

Dear Students,

Here is your first homework.

The goal of the exercises given bellow is to learn creating programs in C++, compiling these programs on as many computers as you have access to using different compilers and optimization flags. You should also learn how to use high performance libraries like BLAS and try to “beat” BLAS’s performance by writing your own functions.

Task 1.

Write C++ code that performs matrix-matrix multiplication. First, use small matrices and **MAKE SURE YOUR RESULTS ARE CORRECT**. Second, increase the size of matrices up to  $\sim 20,000 \times 20,000$ .

Compile your code on as many computers as you have access to using different compilers (g++, pgi, .....) and different optimization flags (-O, -O2, -O3, -fast ...).

Task 2.

Use different permutations of the “for loops” and also try to use blocking to achieve better performance. I recommend to read

<http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=04484942>

to see examples on tuning performance for matrix-matrix multiplications.

Task 3.

Use BLAS library (or its equivalent) to perform matrix-matrix multiplication and compare performance.

You should report on your findings/experience. Use not more than 4 pages for your reports. Use plots to compare performance. Show that your matrix-matrix multiplications produce correct results!

I am sure these tasks will keep you busy and you will have a lot of questions. I advise that you first check computer cluster related web pages for the information, and then contact me if you did not find it.

Good luck and submit your reports in two weeks ( Feb 23, 2001).