

LU Factorization II

CS 205A:
Mathematical Methods for Robotics, Vision, and Graphics

Justin Solomon

Announcements

- ▶ Homework due *today*!
Five late days; next homework out.
- ▶ Please direct all questions to Piazza
Includes “private” and/or “anonymous” options!
Easier for us to index, includes \LaTeX , and all staff sees it!
- ▶ Thanks for close reading!
Keep it up!

From Last Time

$$A = LU$$

Question

Does every A admit a factorization $A = LU$?

Recall: Pivoting

Pivoting

Permuting rows and/or columns to avoid dividing by small numbers or zero.

- ▶ *Partial* pivoting
- ▶ *Full* pivoting

$$\begin{pmatrix} 1 & 10 & -10 \\ 0 & 0.1 & 9 \\ 0 & 4 & 6.2 \end{pmatrix}$$

Pivoting by Swapping Columns

$$\underbrace{(E_k \cdots E_1)}_{\text{elimination}} \cdot A \cdot \underbrace{(P_1 \cdots P_\ell)}_{\text{permutations}} \cdot \underbrace{(P_\ell^\top \cdots P_1^\top)}_{\text{inv. permutations}} \vec{x}$$

$$= (E_k \cdots E_1) \vec{b}$$

$$\Downarrow$$

$$A = LUP$$

[▶ Next](#)