AI homework8

yanyue 2017K8009918013

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1

we need to maximaze the function
$L = \Pi_i^N \Pi_j^N p(w_i, w'_j)^{c_{ij}(w_i, w'_j)}$
$ln(L) = \ln(\Sigma_i \Sigma_j c_{ij} p(w_i, w'_j))$
$ln(L) = \ln(\Sigma_i \Sigma_j c_{ij} \Sigma_k p(w_i, w'_j, z_k))$
$ln(L) \geq \Sigma_i \Sigma_j c_{ij} \Sigma_k Q(z_k) \ln(p(w_i, w'_j, z_k) - Const$
$ln(L) \geq \Sigma_i \Sigma_j c_{ij} \Sigma_k Q(z_k)[lnP(z_k) + lnP(w_i|z_k) + lnP(w'_j|z_k)] - Const$

2

$Q(z_k) = P(z_k|w_i, w'_j)$
$Q(z_k) = \frac{P(w_i, w'_j, z_k)}{P(w_i, w'_j)}$
$Q(z_k) = \frac{P(w_i, w'_j, z_k)}{\Sigma_k P(w_i, w'_j, z_k)}$
$Q(z_k) = \frac{P(z_k)P(w_i|z_k)P(w'_j|z_k)}{\Sigma_k P(z_k)P(w_i|z_k)P(w'_j|z_k)}$