UTAustinX UT.5.05x
Linear Algebra - Foundations to Frontiers

Help

sandipan_dey

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7.2.4 Gaussian Elimination with Row Swapping (LU Factorization with Partial Pivoting)

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Calculator

Week 7 due Nov 20, 2023 01:42 IST

7.2.4 Gaussian Elimination with Row Swapping (LU Factorization with Partial Pivoting)

For the following video and exercises, you will want to print the "worksheet": <u>PDF</u> .

Video

Dr. Robert van de Geijn: Let's have a look

and see how we can fix the algorithms we looked at last week,

when we encounter a divide by zero along the way.

Now that we've introduced pivot matrices,

▶ 0:00 / 0:00   ▸ 2.0x   🔊   ⤢   CC   ❝

Video

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Reading Assignment

0 points possible (ungraded)
Read Unit 7.2.4 of the notes. [LINK]

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Discussion

Topic: Week 7 / 7.2.4

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? Homework 7.2.4.1 (b)

Calculator

Can someone explain the second problem on Homework 7.2.4.1...I understood the first example but got lost on the second.

?   Question about Pivoting   2

Video

Start of transcript. Skip to the end.

Dr. Robert van de Geijn: So let me show you

how to use this worksheet we have here for the example.

Here we have the matrix, and we have a column

in which we're going to keep track of how the matrix has been updated.

We have a column where we're going to indicate

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Homework 7.2.4.1

2/2 points (graded)

$$\text{Compute} \left(\begin{array}{c|cc} 1 & 0 & 0 \\ \hline 0 & 0 & 1 \\ 0 & 1 & 0 \end{array} \right) \left(\begin{array}{c|cc} 1 & 0 & 0 \\ \hline 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right) \left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 4 & 8 & 6 \\ 6 & -4 & 2 \end{array} \right) =$$

- ⊙ $\left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 6 & -4 & 2 \\ 4 & 8 & 6 \end{array} \right)$

- ○ $\left(\begin{array}{c|cc} 4 & 8 & 6 \\ \hline 6 & -4 & 2 \\ 2 & 4 & -2 \end{array} \right)$

- ○ $\left(\begin{array}{c|cc} 4 & 8 & 6 \\ \hline 2 & 4 & -2 \\ 6 & -4 & 2 \end{array} \right)$

- ○ $\left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 4 & 8 & 6 \\ 6 & -4 & 2 \end{array} \right)$

🖩 Calculator

✔

Compute $\left(\begin{array}{c|cc} 1 & 0 & 0 \\ \hline 3 & 1 & 0 \\ 2 & 0 & 1 \end{array}\right) \left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 0 & -16 & 8 \\ 0 & 0 & 10 \end{array}\right)$

⦿ $\left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 6 & -4 & 2 \\ 4 & 8 & 6 \end{array}\right)$

○ $\left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 0 & -48 & 24 \\ 0 & 0 & 20 \end{array}\right)$

○ $\left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 0 & -16 & 8 \\ 0 & 0 & 10 \end{array}\right)$

○ $\left(\begin{array}{c|cc} 2 & 4 & -2 \\ \hline 4 & 8 & 6 \\ 6 & -4 & 2 \end{array}\right)$

✔

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ⓘ Answers are displayed within the problem

Typo in Video for 7.2.4.1

question posted about 16 hours ago by AmazingGeorgeZhang

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At 3:48 of the video, the first row of the permutation matrix on the very left side is supposed to be 1 0 0, but is written as 0 0 0. I believe it is a typo.

Comment from Robert: Yes, this is a typo! Thank you George.

Video

Start of transcript. Skip to the end.

Calculator

Dr. Robert van de Geijn: So hopefully you've

practiced enough that you will now understand the algorithm.

Let's try to explain this algorithm.

All the changes is that the vector of integers is passed into the algorithm.

And that vector we've marched through

▶ 0:00 / 0:00   ▶ 2.0x 🔊 ✕ CC ❝

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Homework 7.2.4.2

1/1 point (graded)

If you want to print: PDF .

Perform Gaussian elimination with row swapping (row pivoting):

i	L_i	$\tilde{P}$	A	p
0			$\begin{array}{c\|cc} 0 & 4 & -2 \\ \hline 4 & 8 & 6 \\ 6 & -4 & 2 \end{array}$	
1				

2				

✅ Done

✔

Perform Gaussian elimination with row swapping (row pivoting):

i	L_i	$\tilde{P}$	A	p
0		$\left(\begin{array}{ccc}0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1\end{array}\right)$	$\left(\begin{array}{c\|cc}0 & 4 & -2 \\ 4 & 8 & 6 \\ 6 & -4 & 2\end{array}\right)$	$\left(\begin{array}{c}1 \\ \cdot \\ \cdot\end{array}\right)$
	$\left(\begin{array}{c\|cc}1 & 0 & 0 \\ 0 & 1 & 0 \\ -\frac{3}{2} & 0 & 1\end{array}\right)$		$\left(\begin{array}{c\|cc}4 & 8 & 6 \\ 0 & 4 & -2 \\ 6 & -4 & 2\end{array}\right)$	$\left(\begin{array}{c}1 \\ \cdot \\ \cdot\end{array}\right)$
1		$\left(\begin{array}{c\|c} & \\ 1 & 0 \\ 0 & 1\end{array}\right)$	$\left(\begin{array}{c\|cc}4 & 8 & 6 \\ 0 & 4 & -2 \\ \frac{3}{2} & -16 & -7\end{array}\right)$	$\left(\begin{array}{c}1 \\ 0 \\ \cdot\end{array}\right)$
	$\left(\begin{array}{c\|cc}1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 4 & 1\end{array}\right)$		$\left(\begin{array}{c\|cc}4 & 8 & 6 \\ 0 & 4 & -2 \\ \frac{3}{2} & -16 & -7\end{array}\right)$	$\left(\begin{array}{c}1 \\ 0 \\ \cdot\end{array}\right)$
2			$\left(\begin{array}{cc\|c}4 & 8 & 6 \\ 0 & 4 & -2 \\ \frac{3}{2} & -4 & -15\end{array}\right)$	$\left(\begin{array}{c}1 \\ 0 \\ 0\end{array}\right)$

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ℹ Answers are displayed within the problem

At the end of the next video, the "4" in the bottom row, second column, should be a "-4". (If you click on "Show Answer" for Homework 7.2.4.2, the answer is correct there.)

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