

Homework 2: Krylov Methods

Patryk Drozd

2

Structure

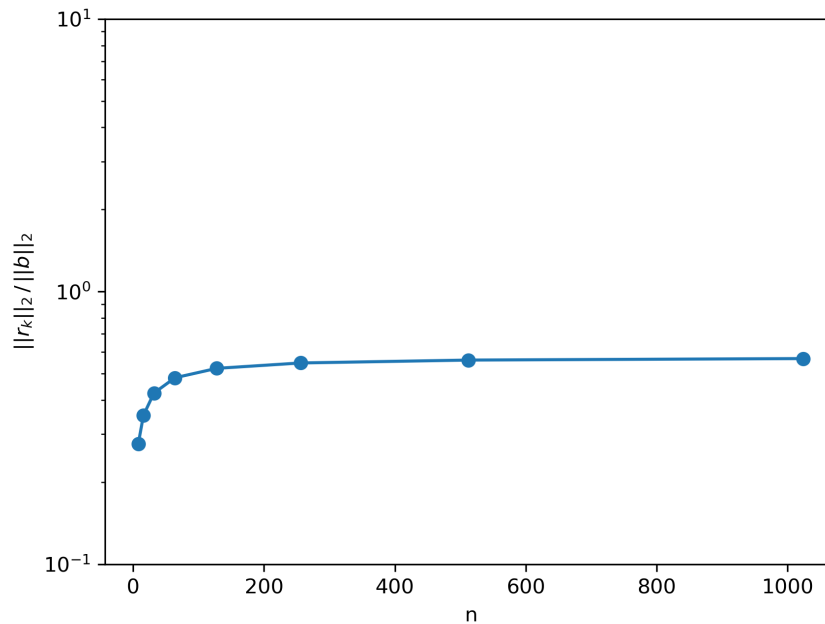
2.1

2.2

For the serial implementation of GMRES in python I chose to follow Algorithm 6.9 from *Iterative Methods for Sparse Linear Systems* by Yousef Saad. For solving the minimization problem in line 12 I used a QR factorisation algorithm (modified gram schmidt) I wrote last semester for another module, which was then followed by a back substitution function.

Figure shows for $n = 8, 16, 32, 64, 128, 256$ the serial gmres function run for $m = n/2$ iterations. In this plot we can see that the convergence rate of my gmres function is for a loglog plot almost a straight line which lets us conclude that that

$$\frac{\|r_k\|_2}{\|b\|_2} \propto n^{-a}$$



2.3