Problem and Users

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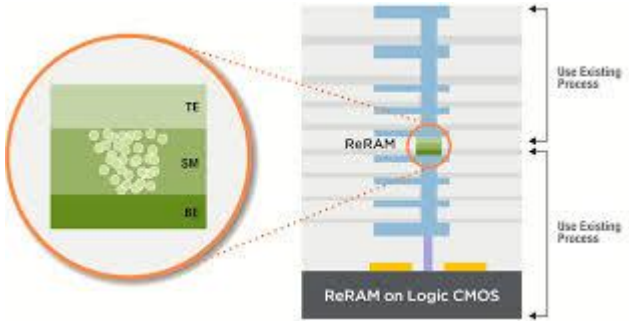
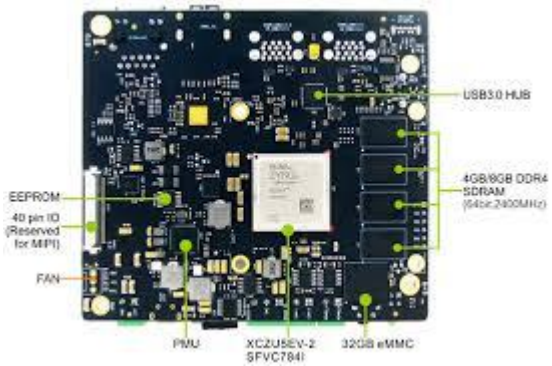
Project Overview

Matrix-vector multiplication(MVM) is the most common operation in most machine learning applications. Performing large numbers of MVM operations takes a lot of time and energy in a typical CPU. This project aims to utilize Resistive Random Access Memory (ReRAM) to perform in-memory MVM computations, which can be dispatched by a CPU, acting as an accelerator for machine learning applications.





Problem Statement

This project aims to develop and evaluate a versatile ReRAM-based chip using the Skywater 130nm process, seeking to enhance matrix vector multiplication performance while addressing the trade-offs of different ReRAM configurations.

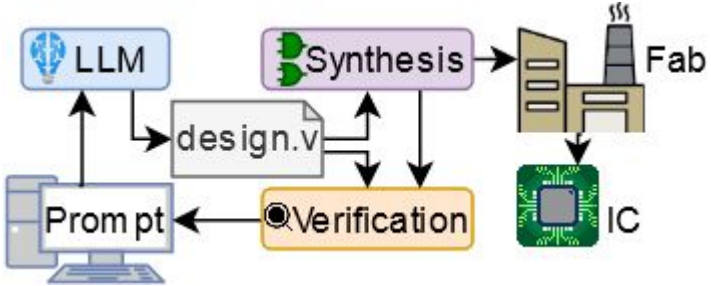
List and Descriptions of Users

- Primary Users
  - Professors (As a learning tool for students)
  - Students (To learn from this tool)
  - Graduate students (A research vehicle)
- Secondary Users
  - ChipForge (For learning purposes and to innovate upon)
- Tertiary Users
  - Public (which will further research in the field and help the field evolve)

Users Needs

The users needs include:

- A research vehicle that will experiment with 4 different architectures of the chips layout
- Tutorials to explain how to use the research vehicle
- C Code for easy interface between the ReRAM cell and the Microcontroller
- Circuit design testbench to see if design works and for other teams to use if needed



Conclusions

In conclusion, developing a comprehensive tool for memory technologies can significantly enhance learning and research for various user groups. By addressing the distinct needs of professors, students, graduate students, Chip Forge, and the public, the tool can facilitate experimentation, education, and innovation in chip architecture.