

$$\gamma(\mathbf{x}) = p(\mathbf{x}, \mathbf{y}) = \prod_{i=1}^N \tilde{g}_i(\mathbf{x}_{n_i}) \left(y_i \middle| \tilde{\phi}_i(\mathbf{x}_{n_i}) \right) \prod_{j=1}^M \tilde{f}_j(\mathbf{x}_{j-1}) \left(x_j \middle| \tilde{\theta}_j(\mathbf{x}_{j-1}) \right)$$