Benchmarking applications on ARM Boards

भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

ARM BOARDS USED

ODROID-N2L (HEXA-CORE CPU)	ODROID-XU4 (OCTA-CORE CPU)
64-BIT PROCESSOR	32-BIT PROCESSOR
4 X A73 CORES (BIG)	4 X A15 CORES (BIG)
2 X A53 CORES (LITTLE)	4 X A7 CORES (LITTLE)

Big cores are more powerful and energy-consuming while little cores are less powerful but more energy efficient

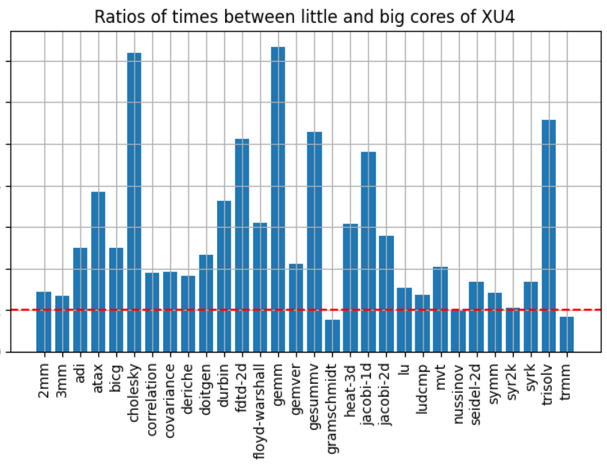
TEAM MEMBERS:

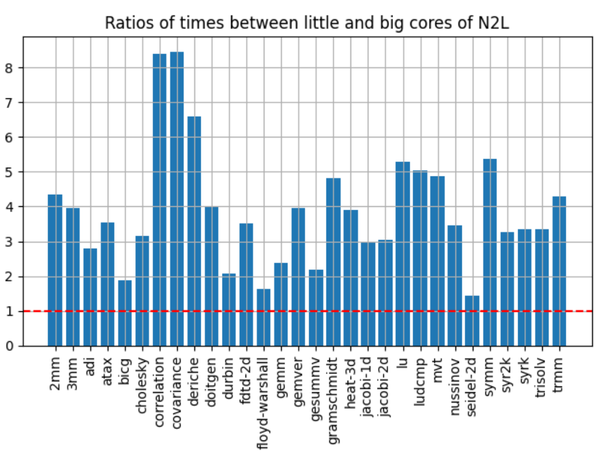
CS21BTECH11006: Beeram Sandya
CS21BTECH11012: Challa Akshay Santoshi
CS21BTECH11013: Cheekatla Hema Sri

