targeted KPIs, and reduce the time-to-market.

