Particle filter

$$t = 3$$

Normalise weights

$$W_{3}^{(k)} = \frac{w_{3}^{(k)}}{\sum_{k'} w_{3}^{(k')}}$$

$$\begin{pmatrix} \mathbf{x}_{1}^{(1)} & \mathbf{x}_{1}^{(2)} & \mathbf{x}_{1}^{(3)} & \mathbf{x}_{1}^{(4)} & \mathbf{x}_{1}^{(5)} \end{pmatrix}$$

$$0/5 \qquad 2/5 \qquad 2/5 \qquad 0/5 \qquad 1/5$$

$$A_{1}^{(1)} = 2 \qquad A_{1}^{(2)} = 3 \qquad A_{1}^{(3)} = 5 \qquad A_{1}^{(4)} = 3 \qquad A_{1}^{(5)} = 2$$

$$\begin{pmatrix} \mathbf{x}_{2}^{(1)} & \mathbf{x}_{2}^{(2)} & \mathbf{x}_{2}^{(3)} & \mathbf{x}_{2}^{(4)} & \mathbf{x}_{2}^{(5)} \end{pmatrix}$$

$$2/5 \qquad 1/5 \qquad 0/5 \qquad 1/5 \qquad 1/5$$

$$A_{2}^{(1)} = 2 \qquad A_{2}^{(2)} = 4 \qquad A_{2}^{(3)} = 1 \qquad A_{2}^{(4)} = 5 \qquad A_{2}^{(5)} = 1$$

$$\begin{pmatrix} \mathbf{x}_{3}^{(1)} & \mathbf{x}_{3}^{(2)} & \mathbf{x}_{3}^{(3)} & \mathbf{x}_{3}^{(4)} & \mathbf{x}_{3}^{(5)} \end{pmatrix}$$

$$1/5 \qquad 3/5 \qquad 0/5 \qquad 0/5 \qquad 0/5 \qquad 1/5$$

Can resample from

$$\hat{p}(d\mathbf{x}_{1:3} \mid \mathbf{y}_{1:3}, \theta) = \sum_{k} W_3^{(k)} \delta_{\mathbf{x}_{1:3}^{(k)}}(\mathbf{x}_{1:3})$$

to estimate

$$p(\mathbf{x}_{1:3} \mid \mathbf{y}_{1:3}, \theta)$$