Algorithm 15.2 Likelihood-weighted particle generation for a 2-TBN

     Procedure LW-2TBN (

        $\mathcal{B}_\rightarrow$ // 2-TBN

        ξ // Instantiation to time $t-1$ variables

        $\boldsymbol{O}^{(t)} = \boldsymbol{o}^{(t)}$ // time t evidence

)

1   Let $X_1', \ldots, X_n'$ be a topological ordering of $\mathcal{X}'$ in $\mathcal{B}_\rightarrow$

2       $w \leftarrow 1$

3   **for** $i = 1, \ldots, n$

4         $\boldsymbol{u}_i \leftarrow (\xi, \boldsymbol{x}')\langle \mathrm{Pa}_{X_i'} \rangle$

5   // Assignment to $\mathrm{Pa}_{X_i'}$ in $x_1, \ldots, x_n, x_1', \ldots, x_{i-1}'$

6   **if** $X_i' \notin \boldsymbol{O}^{(t)}$ **then**

7   Sample x_i' from $P(X_i' \mid \boldsymbol{u}_i)$

8   **else**

9           $x_i' \leftarrow \boldsymbol{o}^{(t)}\langle X_i'\rangle$ // Assignment to X_i' in $\boldsymbol{o}^{(t)}$

10           $w \leftarrow w \cdot P(x_i' \mid \boldsymbol{u}_i)$ // Multiply weight by probability of desired value

11   **return** $(x_1', \ldots, x_n'), w$

Algorithm 15.3 Likelihood weighting for filtering in DBNs

     Procedure LW-DBN (

        $\langle \mathcal{B}_0, \mathcal{B}_\rightarrow \rangle$,   // DBN

        M // Number of samples

        $\boldsymbol{o}^{(1)}, \boldsymbol{o}^{(2)}, \ldots$ // Observation sequence

)

1   **for** $m = 1, \ldots, M$

2   Sample $\xi^{(0)}[m]$ from $\mathcal{B}_0$

3         $w[m] \leftarrow 1$

4   **for** $t = 1, 2, \ldots$

5   **for** $m = 1, \ldots, M$

6           $(\xi^{(t)}[m], w) \leftarrow$ LW-2TBN$(\mathcal{B}_\rightarrow, \xi^{(t-1)}[m], \boldsymbol{o}^{(t)})$

7   // Sample time t variables starting from time $t-1$ sample

8           $w[m] \leftarrow w[m] \cdot w$

9   // Multiply weight of m'th sample with weight of time t evidence

10         $\hat{\sigma}^{(t)}(\xi) \leftarrow \dfrac{\sum_{m=1}^{M} w[m] \boldsymbol{I}\{\xi^{(t)}[m] = \xi\}}{\sum_{m=1}^{M} w[m]}$