Particle filter

$$t = 2$$

Normalise weights

$$W_2^{(k)} = \frac{w_2^{(k)}}{\sum_{k'} w_2^{(k')}}$$

$\mathbf{x}_1^{(1)}$ $\mathbf{x}_1^{(2)}$ $\mathbf{x}_1^{(3)}$ $\mathbf{x}_1^{(4)}$ $\mathbf{x}_1^{(5)}$

0/5   2/5   2/5   0/5   1/5

$A_1^{(1)} = 2$ $A_1^{(2)} = 3$ $A_1^{(3)} = 5$ $A_1^{(4)} = 3$ $A_1^{(5)} = 2$

$\mathbf{x}_2^{(1)}$ $\mathbf{x}_2^{(2)}$ $\mathbf{x}_2^{(3)}$ $\mathbf{x}_2^{(4)}$ $\mathbf{x}_2^{(5)}$

2/5   1/5   0/5   1/5   1/5
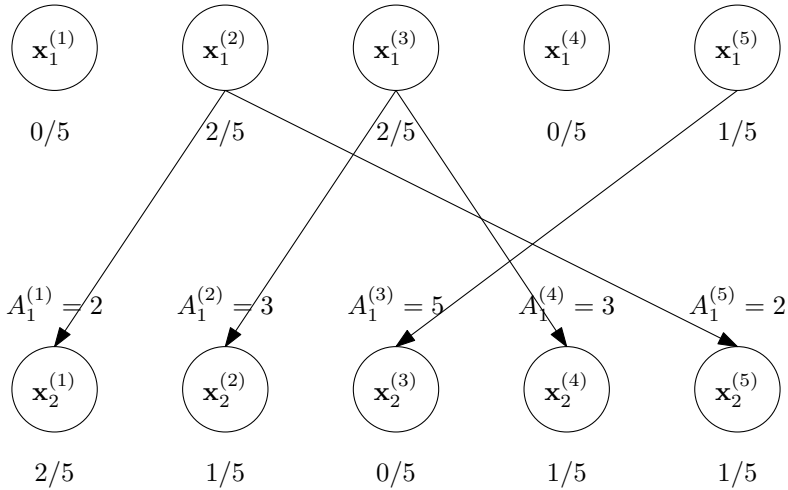
Can resample from

$$\hat{p}(\mathrm{d}\mathbf{x}_{1:2} \mid \mathbf{y}_{1:2}, \theta) = \sum_k W_2^{(k)} \delta_{\mathbf{x}_{1:2}^{(k)}}(\mathbf{x}_{1:2})$$

to estimate

$$p(\mathbf{x}_{1:2} \mid \mathbf{y}_{1:2}, \theta)$$