Lecture 11

HW 3a posted

Exam Next Week!

~~Study~~
Review Session Next Week (Wed. Night!)

Other Recursion Shapes? $n/2$ by $n/2$.

$A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$ Yes! 3a/3b!

Do finite time approach take more/less compute vs. iterative?
(But are more reliable)

Why not check the Residual in the power method function?

How to pick $x^{(0)}$ for power?

Why copy A in my reduce?

In-place vs. Not in-place?

Additional Resources for study?
↳ Review Session?

Power update
$A \to \frac{A}{\rho(A)}$
⇒ all but domin λ will converge to zero?

Cholesky pos. def?

$\lim_{\gamma \to \infty} \frac{x^{(k)} + 2\gamma A x^{(k)}}{\|x^{(k)} + 2\gamma A x^{(k)}\|} = \frac{Ax^{(k)}}{\|Ax^{(k)}\|}$ ⊕ See last video.

Why is $x_k = \rho_k A^k x_0$ when $\|x_0\| = 1$

Does julia store L, U? Can we show that? In fact.

Necessary Cond. for Keeping spd. after 1 step of Elimination.

What is the cost of finite termination?

Power Method.

$$x_{k+1} = \frac{Ax_k}{\|Ax_k\|}$$

Why is $x_k = \rho_k A^k x_0$. (w/ $\|x_0\| = 1$.)

$$x_1 = \frac{Ax_0}{\|Ax_0\|} \Rightarrow \rho_1 = \frac{1}{\|Ax_0\|}$$

$$x_2 = \frac{Ax_1}{\|Ax_1\|} = \frac{A^2 x_0}{\|A^2 x_0\|} \Rightarrow \rho_2 = \frac{1}{\|A^2 x_0\|}.$$

$A \to$ analy $\frac{A}{\rho(A)}$

Don't we get

$$\left(\frac{A}{\rho(A)}\right)^k \to \begin{cases} 0 & \text{non-dom } \lambda\text{-vs} \\ \neq 0 & \text{dom } \lambda \end{cases} ?$$

Why not check Residual $\|Ax - \lambda x\|$ in the power method?

Check $\|Ax - \lambda x\| / |\lambda|$

Pick $x^{(0)}$ for power method
→ use Random.
w. hp. $(x^{(0)})^T y \neq 0$.. ← true dom. λ vec

"In-place vs. Not In-place"

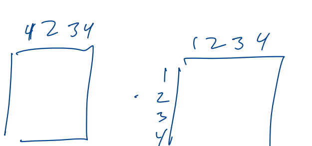
why Copy(A)?

finite time vs. "Simple / iterative"

+ Know how long it will take.
− Sparsity?
+ "any" non-sing. Matrix.
+ Much more Reliable.

+ Can stop Early! (Save work/time)
+ Easier w/ sparse matrix.
− Not Every matrix ~~w/~~ / A^TA.

The Key Step in $Ax = b$ w/ a finite / direct method is a matrix multiplication!



n^3 flops. (assume fma.)