CSCE 435 Fall 2021

Assignment 1: Parallel LU Decomposition of a square matrix

Instructions to compile and execute the program which factorizes a square matrix of size "s" into a product of lower and upper triangular matrices:

1. Upload both the files (**luDecomposition.cpp** and **jobfile.sh**) to either your home directory or your scratch directory after logging into grace portal.
2. You'll be able to change the number of threads in line number 146 of your luDecomposition.cpp file. (Currently, it is set to 16)
   Also, you may uncomment the lines "print_matrix()" in the main() function to see the original matrix and/or the generated lower and upper matrices. (For large matrices, this might increase latency while accessing the output files)
3. Open the current directory in the terminal using the "Open in terminal" option on the top.
4. Authenticate using your net id's password and duo-2 factor authentication.
5. Compile the source file using the following command:
   g++ -O -fopenmp luDecomposition.cpp -o luDecomposition

6. Run the batch file with "size of the matrix" as its argument:
   sbatch jobfile.sh x   (where x is the size of the matrix)

7. Don't forget to re-compile the source file every time you change the number of threads.
8. After a job is complete, you'll be able to see the runtime in the output file corresponding to your jobid in the same directory as the source code.
   (You'll be able to find out whether a recent job has been completed or not by going to: grace dashboard > jobs > active jobs)

Assignment:
- For each of the matrix sizes {100, 1000, 4000}, plot a graph between **number of threads** and **runtime**, where number of threads will vary between{1, 2, 4, 8, 16, 32, 64, 128}.
- Write down your observations on the variation of runtime with the number of threads for various matrix sizes.

   (Upload a pdf containing your answers on canvas)