

COSC 594 – Spring 2020
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Homework – Performance Modeling
Due April 1, 2020

For this assignment, we will use the single-node PolyBench benchmarks at www.cse.ohio-state.edu/~pouchet/software/polybench. and Hydra, one of the EECS machines. If you do not have access to Hydra, please let me know. In this case you may choose any other machine you have access to.

You may choose to use either C, C++ or Fortran. You may choose any two kernel benchmarks to work with or construct your own kernel benchmark by modifying one of those in PolyBench.

1. Determine the machine characteristics of a Hydra node from processor specifications and/or low-level benchmarks.
2. Construct analytical models for your kernel benchmarks based on an analysis of their arithmetic intensity and use the models to predict performance on Hydra.
3. Run your kernel benchmarks for different size problems and measure the results. Discuss possible reasons for differences from your predicted performance and refine your analytical models if possible.

For background, read:

Hager and Wellein. [Introduction to HPC for Scientists and Engineers \(PDF\)](#). Chapter 3.

See also:

Samuel Williams, Andrew Waterman, and David Patterson. 2009. Roofline: an insightful visual performance model for multicore architectures. Commun. ACM 52, 4 (April 2009), 65-76.