

Week 5

This week, the main task was writing some code and conducting tests.

GFLOPS	mult_0_kij	mult_0_kij_threaded	mult_0_kij_ColA_threaded	mult_1_kij_threaded	mult_2_kij_threaded
4x4:	0.2210	0.0056	0.0054	0.0054	0.0059
8x8:	8.7784	0.0489	0.0528	0.0591	0.0458
16x16:	12.4830	0.3893	0.4367	0.4209	0.4817
32x32:	13.7431	2.8378	2.6346	2.4043	3.0835
64x64:	14.0138	6.2550	5.5775	4.5921	5.8884
128x128:	12.5536	19.1055	22.1789	18.1849	25.5715
256x256:	10.2209	51.9462	40.4373	27.8084	46.8042
512x512:	10.0489	43.9117	38.2235	31.6249	36.8430
1024x1024:	9.4699	42.4691	39.8688	31.1255	29.4540

- mult_0_kij is the single-threaded version of matrix multiplication.
- mult_0_kij_threaded is the multithreaded version of mult_0_kij.
- mult_0_kij_ColA_threaded converts matrix A into a column matrix first and then follows the same approach as mult_0_kij_threaded.
- mult_1_kij_threaded is a slightly modified version of mult_0_kij_threaded, where the inner loop for j performs two calculations simultaneously.
- mult_2_kij_threaded is a block-based matrix multiplication with the block size set to 32.

The compilation option used was -O3. Each matrix multiplication was tested 20 times for each size, and the average results are shown in the graph. The blue color highlights the maximum value for the current row.

Of course, if the compilation option is set to -O0 and the same tests are conducted, the results are shown in the following graph:

GFLOPS	mult_0_kij	mult_0_kij_threaded	mult_0_kij_ColA_threaded	mult_1_kij_threaded	mult_2_kij_threaded
4x4:	0.2363	0.0045	0.0058	0.0065	0.0053
8x8:	0.1982	0.0351	0.0374	0.0397	0.0306
16x16:	0.2962	0.1109	0.0442	0.1565	0.1184
32x32:	0.3136	0.2348	0.2151	0.2780	0.1724
64x64:	0.3309	0.6610	0.5325	0.7389	0.4345
128x128:	0.3419	0.8564	0.4488	0.4576	0.3079
256x256:	0.2960	1.3414	1.3267	1.5852	0.8910
512x512:	0.3572	1.5593	1.4880	1.6412	0.8779
1024x1024:	0.3513	1.3593	1.2263	1.5136	0.8077