

$x_1, y_1 = \text{person}$

$x_2, y_2 = \text{camera}$

$x_3, y_3 = +v$

$x_4, y_4 = \text{person}$

$x_5, y_5 = \text{camera}$

$$\begin{aligned} p(x_{1:5} | y_{1:5}) &= p(x_1, x_4 | y_1, y_4) p(x_3 | y_3) p(x_2, x_5 | y_2, y_5) \\ &= p(x_1, x_4 | c=\text{person}) p(x_3 | c=+v) p(x_2, x_5 | c=\text{camera}) \end{aligned}$$

$$\begin{aligned} p(x_{1:5} | y_{1:5}, \eta) &= p(x_1, x_4 | y_1, y_4, \eta) p(x_3 | y_3, \eta) p(x_2, x_5 | y_2, y_5, \eta) \\ &= p(x_1, x_4 | \eta_{\text{person}}) p(x_3 | \eta_{+v}) p(x_2, x_5 | \eta_{\text{camera}}) \\ &= \prod_{c=1}^3 p(x_{i \in c} | \eta_c) \\ &= \prod_{c=1}^3 \prod_{j=1}^D p(x_{i \in c, j} | \eta_{jc}) \end{aligned}$$

$x_1, y_1 = \text{person}$

$x_2, y_2 = \text{camera}$

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$x_4, y_4 = \text{person}$

$x_5, y_5 = \text{camera}$

..
n

$$p(\tilde{x} | \tilde{y} = \text{person}, x_{1:5}, y_{1:5}) = p(\tilde{x} | \tilde{y} = \text{person}, \underline{x_1}, \underline{x_4})$$

$$= \prod_{j=1}^D p(\tilde{x}_j | \underline{x_{1,j}}, \underline{x_{2,j}})$$

$$= \prod_{j=1}^D p(\tilde{x}_j | x_{i \in \text{person}, j}) \quad \text{more general}$$

$x_{i,j}$