Analysis and Design of Advanced Algorithms
Strassen's Algorithm

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I. Objectives.

a) To compare the performance of two algorithms designed to multiply two order n matrices $A, B \in \mathbb{M}_n(\mathbb{R})$, Strassen's algorithm and the textbook definition algorithm.

II. Programming language and environment. We shall use C++ on Replit.

III. Teams. This homework will be made by teams composed of four people as told in our lecture.

IV. Description.

Comparison of Strassen's algorithm and textbook algorithm.

1) Implement, in a single C++ program, Strassen's algorithm and the textbook definition algorithm we have studied in our course.
2) Provide the user with a method to upload two text files, in scv format. These two files will contain matrices $A, B \in \mathbb{M}_n(\mathbb{R})$, respectively.
3) Multiply matrices $A, B \in \mathbb{M}_n(\mathbb{R})$ using the textbook algorithm.
4) Multiply matrices $A, B \in \mathbb{M}_n(\mathbb{R})$ using Strassen's algorithm.
5) Show on the screen the following results:
   - The matrix produced on step 3) as well as the number of scalar multiplications run in order to compute this matrix.
   - The matrix produced on step 4) as well as the number of scalar multiplications run in order to compute this matrix.

V. Matrices for testing your program. In this same subsection, you will find three pairs of files that correspond to three pairs of matrices: two matrices of order 16 (2^4), two matrices of order 128 (2^7), and two matrices of order 4096 (2^{12}). As told in our lecture, I expect your program to be able to run with matrices of order 16 (2^4) and order 128 (2^7), as a minimum.

VI. Grading.

- The algorithm does not run, i.e. errors during execution: 0/100.
- The algorithm is unable to upload matrix files: 0/100.
- The algorithm produces wrong results for outcomes from 5) 60/100.
- The algorithm produces correct results as described in 5): 100/100.

VII. Deliverables and deadline.

- Program for mutiplying two matrices. Upload it in Canvas. Please do remember that homeworks can be made in teams but deliverables must be uploadad on an individual basis. You must include, as comments in the first lines of your program, the names and matrículas of team members.