Lab 1: Matrix Multiplication Derby

In this lab, you will write a best-effort multithreaded implementation of a dense matrix-matrix multiply in C/C++, and compare it against other implementations with various levels of optimizations.

Files involved

In the lab directory, you will find four files, `guide.pdf`, `main.cpp`, `mult.cpp`, and `Makefile`. You will only edit `mult.cpp`. `guide.pdf` is this document

Implementation guide

Try to use all ideas discussed in class, including AVX, cache-obliviousness and loop unrolling. Some ideas may not work well together. Achieve the best you can!

The sole function in the mult.cpp file, `mult`, takes in five arguments: `a, b, c, matrix_size` and `thread_count`. `a` and `b` are to be multiplied and stored in `c`. `matrix_size` defines the size of the matrix input, where there are `matrix_size*2` elements in the square matrix. `thread_count` define the number of threads supported by the system. In a typical Intel machine, it would be cores*2 due to hyperthreading.

The mult function is currently implemented using a naive triple-loop method.

In order to build and run the project run `make`, and then `./matrix T M`. `T` is the number of threads argument that will be passed to your mult function. `N` is the size of the matrix, where the number of elements in the matrix is `N*N`. The default value of `N` is 2048 unless specified.

Evaluation environment

Your code will be tested on various (but reasonable, desktop-class) machines, with different cache, processor and memory characteristics, using a different thread values. The matrix size will vary between 2048 to 16384.

The derby

Each submission will be given a code name for anonymity, and I will create charts and leaderboards to compare various implementations, as well as some implementations I will make with various levels of optimizations. Grading will *not* be on a curve, so relax, and do your best!

Submission

Please tar-gzip or zip the whole directory, rename it to be your ucinetid.tgz or .zip, and email it to me. The email subject should include `[CS295] lab1 - your_ucinetid`.