

# MA5636 Homework 3

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March 4, 2019

## 1. (a) Tall Skinny QR

The code for tall skinny qr factorization can be found in *tsqr.c*. Error checking was performed by applying the Q matrix (using the householder vectors).

## (b) Communication Avoiding QR

The code for communication avoiding qr factorization is found in *caqr.c*. It calculates only the  $R$  matrix with the implicitly stored  $Q$  matrices freed at the end of execution, if the  $Q$  matrix was required, the code could easily be edited to return it as well.

Note: I did not bother updating the zeroed entries of the R matrix as this would not have been time efficient. If accessed they will contain the values of the last trailing matrix before panel factorization.

## 2. Testing on Different Block Sizes

On size 100,000 by 50,000 I ran into problems both with time and with malloc limits on chuck so I could only run the program on 10,000 by 5,000 size problem. The timing results for these computations are shown in the graph below.

The trends in the graph are similar to what was expected from the previous assignment with optimum block size somewhere around 50 and the time taken climbing almost linearly for larger block size.

Time Taken to Perform CAQR Factorization on 10000x5000 size matrix.

