

**ECE571: Advanced Microprocessor Design – Homework 8**  
Fall 2024

**Due: Friday 8 November 2024, 12:00pm**

Create a document that contains the answers to the questions below. A .pdf or .txt file is preferred but I can accept MS Office or Libreoffice format if necessary.

1. Read the following article:

- **A Validation of DRAM RAPL Power Measurements**

by Desrochers, Paradis and Weaver

[https://web.eece.maine.edu/~vweaver/projects/rapl/2016\\_memsys\\_rapl.pdf](https://web.eece.maine.edu/~vweaver/projects/rapl/2016_memsys_rapl.pdf)  
(warning, it's a large 13MB download, large graphs)

- Answer the following questions:

- (a) What kind of sensor was using for measuring actual DRAM power?
- (b) What tool was used to measure RAPL results?
- (c) Did the actual results match the DRAM results?
- (d) Why is it harder to measure DDR4 power than DDR3 power?
- (e) What additional experiments do you think could be run that would make this paper better?

2. **Bzip2 memory access summary**

For this section, log into the Haswell-EP machine just like in previous homeworks.

(a) Measure bzip2 memory behavior using perf

```
perf mem record -a \  
/opt/ece571/401.bzip2/bzip2 -k -f ./input.source
```

Note, if the program finishes instantly with an error message, be sure you have `input.source` in your current directory. You can recopy it with

```
cp /opt/ece571/401.bzip2/input.source .
```

(b) Get the memory report by running `perf mem report`

(c) What is the top type of memory load accesses according to this report? (click enter to select loads)

(d) What is the top type of memory store accesses according to this report? (press escape to go back and then go down one to select stores metric)

3. **equake\_1 memory access summary**

(a) Measure equake memory behavior using perf

```
perf mem record -a \  
/opt/ece571/equake_1.speccomp/equake_1 < \  
/opt/ece571/equake_1.speccomp/inp.in
```

- (b) Get the memory report by running `perf mem report`
- (c) What is the top type of memory load accesses according to this report? (click enter to select loads)
- (d) What is the top type of memory store accesses according to this report? (press escape to go back and then go down one to select stores metric)

4. If you have extra time, also read the paper *Power Measurement Techniques on Standard Compute Nodes: A Quantitative Comparison* by Hackenberg, Ilsche, Schöne, Molka, Schmidt and Nagel (ISPASS 2013).

[https://web.eece.maine.edu/~vweaver/classes/ece571\\_2014f/papers/ispass2013-power\\_measurement.pdf](https://web.eece.maine.edu/~vweaver/classes/ece571_2014f/papers/ispass2013-power_measurement.pdf)

5. Submitting your work.

- Create the document containing the answers to the questions asked.
- Please make sure your name appears in the document.
- e-mail the file to me by the homework deadline.