Lecture 12

Exam Next Week!!

(HW 3 is Due Monday!

QR Relation to LU? (m=n) ✓

Rook vs. Complete Pivoting ✓

Pivoting on the fly vs. at the start?. ✓

LU vs. Recursive Elimination ✓

Pivoting for LU ✓

- Sparsity? ✓

How does ([illegible] orthogonal give us $A^T(b - Ax) = 0$.

Why use largest Mag.-Entry to pivot? ✓

When are M-Matrices useful? ✓

Do we need to give P to LU? ✓

What if not unique.? ✓

Exam

What to Review?
→ See Reading!
Midterm Format? ✓

M/C & Proofs? ✓

EC work? ✓

Partial LU? ✓

Why update

$A[i+1:end, i+1:end]$ ✓

$-= A[i+1:end, i] * A[i, i+1:end]/\alpha.$

LU vs. Recurs
Elimination?

⊛ Those are the "Human-level" differ
no Compat/Math c

In LU, Why are
moving A?

Usually, we write this
to do all this work
"Extracting" pieces.

ws

done Ⓐ

nt

differences

ce

Stop

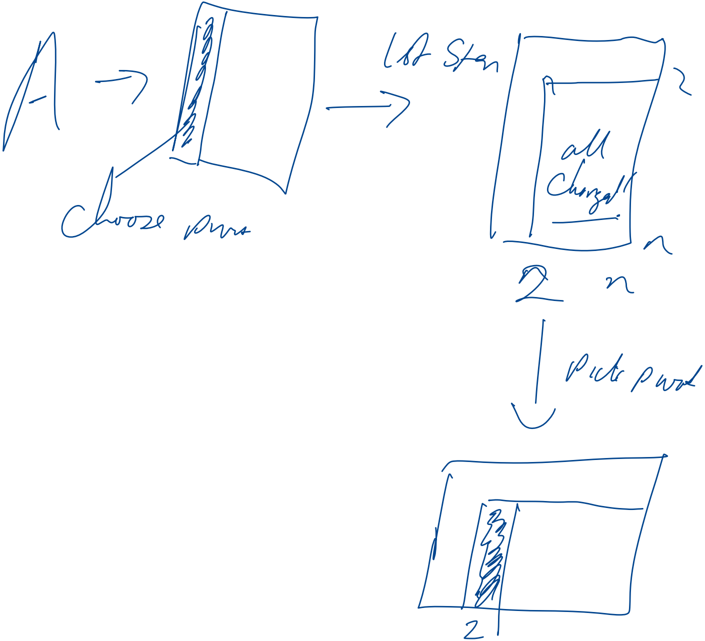
+/0

```
function lu_update!(A, i0, α)
  for j = i0+1 : n
    for i = i0+1 : n
      A[i,j] -= A[i,i0] A[i0,j]
(Something like this ... )
```

α

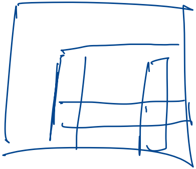
You find P while computing LU!

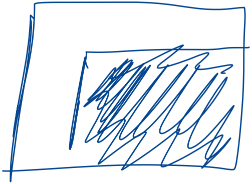
Can't compute P w/o all the LU work!



Pivoting for sparsity?

Rook vs. Complete





spsd

spd vs.

No pivoting

$I - T \Leftrightarrow M$

$(I-T)^{-1}$

M-Matrix

-matrix has diag +

≥ 0.

Theorem: if

$T_{ij} \ge 0$,

$\sum_i T_{ij} \le 1 \quad \forall j$

and there exists j^*

s.t. $\sum_i T_{ij^*} < 1$.

And the graph of T_{ij} is strongly connected

Then $\rho(T) < 1$.

Other

A^T

$A^T($

In LS. $\min \|Ax-b\|$

you can "show" that

Residual $Ax-b$

must be orthog to A^T.

to $A^T \iff$

$= 0.$

$r = Ax-b \implies$

$(Ax-b) \iff A^T A \underline{x} = A^T \underline{b}.$

Think about soln

$\min_y \|\underline{Q} y - \underline{b}$

$\|_2^2$