Brown/Paris Numerical Analysis: Problem set 4

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1 Iterative solvers for linear systems

Same as yesterday, but now we're going to use iterative methods. Of course, iterative methods need to be stopped at a given tolerance, and for this assignment we're going to stop when the residual $r^{(n)} = \mathbf{A}x_n - b$ satisfies $|r^{(n)}| < 10^{-5}$.

- Implement the Jacobi and Gauss-Seidel methods discussed in class (see p. 159 of text for pseudo-code).
 - How does the number of iterations to reach convergence depend upon the size of the problem?
 - Time the performance of your approach: For a fixed tolerance, what is the asymptotic cost of this method?

Either:

- **Open ended problem:** The key to coming up with a good iterative method was coming up with an easily invertible approximation to A. We've used the diagonal and the lower triangular components of the matrix so far. What other parts of matrices do we know how to cheaply invert?
- Use the rest of the class time to work on previous assignments or ask questions (project related questions are OK too).