

# Executing state machines within a memristor-based memory

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## **Background:**

Nowadays, the performance of computer systems is significantly limited by the speed of the memory. Data transportation between the memory and the processor is time consuming and wasteful in energy.

One of the leading ideas for solving these issues is to transfer part of the processing capabilities of the processor into the memory itself. For data-intensive applications, this means a significant increase in computing processing power, while saving a significant amount of time and energy.

A new computer architecture approach, based on a memristor-based memory, enables performing computations within the memory.

The memristor is a passive circuit element, predicted in 1971 by the circuit theorist Leon Chua. The first prototype of this element was unveiled in 2008 by HP labs. The device remembers its history, by varying its own resistance, so it can be used for memory applications. It also enables the formation of basic logic circuits, based on the MAGIC logic gate. The combine of memory with logic enables to perform logic operations within the memory itself, thus to explore advanced non-von Neumann architectures.

## **Project description:**

In this project, the students will design and implement an algorithm for executing state machines within a memristor-based memory. Such a novel method enables to implement a processor within the memory, thus eliminate the need for an external processor in small systems, and therefore reduces the limitations of today's computer systems.