Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	
	$C \to \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix}, A \to \begin{pmatrix} A_L & A_R \end{pmatrix}$ where C_{TL} is 0×0 , A_L has 0 columns
2	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
3	while $m(C_{TL}) < m(C)$ 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} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) $
5a	$ \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}, \begin{pmatrix} A_L & A_R \end{pmatrix} \rightarrow \begin{pmatrix} A_0 & a_1 & A_2 \end{pmatrix} $ where γ_{11} is 1×1 , a_1 has 1 column
6	$ \left\{ \begin{array}{c cc} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{array}\right\} = \left(\begin{array}{c cc} A_0^T A_0 + \widehat{C}_{00} & \widehat{c}_{01} & \widehat{C}_{02} \\ \hline \widehat{c}_{10}^T & \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array}\right) $
8	$c_{10}^T := a_1^T A_0 + c_{10}^T$ $\gamma_{11} := a_1^T a_1 + \gamma_{11}$
7	$ \left\{ \begin{array}{c c} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c c} A_0^T A_0 + \widehat{C}_{00} & A_0^T a_1 + \widehat{c}_{10}^T & \widehat{C}_{02} \\ a_1^T A_0 + \widehat{c}_{10}^T & a_1^T a_1 + \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \hline \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array} \right) $
5b	$ \left(\begin{array}{c 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), \left(\begin{array}{c 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) $
2	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) \right\}$
1b	$\{C = A^T A + \widehat{C} $ }

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$	
1a	{	}
4	where	
2		}
3	while do	
2,3	^	$\left. \right\}$
5a	where	
6		
8		
7		$\left.\begin{array}{c} \\ \end{array}\right\}$
5b		
2		$\bigg\}$
	endwhile	
2,3	$ \left\{ \begin{array}{c} \wedge \neg (\end{array} \right.)$	$\bigg\}$
1b	{	}

Step	Algorithm: $[C] := SYRK_LT_UNB_VAR$	1(A,C)		
1a	$\{C=\widehat{C}$			}
4	where			
2				}
3	while do			
2,3		٨		$\bigg\}$
5a	where			
6				
8				
7				
5b				
2				$\bigg\}$
	endwhile			
2,3		^¬()	
1b	$\{C = A^T A + \widehat{C}$			}

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	$\{C = \widehat{C}$
4	where
2	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
3	while do
2,3	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \right.$
5a	where
6	
8	
7	
5b	
2	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2,3	$ \left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg () \right\} $
1b	$\left\{ C = A^T A + \widehat{C} \right\}$

Step	Algorithm: $[C] := SYRK_LT_UNB_VAR1(A, C)$
1a	${C = \widehat{C}}$
4	where
2	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \\ \end{array} \right\}$
5a	where
6	
8	
7	
5b	
2	$\left\{ \begin{array}{c c} \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \end{array} \right.$
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg (m(C_{TL}) < m(C)) \right\}$
1b	$\left\{C = A^T A + \widehat{C}\right\}$

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	$\{C = \widehat{C}\}$
4	$C \to \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_L & A_R \end{array}\right)$ where C_{TL} is 0×0 , A_L has 0 columns
2	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
3	while $m(C_{TL}) < m(C)$ 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} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) $
5a	where
6	
8	
7	
5b	
2	$ \left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
2,3	endwhile $ \left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) $
1b	$\left\{ C = A^T A + \widehat{C} \right\}$

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	${C = \widehat{C}}$
4	$C \to \begin{pmatrix} C_{TL} & C_{TR} \\ C_{BL} & C_{BR} \end{pmatrix}, A \to \begin{pmatrix} A_L & A_R \end{pmatrix}$ where C_{TL} is 0×0 , A_L has 0 columns
2	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C)$
5a	$ \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}, \begin{pmatrix} A_L & A_R \end{pmatrix} \rightarrow \begin{pmatrix} A_0 & a_1 & A_2 \end{pmatrix} $ where γ_{11} is 1×1 , a_1 has 1 column
6	
8	
7	
5b	$ \left(\begin{array}{c 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), \left(\begin{array}{c 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) $
2	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) \right\}$
1b	$\left\{C = A^T A + \widehat{C}\right\}$

