From figure 8 (algorithm for computing UDU^T factorization of a symmetric matrix, the below changes are to be made:

Option 2

$a_{01} := a_{01}/\alpha_{11}$

$A_{00} := A_{00} - \alpha_{11} a_{01} a_{01}^T$ (updating upper triangle).

Then,

Exercise 5.2

From the repartition

$$\left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right) \longrightarrow \left(\begin{array}{c|c|c|c} A_{00} & \alpha_{01} e_L & 0 & 0 \\ \star & \alpha_{11} & \alpha_{12} & 0 \\ \hline \star & \star & \alpha_{22} & \alpha_{23} e_F^T \\ \hline \star & \star & \star & A_{33} \end{array}\right)$$

$A_{FF} = A_{00}$; $\alpha_{FM} e_L \to$; $\alpha_{ML} e_F^T \to$; ALL

In this partition, the upper triangular matrix is $\left(\begin{array}{c|c} A_{FF} & \alpha_{FM} e_L \\ \hline & \alpha_{MM} \end{array}\right)$ where $A_{FF} \to \left(\begin{array}{c|c} A_{00} & \alpha_{01} e_L \\ \hline \star & \alpha_{11} \end{array}\right)$ $\alpha_{FM} e_L \to \begin{pmatrix} 0 \\ \alpha_{12} \end{pmatrix}$ $\alpha_{MM} \to \alpha_{22}$

According to algorithm (Fig 8 update mentioned above), the key update is is $a_{01} \to \begin{pmatrix} 0 \\ \alpha_{12} \end{pmatrix}$; hence <Also, in this partition, α_{11} is α_{22}>

(i) $$\begin{pmatrix} 0 \\ \alpha_{12} \end{pmatrix} := \begin{pmatrix} 0 \\ \alpha_{12} \end{pmatrix} / \alpha_{22} \quad \Rightarrow \quad \alpha_{12} := \alpha_{12} / \alpha_{22}$$

(ii) $$\left(\begin{array}{c|c} A_{00} & \alpha_{01} e_L \\ \hline \star & \alpha_{11} \end{array}\right) := \left(\begin{array}{c|c} A_{00} & \alpha_{01} e_L \\ \hline \star & \alpha_{11} \end{array}\right) - \alpha_{22} \begin{pmatrix} 0 \\ \alpha_{12} \end{pmatrix} \begin{pmatrix} 0 \\ \alpha_{12} \end{pmatrix}^T$$

$$= \left(\begin{array}{c|c} A_{00} & \alpha_{01} e_L \\ \hline \star & \alpha_{11} - \alpha_{22} \alpha_{12}^2 \end{array}\right)$$

Algorithm: $A := \text{UDUT\_TRI}(A)$

Partition $A \rightarrow \left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L^T & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right)$

where A_{LL} **is** 0×0

while $m(A_{LL}) < m(A)$ **do**

Repartition

$$\left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c|c} A_{00} & \alpha_{01} e_L & 0 & 0 \\ \hline \star & \alpha_{11} & \alpha_{12} & 0 \\ \hline \star & \star & \alpha_{22} & \alpha_{23} e_F^T \\ \hline \star & \star & \star & A_{33} \end{array}\right)$$

where

$\alpha_{12} := \alpha_{12} / \alpha_{22}$

$\alpha_{11} := \alpha_{11} - \alpha_{22} \alpha_{12}^2$

(updating upper triangle)

Continue with

$$\left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c|c} A_{00} & \alpha_{01} e_L & 0 & 0 \\ \hline \star & \alpha_{11} & \alpha_{12} & 0 \\ \hline \star & \star & \alpha_{22} & \alpha_{23} e_F^T \\ \hline \star & \star & \star & A_{33} \end{array}\right)$$

endwhile

Figure 9: Algorithm for computing the the UDU^T factorization of a tridiagonal matrix.