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"8-bit Precision In-Memory Multiplication with Projected Phase-Change Memory"

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In-memory computing is an emerging non-von Neumann approach in which certain computational tasks such as matrix-vector multiplication are performed using resistive memory devices organized in a crossbar array. However, the conductance variations associated with the memory devices limit the precision of this computation. Here, we demonstrate that the so-called projected phase-change memory (Proj-PCM) devices can achieve 8-bit precision while performing scalar multiplication. The devices were fabricated and characterized using electrical measurements and STEM investigation. They are found to be remarkably immune to conductance variations arising from structural relaxation, 1/f noise and temperature variations. Moreover, it is possible to compensate for the temperature-dependent conductance variations in a crossbar array using a simple model. Finally, we experimentally demonstrate a neural network-based image classification task involving 30 such Proj-PCM devices.

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