Assignment 6

CAAM 519 Fall 2021

due Thursday December 2 (11:59pm)

In this assignment, you will call LAPACK functions in your C code to solve a linear system and do other linear algebraic operations. Please be sure to heavily comment your code. As always, feel free to use code from the class as an "initial condition" for your code. (35 points)

- Make sure you have installed LAPACK and BLAS in your Ubuntu OS.
- Create a header file called linear_algebra_prototypes.h. Within this header file, prototype the LAPACK functions dgesv and dgemv. Recall you can get all the documentation you need for these functions from the website: http://www.netlib.org/lapack/explore-html/ index.html.
- Create a source file called solve_linear_system.c. Within this source file, implement your main function. Use the function dgesv to solve A x = b with

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & 3 \\ 1 & 1 & 0 \end{bmatrix}$$
 and $b = \begin{bmatrix} -3 \\ 6 \\ 3 \end{bmatrix}$.

Print out A, b, and x to the terminal.

• After computing x, use the function dgemv to compute the residual b - Ax to double check that it is zero to machine precision. Print out the residual to the terminal.

In calling these LAPACK functions, keep in mind the parameters that are both IN and OUT, i.e. some of the input parameters will be overwritten. Also, make sure your code is free of memory leaks. The graders will run the code through valgrind. Please upload your source and header files to Canvas.