

$$P(y_i^\ell | \mathbf{y}_{-(\ell, i)}, \mathbf{x}, \mathbf{a}, \mathbf{s}) \propto$$

$$P(x_i^\ell | \mathbf{x}_{-i}^\ell, \mathbf{y}^\ell) P(y_{i+1}^\ell | y_i^\ell, \mathbf{y}_{-(\ell, i)}, \mathbf{a}, \mathbf{s}) P(y_i^\ell | \mathbf{y}_{-(\ell, i)}, \mathbf{a}, \mathbf{s})$$