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ANNA: A Reconfigurable and Programmable Analog Neural Network ASIC

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Abstract

As neural networks become increasingly integrated into all aspects of technology and everyday life, the need for faster and more energy-efficient computation has become essential. Analog Neural Networks (ANNs) have emerged as a possible solution, offering improvements in power efficiency compared to their digital counterparts. In front-end analog signal processing, embedding ANNs directly into the acquisition pipeline enables the elimination of bulky ADCs and FPGAs, reducing both power consumption and system complexity. This is beneficial in sensor-intensive applications like PET and SPECT. Last year, we introduced the concept of ANNA, an ASIC designed to predict the interaction coordinates of gamma rays within a monolithic scintillator in radiation detectors. This year, we present the architectural advances that allow this new ASIC to be reconfigurable to accommodate a variety of applications. In addition, we report simulation results to validate the correct operation and demonstrate the practical feasibility of the proposed ASIC.

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