

EE/CprE/SE 491 WEEKLY REPORT 10

11/15/2024 - 11/21

Group number: *sdmay25-19*

Project title: *ReRAM AI Accelerator*

Client &/Advisor: *Dr. Henry Duwe and Dr. Cheng Wang*

Team Members/Role: *Noah Mack, Olivia Price, Sam Burns, Travis Jakl*

○ Weekly Summary

This week we focused on brainstorming new architecture designs to implement for the project. To accomplish this goal we read about noise and also papers about alternative compute architectures. We have found an analog design textbook as a resource for learning about noise in analog circuits that we will use to inform our design choices moving forward.

○ Past week accomplishments

- Noah Mack: Helped come up with plans for our unique architectures. Started prototyping components in xschem, trying to create a 1T1R ReRAM cell using PMOS and creating a testbench for it.
- Sam Burns: I helped brainstorm design decisions for new architecture designs by performing calculations. I also created testbenches for the PMOS and NMOS 1T1R cells. I spoke with analog faculty to find resources for learning more about analog noise.
- Travis Jakl: Looked into ideas for implementing a new architecture, specifically Multi-Level Cell. This implementation is seemingly a bust, though, as it would be too complex for the scope of this project.
- Olivia Price: Helped with performing calculations for investigating design decisions on potential architectures. Worked on design document as well.

○ Pending issues

- Noah Mack: I am not very familiar with testbenching for analog circuits as a computer engineer. This is a skill that my team will need to help me get better at.

○ Individual contributions

<u>NAME</u>	<u>Individual Contributions</u> (Quick list of contributions. This should be short.)	<u>Hours this week</u>	<u>HOURS cumulative</u>
Noah Mack	Developed ideas for our unique architectures and started testing these ideas.	6	71

Sam Burns	Calculated feasibility of multiple design ideas. Created testbenches for PMOS and NMOS 1T1R cells. Spoke with analog faculty about design choices.	6	71
Travis Jakl	Looked into ideas to implement for a new architecture, specifically Multi-Level Cell.	6	71
Olivia Price	Helped perform calculations to investigate architectures and lead design decisions. Also worked on the design document.	6	71

○ **Plans for the upcoming week**

- Noah Mack: I will contribute to the design document, updating it with our new ideas for our unique architectures. I will also research the true ReRAM crossbar architecture (no transistors) by finding papers and seeing if they have been used for compute in memory applications.
 - Sam Burns: I will work to determine expected behavior of NMOS and PMOS 1T1R cells. I will also read about analog circuit noise to determine design decisions moving forwards. I will attempt to calculate corner frequencies of the PMOS and NMOS transistors on this process given the information from the PDK.
 - Travis Jakl: Put my architecture efforts into reducing noise rather than other aspects of our design.
 - Olivia Price: I will look into TIA designs to improve performance of the system. I will also help with calculations related to informing our architecture designs.

○ **Summary of weekly advisor meeting**

At our meeting this week we discussed the new architectures we are considering and investigating. We also covered some SPICE file issues the Dec24-13 team is facing. Our advisors also told us to prepare for a practice presentation and the design document for after break. We are going to read about sources of noise in analog circuits