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 y_1, y_2, \dots, y_n x

$$\log \text{it}(E[Y_i|x_i]) = x_i^T \beta \quad ()$$

$$f(Y|X, \beta)$$

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$$f(Y, X | \Omega) = f(Y|X, \beta) f(X|\gamma) \quad ()$$

$$\Omega = (\beta, \gamma)$$

$$f(X; Y)$$

$$f(Y, X, A | \Omega^*) = f(Y | X, A, \beta^*) f(X, A | \gamma^*)$$

$$\Omega^* = (\beta^*, \gamma^*)$$

$$E(Y | X, A) = \int Y f(Y | X, A, \beta) dY$$

$$f(Y, X, A | \theta) = f(A | Y, X, \alpha) f(Y | X, \beta) f(X | \gamma)$$

$$\theta = (\alpha, \beta, \gamma)$$

$$\sum_i l_{a,y,x}(\theta | a_i, y_i, x_i) = \sum_i \{ l_{a|y,x}(\alpha | a_i, y_i, x_i) + l_{y|x}(\beta | y_i, x_i) + l_x(\gamma | x_i) \}$$

$$L_{a,y,x}(\theta) = \prod_i f(Y_i | X_i, \beta)$$

$$L_{a,y,x}^0(\theta) = \sum_i \log \{ L_{a|y,x}(\alpha | a_i, y_i, x_i) \times L_{y|x}(\beta | y_i, x_i) L_x(\gamma | x_i) \}$$

$$X = (x_1, x_2, \dots, x_p)$$

EM β X $\gamma = (\gamma_1, \gamma_2, \dots, \gamma_r)$
 $r = 2^3 - 1 = 7$
 c_1, \dots, c_p

E $\theta^{(t)}$ $L_{a,y,x}(\theta|a,Y,X)$ $r = c_1 \times \dots \times c_p - 1$
 $f(Y|X, \beta)$
 $f(X|Y)$ $f(A|X, Y, \alpha)$
 (β) γ, α
 X
 $r+1$ γ
 x
 X_i X_i
 $Q(\theta|\theta^{(t)})$ $f(A|X, Y, \alpha)$ p

$$Q(\theta|\theta^{(t)}) = \sum_{i=1}^n \sum_{j=1}^{r+1} w_{ij}^{(t)} L_{a,y,x}(\theta|a_i, y_i, x^j)$$

$$= \sum_{i=1}^n \sum_{j=1}^{r+1} w_{ij}^{(t)} \{l_{a|y,x}(\alpha|a_i, y_i, x^j) + l_{y|x}(\beta|y_i, x^j) + L_x(\gamma|x^j)\} \quad (1)$$

$x^j = x_{obs,i}$ X_i $L_{a,y,x}(\theta|a_i, y_i, x_i)$ θ

$$w_{ij}^{(t)} = p(x^j|a_i, y_i, x_{obs,i}, \theta^{(t)})$$

$$W_{it} = 1$$

x^j $X_{obs,i}$ w_{ij}
 $X_{obs,i}$ x^j
 $X_{obs,i}$ x^j

(1)

$$W_{ij}^{(t)} = P(x^j | a_i, y_i, x_i, \theta^{(t)})$$

$$= \begin{cases} 0 & \text{if } x^j \text{ is not compatible with } x_i \\ \frac{p(y_i | x_i^j) p(a_i | x_i^j, y_i) p(x_i^j)}{\sum_{k \in \text{obs}_i} p(y_i | x_i^k) p(a_i | x_i^k, y_i) p(x_i^k)} & \text{if } x^j \text{ is compatible with } x_i \end{cases} \quad ()$$

p x^j
 $X_{obs,i}$ j

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 $f(A|X, Y, \alpha), f(X; \delta)$

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 $f(A|Y, X)$

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