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	$\{C = \widehat{C} $
4	$C o \left(egin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} ight) , A o \left(\left. A_L \right A_R \right) \\ \text{where } C_{TL} \text{ is } 0 imes 0, A_L \text{ has } 0 \text{ columns} \end{cases}$
2	$ \left\{ \left(\frac{C_{TL}}{C_{BL}} \left \frac{C_{TR}}{C_{BR}} \right) = \left(\frac{A_L^T A_L + \hat{C}_{TL}}{\hat{C}_{BL}} \left \frac{\hat{C}_{TR}}{\hat{C}_{BR}} \right) \right. \right\} $
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right\} = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C)$
5a	$ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right) \to \left(\begin{array}{c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c c} A_L & A_R \end{array}\right) \to \left(\begin{array}{c c} A_0 & a_1 & A_2 \end{array}\right) $
6	$ \begin{cases} \frac{C_{00}}{c_{01}} & c_{01} & C_{02} \\ \hline c_{10}^{T} & \gamma_{11} & c_{12}^{T} \\ C_{20} & c_{21} & C_{22} \end{cases} = \begin{pmatrix} \frac{A_{0}^{T} A_{0} + \widehat{C}_{00}}{\widehat{c}_{10}} & \widehat{c}_{01} & \widehat{C}_{02} \\ \hline \widehat{c}_{10}^{T} & \widehat{\gamma}_{11} & \widehat{c}_{12}^{T} \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{pmatrix} $
8	
7	
5b	$\left(egin{array}{c c} C_{BL} & C_{BR} \end{array} \right) \left(egin{array}{c c} C_{20} & c_{21} & C_{22} \end{array} \right)$
2	$ \left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) \right\}$
1b	$\left\{ C = A^T A + \widehat{C} \right\}$

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	$\{C = \widehat{C}$
4	$C \to \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_L & A_R \end{array}\right)$ where C_{TL} is 0×0 , A_L has 0 columns
2	$ \left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\} $
3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right\} = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C)$
5a	$ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right) \to \left(\begin{array}{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} A_L & A_R \end{array}\right) \to \left(\begin{array}{c c} A_0 & a_1 & A_2 \end{array}\right) $
6	$ \begin{cases} \frac{C_{00}}{c_{01}} & c_{01} & c_{02} \\ \hline c_{10}^{T} & \gamma_{11} & c_{12}^{T} \\ C_{20} & c_{21} & C_{22} \end{cases} = \begin{pmatrix} \frac{A_{0}^{T} A_{0} + \widehat{C}_{00}}{\widehat{c}_{10}} & \widehat{c}_{01} & \widehat{C}_{02} \\ \hline \widehat{c}_{10}^{T} & \widehat{\gamma}_{11} & \widehat{c}_{12}^{T} \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{pmatrix} $
8	
7	$ \left\{ \begin{array}{c cc} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c cc} A_0^T A_0 + \widehat{C}_{00} & A_0^T a_1 + \widehat{c}_{10}^T & \widehat{C}_{02} \\ a_1^T A_0 + \widehat{c}_{10}^T & a_1^T a_1 + \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \hline \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array} \right) $
5b	$\left(egin{array}{c c} C_{BL} & C_{BR} \end{array} \right) = \left(egin{array}{c c} C_{20} & c_{21} & C_{22} \end{array} \right)$
2	$ \left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
	endwhile
2,3	$ \left\{ \left(\frac{C_{TL}}{C_{BL}} \left \frac{C_{TR}}{C_{BR}} \right) = \left(\frac{A_L^T A_L + \widehat{C}_{TL}}{\widehat{C}_{BL}} \left \widehat{C}_{TR} \right \right) \land \neg (m(C_{TL}) < m(C)) \right\} $
1b	$\left\{ C = A^T A + \widehat{C} \right\}$

