

Set 5 - OpenMP, BLAS

Issued: October 27, 2017

Hand in (optional): November 03, 2017 8:00am

Question 1: Quadratic Form

We want to compute the quadratic form

$$Q = \vec{v}^T \cdot A \cdot \vec{w} = \sum_{ij} v_i A_{ij} w_j \quad (1)$$

in parallel employing shared memory parallelism with OpenMP.

Given the $n \times n$ matrix A and the vectors v , w prepared in the provided skeleton code `QuadraticForm/skeleton.cpp` compute the quadratic form of Equation 1 for a shared memory architecture. Put your solution in `QuadraticForm/main_shared.cpp`.

Question 2: GEMM

In this exercise you should familiarize yourself with general matrix multiplications (GEMM) using a BLAS library. We can start with the code of exercise 1, which you should parallelize using OpenMP. In the same code you should additionally perform the matrix multiplication with a call to GEMM. Install a BLAS library on your personal system.

- a) Report on what version of BLAS you are using, how you can link to it, if it is single-threaded or multi-threaded, and how can you specify the number of threads in the multi-threaded version. Submit a Makefile along with your code.
- b) How much faster is your code with BLAS compared to the trivial implementation of the matrix multiplication in the initial code?