

ASSIGNMENT 2

Write C programs implementing two algorithms of multiplication of two $n \times n$ dense matrices based on your variants.

- 1) You need to experiment with the programs and present the speedup of the blocked algorithms over the non-blocked one for several matrix sizes n .
- 2) In this task, investigate the influence of block size on cache utilization and the execution time of blocked matrix multiplication. Experimental procedure:
 - Consider a matrix size n between 1024 and 4096.
 - Utilize the Linux command **lscpu** to obtain detailed information about the cache sizes, including L1, L2, and L3 caches.
 - For each cache level, carefully detect the largest block size to enhance the cache utilisation in that level. Based on these findings, select a representative range of block sizes for experiments.
 - Execute your blocked matrix multiplication application with the selected matrix size n and block sizes and record the execution time.
 - Examine the results obtained from various block sizes and elucidate these results in the context of the cache sizes of the machine employed for application execution.

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Variants of the assignment:

- 1) Multiplication of matrix blocks in the implementation of the blocked *ijk* algorithm:
 - a. manually written
 - b. BLAS calls
 - c. ATLAS calls
 - 2) Comparison with non-blocking BLAS/ATLAS dgemm routine:
 - a. BLAS
 - b. ATLAS
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