Submission Guidelines for Homework 2

VU Numerical High Performance Algorithms, WiSe 2018

due date: 19.11.2018, 18:00

1. Basics:
   - Octave users: please use *version 4.4* or higher
   - Matlab users: please use *version 9.2 (R2017a)* or higher
   - Your submission will be evaluated. Please indicate the used environment (Matlab/Octave) and version in your report.
   - No global variables allowed.
   - Pay attention to the interface definitions (i.e., use the specified terms. In/output parameters must be in the specified order.)
   - Your routines should always check the number and types of input arguments.
   - Do not plot results in predefined routines. Plot results in scripts or self defined routines only.
   - You can either use your own implementation of the lu-factorization from HW1 or the integrated routines provided by Matlab/Octave.
   - Measure runtimes of routines only (i.e. do not measure the time needed for memory allocation and initializations). Measurements have to be done outside the specified routines.
2. Interface:
   - Implement the following interface for the *inverse iteration*:

     $$[lambda, v, it, erreval, errres] = invit(n, A, x_0, sigma, eps, maxit, l)$$

   - Implement the following interface for the *standard Rayleigh quotient iteration*:

     $$[lambda, v, it, erreval, errres] = rqi(n, A, x_0, sigma, eps, maxit, l)$$

   - Implement the following interface for the k^{th} iteration variant of RQI:

     $$[lambda, v, it, erreval, errres] = rqi\_k(n, A, x_0, sigma, eps, maxit, l, k)$$

* Description of input parameters:
  - n: dimension (scalar)
  - A: $n \times n$ matrix
  - x_0: starting vector of size n
  - $sigma$: shift/eigenvalue approximation (scalar)
  - eps: error tolerance (scalar)
  - $maxit$: the maximum number of iterations (scalar)
  - l : reference (true) dominant eigenvalue (scalar)
  - k: a scalar defining the number of $k-1$ iterations before the shift is updated
* Description of output parameters:
  - $lambda$: the dominant eigenvalue (scalar)
  - v: the dominant eigenvector of size n
  - it: the iteration-number at termination (scalar)
  - $erreval$: a vector of size it containing the history of relative eigenvalue approximation errors
  - $errres$: a vector of size it containing the history of relative residuals

- Write a script *assignment2.m* to call your routines and plot your results.

3. Submission:
   - Upload a single zip archive with all your source code files and your report (as a single PDF file named *report.pdf* with all plots and discussions of results) on the course page in Moodle.
   - Name your archive `a<matriculation_number>.zip` (e.g. *a01234567.zip*)
   - Directories in the archive are not allowed.
   - A complete submission should include the following files:
     a) Routine(s): *invit.m, rqi.m, rqi_k.m*, self defined routines (optional)
     b) Script(s): *assignment2.m*
     c) Documentation: *report.pdf*