

# HOMEWORK 4

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✓ Des petits calculs

$$\text{Or a } \frac{\delta \log z(x)}{\delta \theta_j} = \frac{1}{2} \sum_y F_j(x, y) e^{(\theta_y^T F(x, y))} \quad (1)$$

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

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

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

$$\frac{\delta \left( \frac{\delta \log z}{\delta \theta_i} \right)}{\delta \theta_i} = \sum_y \left( \frac{\delta p(y|x)}{\delta \theta_i} F_j + \frac{\delta F_j}{\delta \theta_i} \right)$$

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

$$\begin{aligned} &= \sum_y \left[ \theta \frac{\delta \left( e^{(\theta_y^T F)/2} \right)}{\delta \theta_i} F_j \right] \\ &= \sum_y \left( F_j \frac{\delta \left( \frac{e^{(\theta_y^T F)}}{2} \right)}{\delta \theta_i} \right) + \sum_y \left( \frac{\delta \left( \frac{e^{(\theta_y^T F)}}{2} \right)}{\delta \theta_i} F_j \right) \end{aligned}$$

(1)

$$= \sum_j \left( F_j \frac{(\sigma_y^T F) F_i}{2} \right) + \sum_j \left( F_j \frac{(\sigma_y^T F)}{2\sigma_{i1}} \delta(t_2) \right)$$

$$\Rightarrow E(F_i, F_j) + \sum_j \left( F_j \frac{(\sigma_y^T F)}{2} \right) \times \left( \frac{-1}{2} \right) \leq F_i \frac{(\sigma_y^T F)}{2}$$

$p(y/x)$

$$\Rightarrow E(F_i, F_j) + \sum_j \left( \frac{-F_j \times (\sigma_y^T F)}{2} \right) \times E(F_i)$$

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

g/ Encoveles model de Markov

$M = \{a, n, d, -\}$

$F = \{a, m, n, -\}$

$R = \{a, b, -\}$

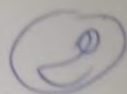
$$P(S) = \left( \prod_R \pi_R \right) \pi_M \left( \prod_M \pi_M \right)^3 \pi_F \left( \prod_F \pi_F \right)^3 \prod_M \pi_R \pi_F \left( \prod_R \pi_R \right)^2 \prod_M \left( \prod_M \pi_M \right)^2 \prod_F \pi_F$$

$$\pi_F = 0,8 \quad \pi_M = 0,8 \quad \pi_R = 0,6$$

$$y_t = \{m, b, n\}$$

$$F(x_{[1:t]}, y_{[1:t]}) = \sum F_{y_m}(x_t, y_t, t)$$

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



$g_m(x_t)$  représente la fonction de contexte en  $x_t$   
retournant vrai si  $W(x_t) \in y$

$$\Rightarrow \prod_{t=1}^T P(x_{[1:t]}, y_{[1:t]}) = \prod_{t=1}^T \sum_{y_t \in Y} \alpha_{y_t} h_{y_t}(x_t, y_t, t)$$

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

On infère:

$$y^*_{[1:T]} = \underset{y_{[1:T]} \in Y^T}{\operatorname{argmax}} O^T_F(x_{[1:T]}, y_{[1:T]})$$

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