

**Algorithm 15.4 Particle filtering for DBNs**

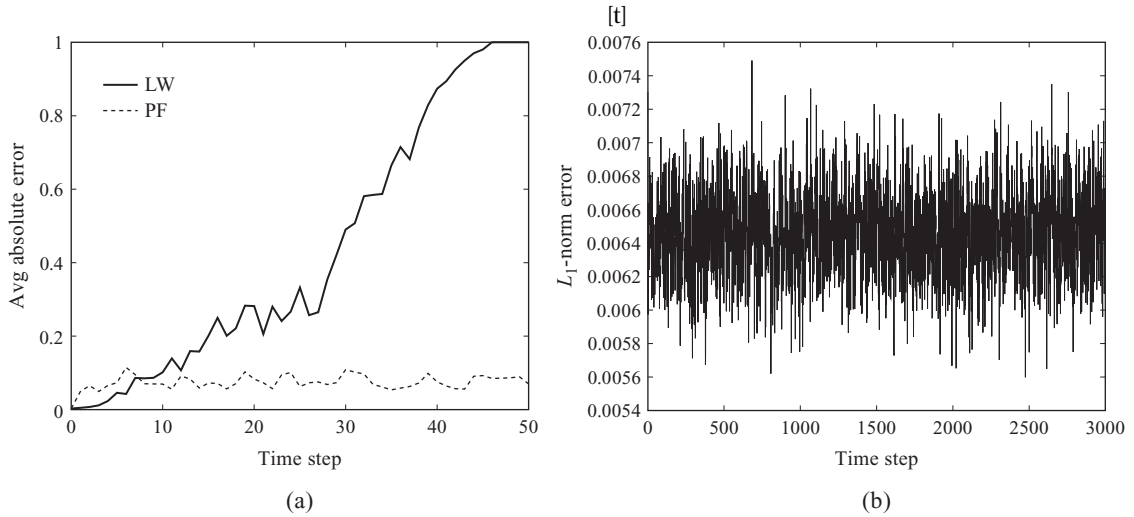

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Procedure Particle-Filter-DBN (
   $\langle \mathcal{B}_0, \mathcal{B}_\rightarrow \rangle$ , // DBN
   $M$  // Number of samples
   $\mathbf{o}^{(1)}, \mathbf{o}^{(2)}, \dots$  // Observation sequence
)
1  for  $m = 1, \dots, M$ 
2    Sample  $\bar{\mathbf{x}}^{(0)}[m]$  from  $\mathcal{B}_0$ 
3     $w^{(0)}[m] \leftarrow 1/M$ 
4  for  $t = 1, 2, \dots$ 
5    for  $m = 1, \dots, M$ 
6      Sample  $\bar{\mathbf{x}}^{(0:t-1)}$  from the distribution  $\hat{P}_{\mathcal{D}^{(t-1)}}$ .
7      // Select sample for propagation
8       $(\bar{\mathbf{x}}^{(t)}[m], w^{(t)}[m]) \leftarrow \text{LW-2TBN}(\mathcal{B}_\rightarrow, \bar{\mathbf{x}}^{(t-1)}, \mathbf{o}^{(t)})$ 
9      // Generate time  $t$  sample and weight from selected sample
10      $\bar{\mathbf{x}}^{(t-1)}$ 
11      $\mathcal{D}^{(t)} \leftarrow \{(\bar{\mathbf{x}}^{(0:t)}[m], w^{(t)}[m]) : m = 1, \dots, M\}$ 
12      $\hat{\sigma}^{(t)}(\mathbf{x}) \leftarrow \hat{P}_{\mathcal{D}^{(t)}}$ 

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**Figure 15.6 Likelihood weighting and particle filtering over time.** (a) A comparison for 1,000 time slices. (b) A very long run of particle filtering.