ODROID XU4

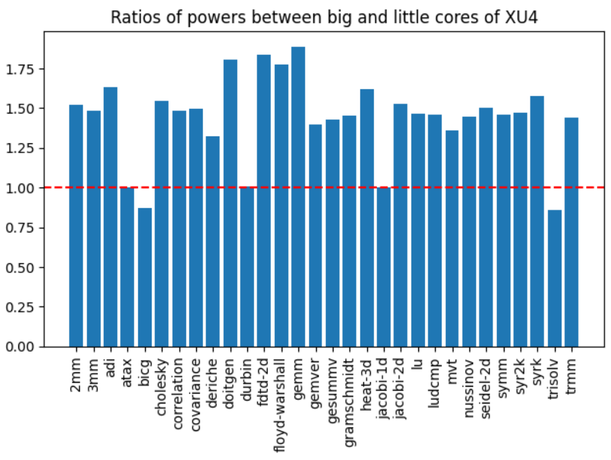
SMART POWER3 POWER SUPPLY

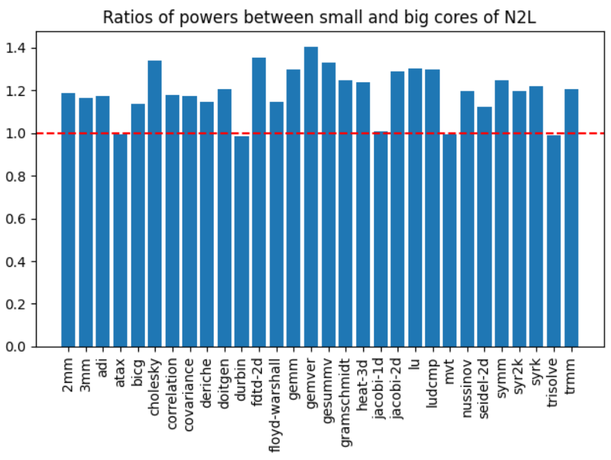
POLYBENCH BENCHMARK SUITES





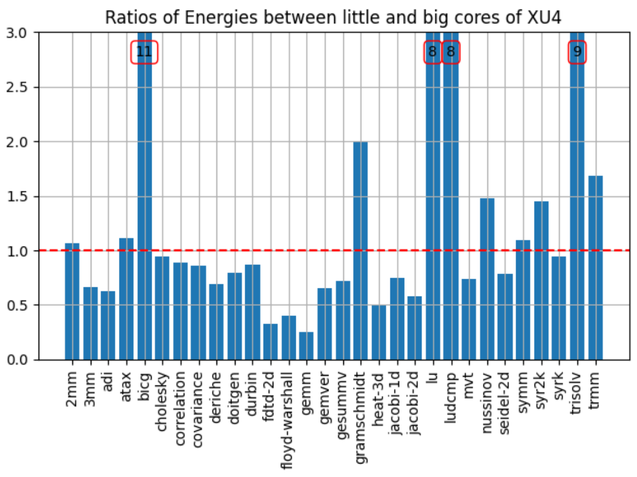
Time plots of **LITTLE:BIG** on two boards shows that for most applications little cores take more time than big cores. Exceptions are the gramschmidt and trmm applications on XU4 Board.

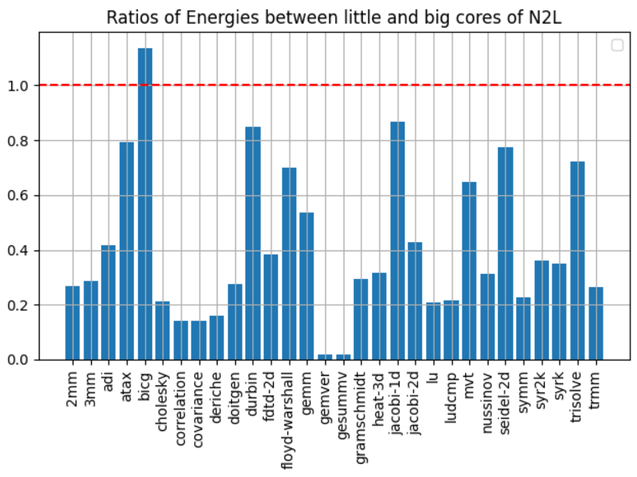




Power used by the little core for all the benchmarks on XU4 is around 3.32 W. Power used by the big core for all the benchmarks on XU4 is around 4.82 W. So the ratio of the power used by the big and the little core is 1.45.

Power used by the little core for all the benchmarks on N2L is around 2.37W. Power used by the big core for all the benchmarks on N2L is around 2.83W. So the ratio of power used by the big and the little core is 1.19.





Energy values depend on both power and time. The specific energy consumption ratio depends on the workload of the application being performed.

Little cores are more energy-efficient in the above applications with the exception of bicg, gramschmidt, lu, ludcmp, trisolv.

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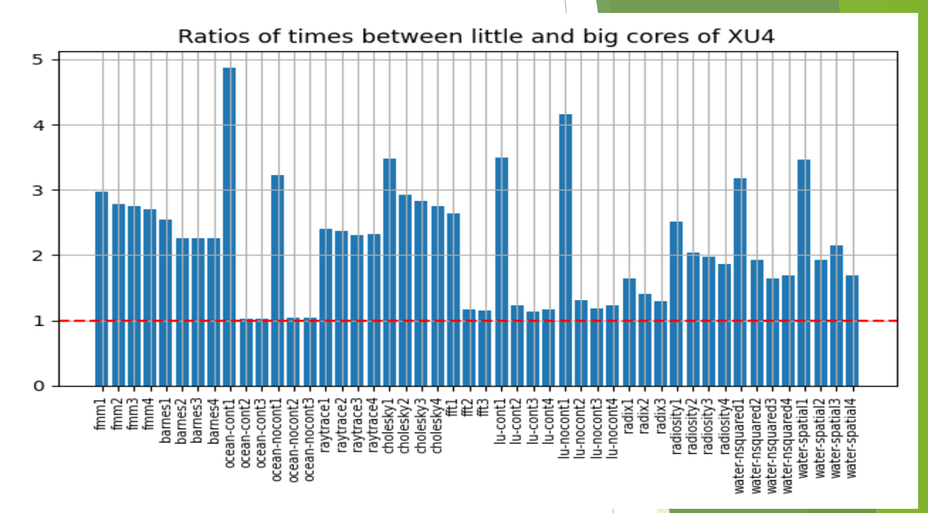
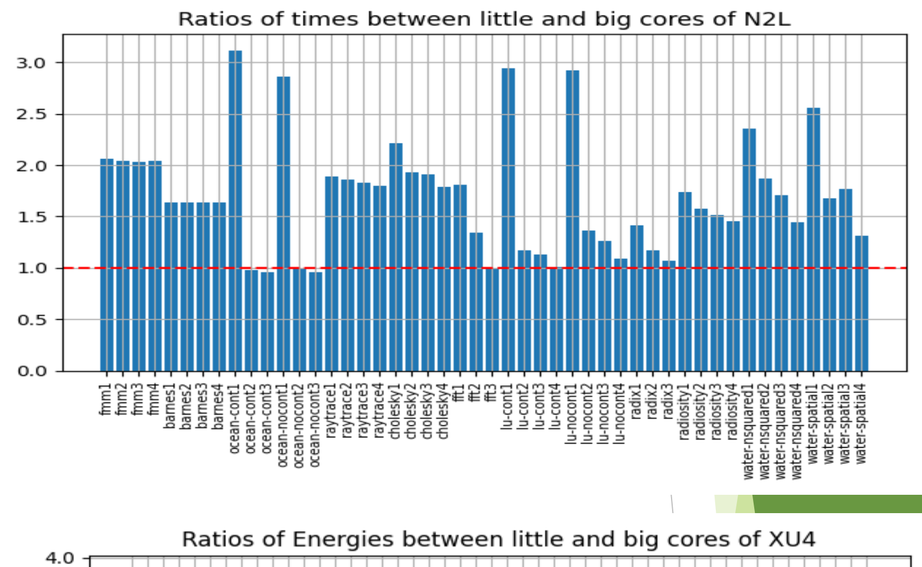
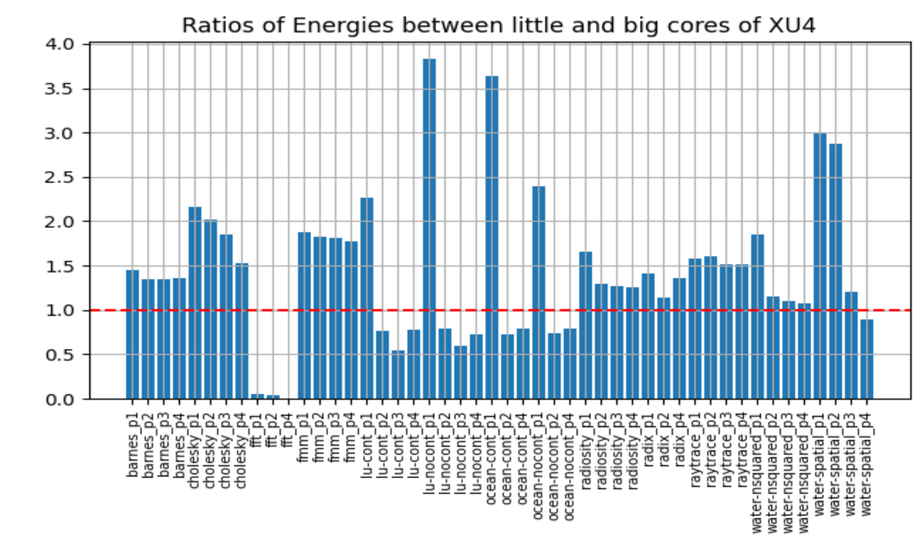
Learnings

