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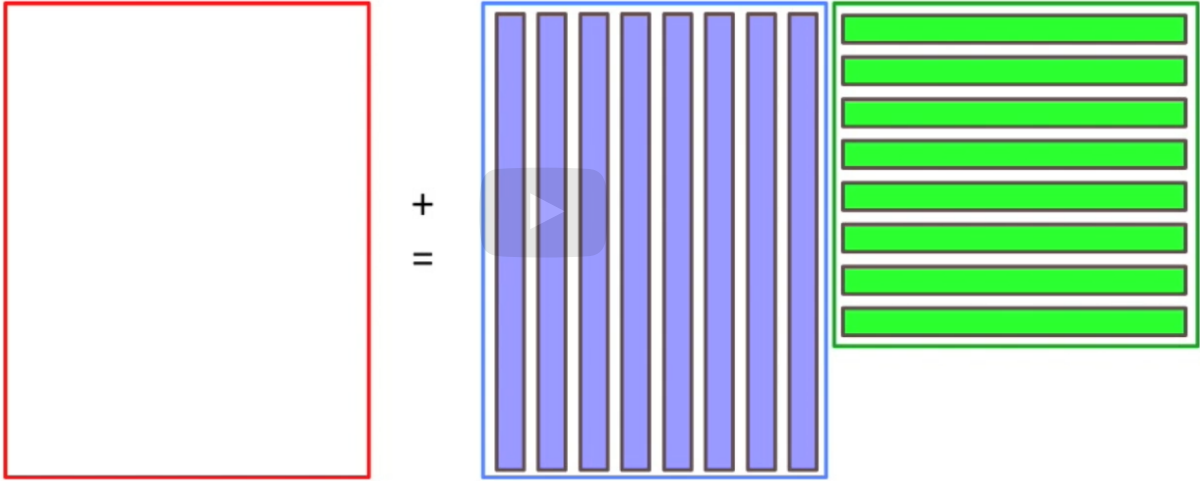
5.3.4 Matrix-Matrix Multiplication with Rank-1 Updates

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Week 5 due Nov 6, 2023 22:42 IST

5.3.4 Matrix-Matrix Multiplication with Rank-1 Updates

Summary



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Reading Assignment

0 points possible (ungraded)
Read Unit 5.3.4 of the notes. [\[LINK\]](#)

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Answer: -3



Answer: -4



Answer: 7

$$\begin{pmatrix} 1 & -2 & 2 \\ -1 & 2 & 1 \\ 0 & 1 & 2 \end{pmatrix} \begin{pmatrix} -1 & 0 & 1 \\ 2 & 1 & -1 \\ 1 & -1 & 2 \end{pmatrix} =$$



Answer: 6



Answer: 1



Answer: -1



Answer: 4



Answer: -1



Answer: 3


$$\left(\begin{array}{c|c} 1 & \\ \hline -1 & \\ 0 & \end{array} \right) \left(\begin{array}{ccc} -1 & 0 & 1 \\ \hline & & \end{array} \right) = \left(\begin{array}{ccc} -1 & 0 & 1 \\ \hline 1 & 0 & -1 \\ 0 & 0 & 0 \end{array} \right)$$

$$\left(\begin{array}{c|c} -2 & \\ \hline 2 & \\ 1 & \end{array} \right) \left(\begin{array}{ccc} & & \\ \hline 2 & 1 & -1 \\ \hline & & \end{array} \right) = \left(\begin{array}{ccc} -4 & -2 & 2 \\ \hline 4 & 2 & -2 \\ \hline 2 & 1 & -1 \end{array} \right)$$

$$\left(\begin{array}{c|c} 2 & \\ \hline 1 & \\ 2 & \end{array} \right) \left(\begin{array}{ccc} & & \\ \hline 1 & -1 & 2 \\ \hline & & \end{array} \right) = \left(\begin{array}{ccc} 2 & -2 & 4 \\ \hline 1 & -1 & 2 \\ \hline 2 & -2 & 4 \end{array} \right)$$

$$\begin{pmatrix} 1 & -2 & 2 \\ -1 & 2 & 1 \\ 0 & 1 & 2 \end{pmatrix} \begin{pmatrix} -1 & 0 & 1 \\ 2 & 1 & -1 \\ 1 & -1 & 2 \end{pmatrix} = \begin{pmatrix} -3 & -4 & 7 \\ 6 & 1 & -1 \\ 4 & -1 & 3 \end{pmatrix}$$

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 Answers are displayed within the problem

Homework 5.3.4.2

1/1 point (graded)

Algorithm: $C := \text{GEMM_UNB_VAR3}(A, B, C)$

Partition $A \rightarrow \left(\begin{array}{c|c} A_L & A_R \end{array} \right), B \rightarrow \left(\begin{array}{c} B_T \\ B_B \end{array} \right)$

where A_L has 0 columns, B_T has 0 rows

while $n(A_L) < n(A)$ **do**

Repartition

$\left(\begin{array}{c|c} A & \end{array} \right) \rightarrow \left(\begin{array}{c|c} A_L & A_R \end{array} \right), \left(\begin{array}{c} B_T \end{array} \right) \rightarrow \left(\begin{array}{c} B_0 \\ B_T \end{array} \right)$

 Calculator

$$\left(\begin{array}{c|c} A_L & A_R \end{array} \right) \leftarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array} \right), \left(\begin{array}{c} B_B \end{array} \right) \leftarrow \left(\begin{array}{c} b_1 \\ B_2 \end{array} \right)$$

where a_1 has 1 column, b_1 has 1 row

$$C := a_1 b_1^T + C$$

Continue with

$$\left(\begin{array}{c|c} A_L & A_R \end{array} \right) \leftarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array} \right), \left(\begin{array}{c} B_T \\ B_B \end{array} \right) \leftarrow \left(\begin{array}{c} B_0 \\ b_1^T \\ B_2 \end{array} \right)$$

endwhile

Write the routine

- [C_out] = Gemm_unb_var3(A, B, C)

that computes $C := AB + C$ using the above algorithm.

Some links that will come in handy:

- [Spark](#) (alternatively, open the file LAFF-2.0xM -> Spark -> index.html)
- [PictureFLAME](#) (alternatively, open the file LAFF-2.0xM -> PictureFLAME -> PictureFLAME.html)

The update $C := a_1 b_1^T + C$ can be accomplished by the call to

laff_ger(...)

(click on the "laff routines" tab at the top of the page for more info).

You may want to use the following script to test your implementations:

- [test_Gemm_unb_var3.m](#)

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[Gemm_unb_var3.m](#)

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