Step	Algorithm: $[C] := \text{SYRK_LT_UNB_VAR1}(A, C)$
1a	$\{C = \widehat{C}$
4	$C o \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \ , \ A o \left(\begin{array}{c c} A_L & A_R \end{array} \right)$ where C_{TL} is 0×0 , A_L has 0 columns
2	$ \left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \hat{C}_{TL} & \hat{C}_{TR} \\ \hline \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\} $
3	while $m(C_{TL}) < m(C)$ 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} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) $
5a	$ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right) \rightarrow \left(\begin{array}{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} A_L & A_R \end{array}\right) \rightarrow \left(\begin{array}{c c} A_0 & a_1 & A_2 \end{array}\right) $ where γ_{11} is 1×1 , a_1 has 1 column
6	$ \left\{ \begin{array}{c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{array}\right\} = \left(\begin{array}{c c} A_0^T A_0 + \widehat{C}_{00} & \widehat{c}_{01} & \widehat{C}_{02} \\ \hline \widehat{c}_{10}^T & \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array}\right) $
8	$c_{10}^T := a_1^T A_0 + c_{10}^T$ $\gamma_{11} := a_1^T a_1 + \gamma_{11}$
7	$ \left\{ \begin{array}{c cccc} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c cccc} A_0^T A_0 + \widehat{C}_{00} & A_0^T a_1 + \widehat{c}_{10}^T & \widehat{C}_{02} \\ a_1^T A_0 + \widehat{c}_{10}^T & a_1^T a_1 + \widehat{\gamma}_{11} & \widehat{c}_{12}^T \\ \hline \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array} \right) $
5b	$\left(\begin{array}{c c} C_{BL} & C_{BR} \end{array} \right) \left(\begin{array}{c c} C_{20} & c_{21} & C_{22} \end{array} \right)$
2	$ \left\{ \begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) $
	endwhile
2,3	$\left\{ \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \land \neg (m(C_{TL}) < m(C)) \right\}$
1b	$\{C = A^T A + \widehat{C} $

Algorithm: $[C] := SYRK_LT_UNB_VAR1(A, C)$
$C \to \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right), A \to \left(\begin{array}{c c} A_L & A_R \end{array}\right)$ where C_{TL} is 0×0 , A_L has 0 columns
while $m(C_{TL}) < m(C)$ do
$ \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}, \begin{pmatrix} A_L & A_R \end{pmatrix} \rightarrow \begin{pmatrix} A_0 & a_1 & A_2 \end{pmatrix} $ where γ_{11} is 1×1 , a_1 has 1 column
$c_{10}^T := a_1^T A_0 + c_{10}^T$ $\gamma_{11} := a_1^T a_1 + \gamma_{11}$
$ \left(\begin{array}{c 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} \\ 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_L & A_R \end{array}\right) \leftarrow \left(\begin{array}{c c c} A_0 & a_1 & A_2 \end{array}\right) $
endwhile

Algorithm: $[C] := SYRK_LT_UNB_VAR1(A, C)$

$$C \to \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right) , A \to \left(\begin{array}{c|c} A_L & A_R \end{array}\right)$$

where C_{TL} is 0×0 , A_L has 0 columns

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

$$\left(\begin{array}{c|c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right) \to \left(\begin{array}{c|c|c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c|c|c} A_L & A_R \end{array}\right) \to \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array}\right)$$

where γ_{11} is 1×1 , a_1 has 1 column

$$c_{10}^T := a_1^T A_0 + c_{10}^T$$

$$\gamma_{11} := a_1^T a_1 + \gamma_{11}$$

$$\left(\begin{array}{c|c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} C_{00} & c_{01} & C_{02} \\ c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array}\right), \left(\begin{array}{c|c|c} A_L & A_R \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array}\right)$$

endwhile