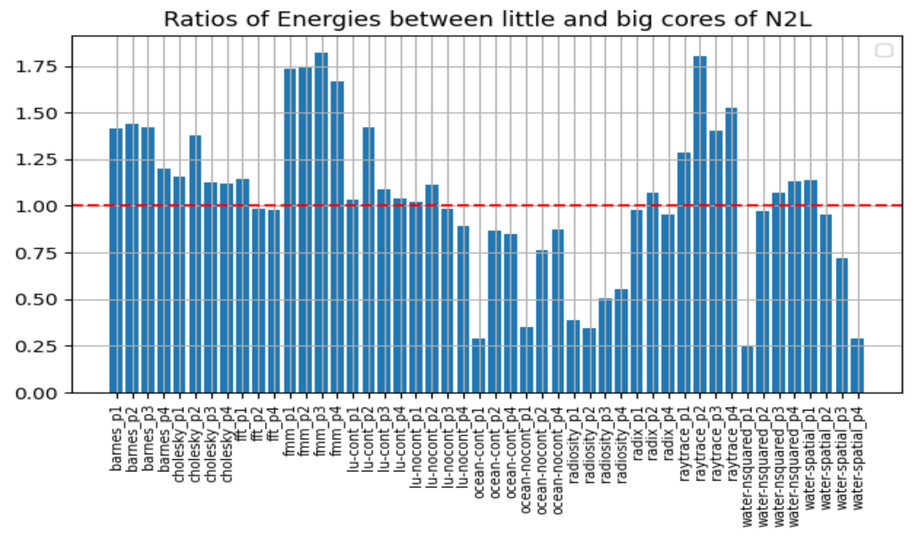
- Finding IP Address of Odroid boards using Angry IP Scanner
- Cross-compilation to get executable files for boards.
- Bash scripts to automate execution process.
- Used minicom to extract power values from Smartpower3
- Used python to visualize the data.

SPLASH-4 BENCHMARK SUITES









Little Cores are taking more time as can be observed from both of the plots
In general, as the number of processes increases, the execution time should be less.
But here time increases because we used only one core of the CPU at a time to run the applications

Conclusion

- For both Polybench and Splash-4 benchmark applications , N2L is more energy efficient than XU4.
- For applications that require less memory, 32-bit board in more efficient than 64-bit board (since if application does not demand a large address space, a 32-bit board would be efficient)
- For applications that involves multi-tasking, 64-bit board is efficient since it can handle more complex tasks then 32-bit boards
- For applications involving heavy computations or large input size, 64-bit board would be more recommendable