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HOMEWORK4

1/ Des petits calculs

On a $\frac{\delta \log z(x)}{\partial \theta_j} = \frac{1}{2} \sum_y F_1(x,y) e^{(\theta_y^T F(x,y)} \quad — (1)$

$\frac{\partial \log t}{\partial t} \frac{\delta t}{\delta \theta_j} = \frac{1}{2} \sum_y F_j(x,y) e^{\theta_y^T F(x,y))}$

$\Rightarrow \frac{\delta z}{\partial \theta_j} = \sum_y F_j(x,y) e^{\theta_y^T F(x,y))} \quad — (2)$

On note $F(x,y) = F$ et $F_j(x,y) = F_j$

$\frac{\delta \left(\frac{\delta \log z}{\delta \theta_j} \right)}{\delta \theta_i} \overset{(1)}{=} \sum_y \left(\frac{\delta p(y/x)}{\partial \theta_i} F_j + \frac{\delta F_j}{\partial \theta_i} \right.$

de l'équation (1) $\frac{\delta F_j}{\delta \theta_i} = 0$

$= \sum_y \left[\theta \frac{\delta (e^{(\theta_y^T F)} / z}{\delta \theta_i} \cdot F_j \right]$

$= \sum_y \left(F_j \frac{\delta (e^{(\theta_y^T F)}}{\delta \theta_i} \cdot \frac{1}{z} \right) + \sum_y \left(\frac{\delta (z)}{\delta \theta_i} F_j \right)$

(1)

$$= \sum_y \left(F_j \frac{e^{(O_y^T F)} F_i}{2} \right) + \sum_y \left(F_j e^{(O_y^T F)} \frac{\delta (Z)}{\delta O_i} \right)$$

$$\Rightarrow \underset{p(y/x)}{\mathcal{E}} (F_i, F_j) + \sum_y \left(F_j e^{(O_y^T F)} * \left(\frac{-1}{2^2}\right) \sum_y F_i \cdot e^{(O_y^T F)} \right)$$

$$\Rightarrow \mathcal{E}(F_i, F_j) + \sum_y \left(\frac{-F_j * e^{(O_y^T F)} * \mathcal{E}(F_i)}{2} \right)$$

$$\Rightarrow \mathcal{E}[F_i F_j] - \mathcal{E}[F_j] \cdot \mathcal{E}[F_i] = Cov(F_i, F_j)$$

2/ Encore les modèle de Markov

$M = \{ amand, - \}$ $F = \{ amn \ldots \}$ $R = \{ a, b, - \}$

$$P(S) = \left(\prod_R \right)^2 \prod_m \left(\prod_R \right)^3 \prod_F \left(\prod_R \right)^3 \prod_m \prod_R \prod_F \left(\prod_R \right)^2 \prod_M \left(\prod_R \right)^2 \prod_F$$

$\Pi_F = 0,8$ $\Pi_m = 0,8$ $\Pi_R = 0.2$

$Y_t = \{ m, f, r \}$

$$F(x_{(1:T)}, y_{(1:T)}) = \sum_t F_{y_m}(x_t, y_t, t)$$

$$h_{y_m}(x_t, y_t, t) = I(y_m(x_t) \wedge y_t = s)$$

$y_m(x_t)$ représente la fonction de contexte sur x_t
retournant vrai si $w(x_t) \in y$

$$\Rightarrow e^{(\theta^T F(x_{[1:t]}, y_{[1:t]}))} = e^{\sum_j \sum_t \alpha_{y_m} f_{y_m}(x_t, y_t, t))}$$

$$= \prod_{t=1}^{T} e^{(\theta^T f(x_t, y_t, t))}$$

On infère :

$$y^*_{[1:T]} = \underset{y[1:T] \in y^T}{\operatorname{argmax}} \theta^T F(x_{[1:T]}, y[1:T])$$

est très rapide car $y_t \perp\!\!\!\perp y_{t-1} / x_t$