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Scientific Computing

CS-605

Homework 0

Matrix Multiplication Run Times
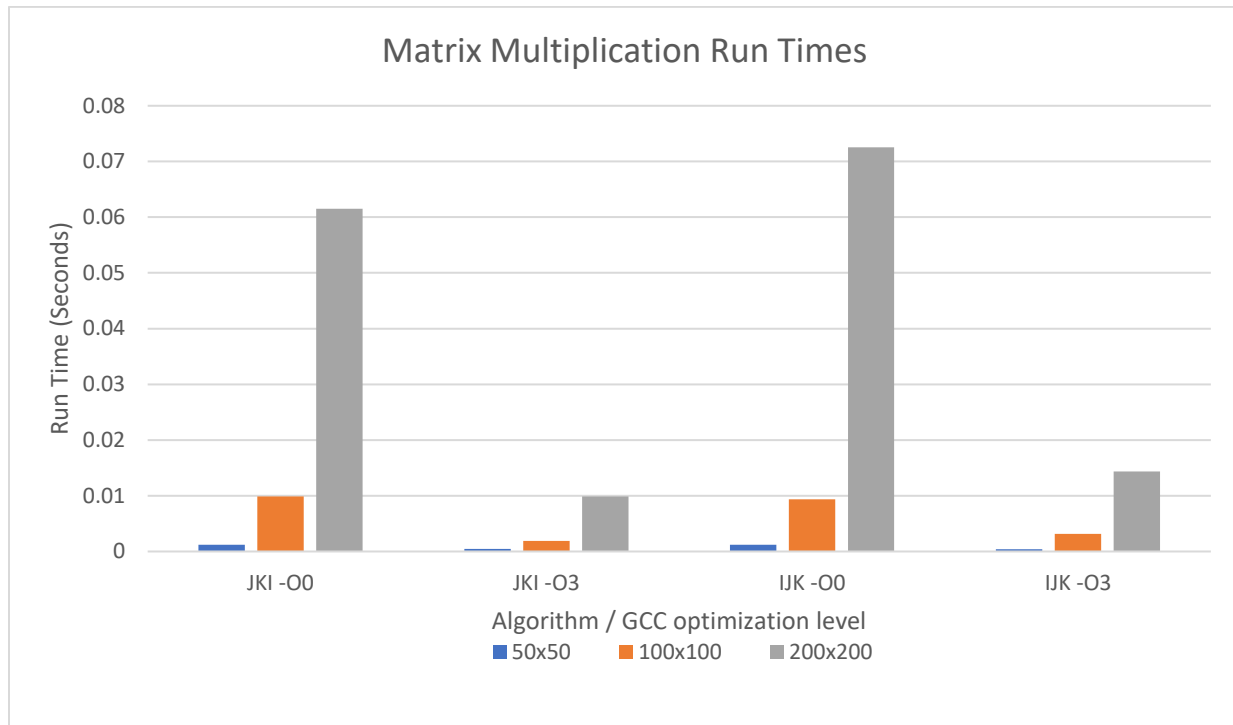
We see that JKI has faster performance than IJK with the 200x200 matrices. We can most likely ignore the <200x200 times, because they are too small to be statistically significant.

We also see significant performance gains from specifying level 3 optimization. Over 6 times on faster on JKI with level 3 specified.

JKI has higher performance most likely because C++ is row-major and JKI takes advantage of memory in that configuration. We could expect that the two algorithms would have switched performance if we were using column-major language like Fortran. When it comes to accessing a register in the CPU and accessing data in the L1/L2/L3 cache, the two have orders of magnitude time difference. If we can have more of the relevant data in the CPU register, that means less swapping needs to happen between the registers, cache, and RAM. Therefore, with a row-major language like C++, if your for loop is accessing elements in a row, those elements are more likely to already be present in the CPU registers.