MAD 6406: HOMEWORK 5

Due: Friday, October 9

Numbered problems are from Trefethen and Bau, Numerical Linear Algebra. Starred problems (*) require the use of Matlab (you can use another language if you prefer, but it's really easier if you use Matlab or Octave here).

(1) 7.3
(2) 7.5
(3) Show that Householder matrices: $H(w) = I - 2ww^*/w^*w$ are both Hermetian and unitary.
(4)* Run Experiment 1 and 2 with the matlab code `classic_gs.m`. What do you observe about the orthogonality and normalization errors?
(5)* Modify `classic_gs.m` to perform a modified Gram-Schmidt algorithm. Name the file `modified_gs.m`. Submit a sample of the output (no more than one page). What do you observe about the orthogonality and normalization errors on each of Experiments 1 and 2?

Not required

- But, if you are interested, try adding some noise to the matrix in Experiment 2 by replacing the matrix A with $A+\varepsilon\cdot\text{rand}(m,n)$ for small values of ε. How do low levels of noise effect the image quality and the orthogonality on your favorite code?

Email address: s.pollock@ufl.edu

Department of Mathematics, University of Florida

Date: October 2, 2020.