

Step	Algorithm:
1a	
4	
	where
2	
3	while do
2,3	\wedge
5a	
	where
6	
8	
5b	
7	
2	
	endwhile
2,3	$\wedge \neg(\quad)$
1b	

Step	Algorithm: $[C] := \text{SYRK2_UNB_VAR1}(A, B, C)$
1a	$C = \widehat{C}$
4	$A \rightarrow \begin{pmatrix} A_T \\ A_B \end{pmatrix}, B \rightarrow \begin{pmatrix} B_T \\ B_B \end{pmatrix}, C \rightarrow \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix}$ where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0
2	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix}$
3	while $m(A_T) < m(A)$ do
2,3	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix} \wedge m(A_T) < m(A)$
5a	$\begin{pmatrix} A_T \\ A_B \end{pmatrix} \rightarrow \begin{pmatrix} A_0 \\ a_1^T \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \rightarrow \begin{pmatrix} B_0 \\ b_1^T \\ B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} \rightarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix}$ where a_1 has 1 row, b_1 has 1 row, γ_{11} is 1×1
6	$\begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & \widehat{c}_{01} & \widehat{C}_{02} \\ \widehat{c}_{10}^T & \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{pmatrix}$
8	$c_{01} = A_0 \beta_1 + B_0 \alpha_1 + c_{01}$ $c_{10}^T = c_{01}^T$ $\gamma_{11} = \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \gamma_{11}$
5b	$\begin{pmatrix} A_T \\ A_B \end{pmatrix} \leftarrow \begin{pmatrix} A_0 \\ a_1^T \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \leftarrow \begin{pmatrix} B_0 \\ b_1^T \\ B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} \leftarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix}$
7	$\begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & A_0 \beta_1 + B_0 \alpha_1 + \widehat{c}_{01} & \widehat{C}_{02} \\ \alpha_1^T B_0^T + \beta_1^T A_0^T + \widehat{c}_{10}^T & \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{pmatrix}$
2	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix}$
	endwhile
2,3	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix} \wedge \neg(m(A_T) < m(A))$
1b	$[C] = \text{syrk2}(A, B, \widehat{C})$

Algorithm: $[C] := \text{SYRK2_UNB_VAR1}(A, B, C)$

$$A \rightarrow \begin{pmatrix} A_T \\ \hline A_B \end{pmatrix}, B \rightarrow \begin{pmatrix} B_T \\ \hline B_B \end{pmatrix}, C \rightarrow \begin{pmatrix} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{pmatrix}$$

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

while $m(A_T) < m(A)$ **do**

$$\begin{pmatrix} A_T \\ \hline A_B \end{pmatrix} \rightarrow \begin{pmatrix} A_0 \\ \hline a_1^T \\ \hline A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ \hline B_B \end{pmatrix} \rightarrow \begin{pmatrix} B_0 \\ \hline b_1^T \\ \hline B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{pmatrix} \rightarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{pmatrix}$$

where a_1 has 1 row, b_1 has 1 row, γ_{11} is 1×1

$$c_{01} = A_0 \beta_1 + B_0 \alpha_1 + c_{01} c_{10}^T = c_{01}^T \gamma_{11} = \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \gamma_{11}$$

$$\begin{pmatrix} A_T \\ \hline A_B \end{pmatrix} \leftarrow \begin{pmatrix} A_0 \\ \hline a_1^T \\ \hline A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ \hline B_B \end{pmatrix} \leftarrow \begin{pmatrix} B_0 \\ \hline b_1^T \\ \hline B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{pmatrix} \leftarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{pmatrix}$$

endwhile

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	where
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \hat{C}_{TL} + A_T B_T^T + B_T A_T^T & \hat{C}_{TR} \\ \hline \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right)$
3	while do
2,3	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \hat{C}_{TL} + A_T B_T^T + B_T A_T^T & \hat{C}_{TR} \\ \hline \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge$
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2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \hat{C}_{TL} + A_T B_T^T + B_T A_T^T & \hat{C}_{TR} \\ \hline \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right)$
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3	while $m(A_T) < m(A)$ do
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2	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \hat{C}_{TL} + A_T B_T^T + B_T A_T^T & \hat{C}_{TR} \\ \hat{C}_{BL} & \hat{C}_{BR} \end{pmatrix}$
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5a	$\left(\begin{array}{c c} A_T \\ \hline A_B \end{array} \right) \rightarrow \left(\begin{array}{c c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array} \right), \left(\begin{array}{c c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left(\begin{array}{c c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$ where a_1 has 1 row, b_1 has 1 row, γ_{11} is 1×1
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5b	$\left(\begin{array}{c c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left(\begin{array}{c c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array} \right), \left(\begin{array}{c c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left(\begin{array}{c c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$
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5b	$\left(\begin{array}{c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left(\begin{array}{c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array} \right), \left(\begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array} \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$
7	$\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c c c} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & A_0 \beta_1 + B_0 \alpha_1 + \widehat{c}_{01} & \widehat{C}_{02} \\ \hline \alpha_1^T B_0^T + \beta_1^T A_0^T + \widehat{c}_{10}^T & \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \hline \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array} \right)$
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg(m(A_T) < m(A))$
1b	$[C] = \text{syrk2}(A, B, \widehat{C})$

