

Step	Algorithm: $C = AB^T + BA^T + C$
1a	$\{C = \hat{C}$
4	$A \rightarrow \left(\begin{array}{c c} A_T & \\ \hline A_B & \end{array} \right), B \rightarrow \left(\begin{array}{c c} B_T & \\ \hline B_B & \end{array} \right), C \rightarrow \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right)$ where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0
2	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline A_B B_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\}$
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline A_B B_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \right\}$
5a	Determine block size b $\left(\begin{array}{c c} A_T & \\ \hline A_B & \end{array} \right) \rightarrow \left(\begin{array}{c c} A_0 & \\ \hline A_1 & \\ \hline A_2 & \end{array} \right), \left(\begin{array}{c c} B_T & \\ \hline B_B & \end{array} \right) \rightarrow \left(\begin{array}{c c} B_0 & \\ \hline B_1 & \\ \hline B_2 & \end{array} \right), \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ \hline C_{20} & C_{21} & C_{22} \end{array} \right)$ where A_1 has b rows, B_1 has b rows, C_{11} is $b \times b$
6	$\left\{ \left(\begin{array}{ccc} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right) = \left(\begin{array}{ccc} A_0 B_0^T + B_0 A_0^T + \hat{C}_{00} & * & * \\ A_1 B_0^T + \hat{C}_{10} & \hat{C}_{11} & * \\ A_2 B_0^T + \hat{C}_{20} & \hat{C}_{21} & \hat{C}_{22} \end{array} \right) \right\}$
8	$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$ $C_{10} := B_1 A_0^T + C_{10}$ $C_{21} := A_2 B_1^T + C_{21}$
7	$\left\{ \left(\begin{array}{ccc} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right) = \left(\begin{array}{ccc} A_0 B_0^T + B_0 A_0^T + \hat{C}_{00} & * & * \\ A_1 B_0^T + B_1 A_0^T + \hat{C}_{10} & A_1 (B_1^T) + B_1 (A_1^T) + \hat{C}_{11} & * \\ A_2 B_0^T + \hat{C}_{20} & A_2 (B_1^T) + \hat{C}_{21} & \hat{C}_{22} \end{array} \right) \right\}$
5b	$\left(\begin{array}{c c} A_T & \\ \hline A_B & \end{array} \right) \leftarrow \left(\begin{array}{c c} A_0 & \\ \hline A_1 & \\ \hline A_2 & \end{array} \right), \left(\begin{array}{c c} B_T & \\ \hline B_B & \end{array} \right) \leftarrow \left(\begin{array}{c c} B_0 & \\ \hline B_1 & \\ \hline B_2 & \end{array} \right), \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ \hline C_{20} & C_{21} & C_{22} \end{array} \right)$
2	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline A_B B_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\}$
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline A_B B_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge \neg(m(C_{TL}) < m(C)) \right\}$
1b	$\{C = AB^T + BA^T + \hat{C}$

Step	Algorithm: $C = AB^T + BA^T + C$
1a	{
4	
	where
2	{
3	while do
2,3	{
	Determine block size b
5a	
	where
6	{
8	
7	{
5b	
2	{
	endwhile
2,3	{
1b	{

Step	Algorithm: $C = AB^T + BA^T + C$
1a	{ $C = \hat{C}$ }
4	where
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3	while do
2,3	{ \wedge }
5a	Determine block size b where
6	{
8	
7	{
5b	
2	{
	endwhile
2,3	{ $\wedge \neg($) }
1b	{ $C = AB^T + BA^T + \hat{C}$ }

