ECE471: Embedded Systems – Homework 10
Energy / Power

Due: Friday 5 December 2025, 5:00pm

For this assignment there is no coding. Please put all of your question answers into a text, pdf, or word document which you then e-mail to me.

Power and Energy (10pts)

Table 1: OpenBLAS HPL N=10000 (Matrix Multiply)

Machine	Processor	Cores	Frequency	Idle Power	Load Power	Time	Total Energy Running MMM
Raspberry Pi 2	Cortex-A7	4	900MHz	1.8W	3.4W	454s	1543J
Dragonboard	Cortex-A53	4	1.2GHz	2.4W	4.7W	241s	1133J
Raspberry Pi 4	Cortex-A72	4	1.5GHz	2.6W	7.3W	88s	642J
Jetson-TX1	Cortex-A57	4	1.9GHz	2.1W	13.4W	47s	629J
Macbook Air	Broadwell	2	1.6GHz	10.0W	29.1W	14s	407J

1. Table 1 shows the energy use of various machines when doing a large Matrix-Matrix multiply.

    (a) Which machine has the lowest under-load power draw?

    (b) Which machine consumes the least amount of energy?

    (c) Which machine computes the result fastest?

2. Consider a use case with an embedded system taking a picture once every 60 seconds and then performing a matrix-multiply similar to the one in the benchmark (perhaps for image-recognition purposes). Could all of the systems listed meet this deadline?

3. Assume a workload where a device takes a picture once a minute then does a large matrix multiply (as seen in Table 1). The device is idle when not multiplying, but under full load when it is.

    (a) Over an hour (note, hour, not minute), what is the total energy usage of the Jetson TX-1?

    (b) Over an hour, what is the total energy usage of the Macbook Air?

4. Given your answer in the previous question, which device would you choose if you were running this project off of a battery?

Submitting the Assignment

Please put your answers to questions 1 - 4 in some sort of document (text, pdf, doc) and ***e-mail*** it to me by the deadline.