Step	Algorithm: $[C] := \text{SYRK2_UNB_VAR1}(A, B, C)$
1a	$C = \widehat{C}$
4	$A \rightarrow \begin{pmatrix} A_T \\ A_B \end{pmatrix}, B \rightarrow \begin{pmatrix} B_T \\ B_B \end{pmatrix}, C \rightarrow \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix}$ where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0
2	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix}$
3	while $m(A_T) < m(A)$ do
2,3	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix} \wedge m(A_T) < m(A)$
5a	$\begin{pmatrix} A_T \\ A_B \end{pmatrix} \rightarrow \begin{pmatrix} A_0 \\ a_1^T \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \rightarrow \begin{pmatrix} B_0 \\ b_1^T \\ B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} \rightarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix}$ where a_1 has 1 row, b_1 has 1 row, γ_{11} is 1×1
6	$\begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & \widehat{c}_{01} & \widehat{C}_{02} \\ \widehat{c}_{10}^T & \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{pmatrix}$
8	$c_{01} = A_0 \beta_1 + B_0 \alpha_1 + c_{01}$ $c_{10}^T = c_{01}^T$ $\gamma_{11} = \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \gamma_{11}$
5b	$\begin{pmatrix} A_T \\ A_B \end{pmatrix} \leftarrow \begin{pmatrix} A_0 \\ a_1^T \\ A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ B_B \end{pmatrix} \leftarrow \begin{pmatrix} B_0 \\ b_1^T \\ B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} \leftarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix}$
7	$\begin{pmatrix} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & A_0 \beta_1 + B_0 \alpha_1 + \widehat{c}_{01} & \widehat{C}_{02} \\ \alpha_1^T B_0^T + \beta_1^T A_0^T + \widehat{c}_{10}^T & \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{pmatrix}$
2	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix}$
	endwhile
2,3	$\begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix} = \begin{pmatrix} \widehat{C}_{TL} + A_T B_T^T + B_T A_T^T & \widehat{C}_{TR} \\ \widehat{C}_{BL} & \widehat{C}_{BR} \end{pmatrix} \wedge \neg(m(A_T) < m(A))$
1b	$[C] = \text{syrk2}(A, B, \widehat{C})$

Step	Algorithm: $[C] := \text{SYRK2_UNB_VAR1}(A, B, C)$
	$A \rightarrow \left(\begin{array}{c} A_T \\ A_B \end{array} \right), B \rightarrow \left(\begin{array}{c} B_T \\ B_B \end{array} \right), C \rightarrow \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right)$ <p>where A_T has 0 rows, B_T has 0 rows, C_{TL} is 0×0</p>
	while $m(A_T) < m(A)$ do
	$\left(\begin{array}{c} A_T \\ A_B \end{array} \right) \rightarrow \left(\begin{array}{c} A_0 \\ \frac{a_1^T}{A_2} \end{array} \right), \left(\begin{array}{c} B_T \\ B_B \end{array} \right) \rightarrow \left(\begin{array}{c} B_0 \\ \frac{b_1^T}{B_2} \end{array} \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$ <p>where a_1 has 1 row, b_1 has 1 row, γ_{11} is 1×1</p>
	$\begin{aligned} c_{01} &= A_0 \beta_1 + B_0 \alpha_1 + c_{01} \\ c_{10}^T &= c_{01}^T \\ \gamma_{11} &= \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \gamma_{11} \end{aligned}$
	$\left(\begin{array}{c} A_T \\ A_B \end{array} \right) \leftarrow \left(\begin{array}{c} A_0 \\ \frac{a_1^T}{A_2} \end{array} \right), \left(\begin{array}{c} B_T \\ B_B \end{array} \right) \leftarrow \left(\begin{array}{c} B_0 \\ \frac{b_1^T}{B_2} \end{array} \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$
	endwhile

Algorithm: $[C] := \text{SYRK2_UNB_VAR1}(A, B, C)$

$$A \rightarrow \begin{pmatrix} A_T \\ \hline A_B \end{pmatrix}, B \rightarrow \begin{pmatrix} B_T \\ \hline B_B \end{pmatrix}, C \rightarrow \begin{pmatrix} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{pmatrix}$$

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

while $m(A_T) < m(A)$ **do**

$$\begin{pmatrix} A_T \\ \hline A_B \end{pmatrix} \rightarrow \begin{pmatrix} A_0 \\ \hline a_1^T \\ \hline A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ \hline B_B \end{pmatrix} \rightarrow \begin{pmatrix} B_0 \\ \hline b_1^T \\ \hline B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{pmatrix} \rightarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{pmatrix}$$

where a_1 has 1 row, b_1 has 1 row, γ_{11} is 1×1

$$c_{01} = A_0 \beta_1 + B_0 \alpha_1 + c_{01} c_{10}^T = c_{01}^T \gamma_{11} = \alpha_1^T \beta_1 + \beta_1^T \alpha_1 + \gamma_{11}$$

$$\begin{pmatrix} A_T \\ \hline A_B \end{pmatrix} \leftarrow \begin{pmatrix} A_0 \\ \hline a_1^T \\ \hline A_2 \end{pmatrix}, \begin{pmatrix} B_T \\ \hline B_B \end{pmatrix} \leftarrow \begin{pmatrix} B_0 \\ \hline b_1^T \\ \hline B_2 \end{pmatrix}, \begin{pmatrix} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{pmatrix} \leftarrow \begin{pmatrix} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{pmatrix}$$

endwhile