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	where
2	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_TB_T^T + B_TA_T^T + \hat{C}_{TL} & * \\ \hline A_BB_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\}$
3	while do
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_TB_T^T + B_TA_T^T + \hat{C}_{TL} & * \\ \hline A_BB_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge$
5a	Determine block size b
	where
6	$\left\{ \right.$
8	
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2	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_TB_T^T + B_TA_T^T + \hat{C}_{TL} & * \\ \hline A_BB_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\}$
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_TB_T^T + B_TA_T^T + \hat{C}_{TL} & * \\ \hline A_BB_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge \neg(\quad) \right\}$
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6	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0 + B_0 A_0 + \hat{C}_{00} & * & * \\ A_1 B_0^T + \hat{C}_{10} & \hat{C}_{11} & * \\ A_2 B_0^T + \hat{C}_{20} & \hat{C}_{21} & \hat{C}_{22} \end{pmatrix} \right\}$
8	
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1a	$\{C = \widehat{C}$
4	$A \rightarrow \left(\begin{array}{c c} A_T & \\ \hline A_B & \end{array} \right), B \rightarrow \left(\begin{array}{c c} B_T & \\ \hline B_B & \end{array} \right), C \rightarrow \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right)$ where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0
2	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline A_B B_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline A_B B_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \right\}$
5a	Determine block size b $\left(\begin{array}{c c} A_T & \\ \hline A_B & \end{array} \right) \rightarrow \left(\begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left(\begin{array}{c c} B_T & \\ \hline B_B & \end{array} \right) \rightarrow \left(\begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right)$ where A_1 has b rows, B_1 has b rows, C_{11} is $b \times b$
6	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ A_1 B_0^T + \widehat{C}_{10} & \widehat{C}_{11} & * \\ A_2 B_0^T + \widehat{C}_{20} & \widehat{C}_{21} & \widehat{C}_{22} \end{pmatrix} \right\}$
8	$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$ $C_{10} := B_1 A_0^T + C_{10}$ $C_{21} := A_2 B_1^T + C_{21}$
7	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ A_1 B_0^T + B_1 A_0^T + \widehat{C}_{10} & A_1 (B_1^T) + B_1 (A_1^T) + \widehat{C}_{11} & * \\ A_2 B_0^T + \widehat{C}_{20} & A_2 (B_1^T) + \widehat{C}_{21} & \widehat{C}_{22} \end{pmatrix} \right\}$
5b	$\left(\begin{array}{c c} A_T & \\ \hline A_B & \end{array} \right) \leftarrow \left(\begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left(\begin{array}{c c} B_T & \\ \hline B_B & \end{array} \right) \leftarrow \left(\begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right)$
2	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline A_B B_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline A_B B_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg(m(C_{TL}) < m(C)) \right\}$
1b	$\{C = AB^T + BA^T + \widehat{C}$

	Algorithm: $C = AB^T + BA^T + C$
	$A \rightarrow \left(\begin{array}{c} A_T \\ A_B \end{array} \right), B \rightarrow \left(\begin{array}{c} B_T \\ B_B \end{array} \right), C \rightarrow \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right)$ <p>where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0</p>
	while $m(C_{TL}) < m(C)$ do
	<p>Determine block size b</p> $\left(\begin{array}{c} A_T \\ A_B \end{array} \right) \rightarrow \left(\begin{array}{c} A_0 \\ A_1 \\ A_2 \end{array} \right), \left(\begin{array}{c} B_T \\ B_B \end{array} \right) \rightarrow \left(\begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right)$ <p>where A_1 has b rows, B_1 has b rows, C_{11} is $b \times b$</p>
	$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$ $C_{10} := B_1 A_0^T + C_{10}$ $C_{21} := A_2 B_1^T + C_{21}$
	$\left(\begin{array}{c} A_T \\ A_B \end{array} \right) \leftarrow \left(\begin{array}{c} A_0 \\ A_1 \\ A_2 \end{array} \right), \left(\begin{array}{c} B_T \\ B_B \end{array} \right) \leftarrow \left(\begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right)$
	endwhile

Algorithm: $C = AB^T + BA^T + C$

$$A \rightarrow \begin{pmatrix} A_T \\ A_B \end{pmatrix}, B \rightarrow \begin{pmatrix} B_T \\ B_B \end{pmatrix}, C \rightarrow \left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right)$$

where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0

while $m(C_{TL}) < m(C)$ **do**

Determine block size b

$$\begin{pmatrix} A_T \\ A_B \end{pmatrix} \rightarrow \begin{pmatrix} A_0 \\ A_1 \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \rightarrow \begin{pmatrix} B_0 \\ B_1 \\ B_2 \end{pmatrix}, \left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c|cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right)$$

where A_1 has b rows, B_1 has b rows, C_{11} is $b \times b$

$$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$$

$$C_{10} := B_1 A_0^T + C_{10}$$

$$C_{21} := A_2 B_1^T + C_{21}$$

$$\begin{pmatrix} A_T \\ A_B \end{pmatrix} \leftarrow \begin{pmatrix} A_0 \\ A_1 \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \leftarrow \begin{pmatrix} B_0 \\ B_1 \\ B_2 \end{pmatrix}, \left(\begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{cc|c} C_{00} & * & * \\ C_{10} & C_{11} & * \\ \hline C_{20} & C_{21} & C_{22} \end{array} \right)$$

endwhile