

CS 515 - Lecture 30

Final Exam: FRNY B124
Wed, 12/17, 10:30am

Course Survey

Extra Office Hours?
→ Teach Nginx on Zoom.

Review of topics

- See Video online.
- HW is important too

If an alg uses Jacobi + GS,
How to Evr Converge?

How many unique λ vals
will a random matrix have?

Twice as many Jacobi steps
or GS steps? Really?

→ PageRank!

Multiple possible Superkribs?

How is Random Matrix Theory
Relevant back vs. 20 yrs ago.

Final vs. Multan
Topics

Computation Q's for
final
SVD by hand?
EVD by hand?

Randomness Algs used
for final?

Website offer.
Semester Ends

State of Rand M.A.
Progress:
Branchehard:
Universities:

Can we use rand(m,n)
Converge to get more
random samples?

Sketching in Iterative
Methods?

$M^{1/2} A M^{-1/2}$ vs
 $M^{-1} A$ in M ~~matrices~~
Relev

Why is PR very diffn
from Chab + Ladda for
MSEERS?

CG vs. Asymmetr Systs!

+ PR was more diffn
to solve -
→ less mat.

In theory - $A = D + L + U$
Jacobi $M_J = -(D^{-1}(L+U))$
GS $M_{GS} = -(D+L)^{-1}U$
Overall: $M = M_{GS} M_J$

Alg: $x^{(0)}$ = iniat.
for $i = 1$ to ...
 $y^{(i)} = \text{JacobiStep}(A, b, x^{(i-1)})$
 $x^{(i)} = \text{GSStep}(A, b, y^{(i)})$
Check $\|Ax^{(i)} - b\|/\|b\|$ here..

Over Relax

$0 < \omega < 2 \Rightarrow$ Convg.
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 $\omega = 1 \Rightarrow$ GS.
 $\omega \in \mathbb{Q} \Rightarrow$ Under-Rel.
 $\omega > 1 \Rightarrow$ Over-Rel.

$A = \text{rand}(n, n)$ (Sym.)
Histogram of λ -vals.

$\begin{bmatrix} 0 & A \\ B & 0 \end{bmatrix}$
 $\begin{bmatrix} 0 & \begin{bmatrix} 0 & A \\ B & 0 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 \end{bmatrix} & 0 \end{bmatrix}$
Q: Optimal Spectral?

A B
Diagram showing connections between nodes.

In theory, MSEERS need
a Sym. matrix.
 $\Rightarrow M^{1/2} A M^{-1/2}$ so
you get a sym. matrix.
More complex than what you use
 $M^{-1} A$ directly --
(Sym. inner prod.)
So it closes better!

Do we look at
 $M^{-1} A$ or $M^{-1/2} A M^{-1/2}$?
 $\Rightarrow Ax = \lambda Mx$

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