Assignment 2 of CISC 3025

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1

a

At nine o'clock

$$\begin{aligned} P(At\ nine\ o'clock) \approx & P(at|<s>) \times P(nine|at) \times P(o'clock|nine) \\ = & \frac{383}{5000} \times \frac{5}{386} \times \frac{2}{65} \\ \approx & 3.0530 \times 10^{-5} \end{aligned} \tag{1}$$

She worked in the Univeristy of Macau

$$\begin{aligned} A = & She\ worked\ in\ the\ Univeristy\ of\ Macau \\ P(A) = & P(she|<s>) \times P(worked|she) \\ & \times P(in|worked) \times P(the|in) \times P(univeristy|the) \\ & \times P(of|univeristy) \times P(macau|of) \\ = & \frac{86}{5000} \times \frac{2}{197} \times \frac{11}{115} \times \frac{10}{170} \times \frac{1}{980} \times \frac{54}{62} \times \frac{0}{31} \\ \approx & 0 \end{aligned} \tag{2}$$

b

At nine o'clock

$$\begin{aligned} P(At\ nine\ o'clock) \approx & P(at|<s>) \times P(nine|at) \times P(o'clock|nine) \\ = & \frac{383+1}{5000+1000} \times \frac{5+1}{386+1000} \times \frac{2+1}{65+1000} \\ \approx & 7.8044 \times 10^{-7} \end{aligned} \tag{3}$$

She worked in the Univeristy of Macau

$$\begin{aligned} A =& She\ worked\ in\ the\ Univeristy\ of\ Macau \\ P(A) =& P(she|<s>) \times P(worked|she) \\ & \times P(in|worked) \times P(the|in) \times P(univeristy|the) \\ & \times P(of|univeristy) \times P(macau|of) \\ =& \frac{86+1}{5000+1000} \times \frac{2+1}{197+1000} \times \frac{11+1}{115+1000} \times \frac{10+1}{170+1000} \\ & \times \frac{1+1}{980+1000} \times \frac{54+1}{62+1000} \times \frac{0+1}{31+1000} \\ \approx& 1.8657 \times 10^{-16} \end{aligned} \tag{4}$$

c

At nine o'clock

$$\begin{aligned} PP(At\ nine\ o'clock) =& \sqrt[3]{\frac{1}{P(At\ nine\ o'clock)}} \\ =& 108.6142 \end{aligned} \tag{5}$$

She worked in the Univeristy of Macau

$$\begin{aligned} A =& She\ worked\ in\ the\ Univeristy\ of\ Macau \\ PP(A) =& \sqrt[7]{\frac{1}{P(A)}} \\ \approx& 176.6123 \end{aligned} \tag{6}$$

2

$$\begin{aligned} \hat{P}(retrieval|DB) =& \frac{1+1}{9+7} \\ \hat{P}(retrieval|NLP) =& \frac{3+1}{14+7} \end{aligned} \tag{7}$$

$$\begin{aligned} \hat{P}(text|DB) =& \frac{1+1}{9+7} \\ \hat{P}(text|NLP) =& \frac{3+1}{14+7} \end{aligned} \tag{8}$$

$$\begin{aligned} \hat{P}(model|DB) =& \frac{0+1}{9+7} \\ \hat{P}(model|NLP) =& \frac{2+1}{14+7} \end{aligned} \tag{9}$$

$$\begin{aligned}\hat{P}(query|DB) =& \frac{2+1}{9+7} \\ \hat{P}(query|NLP) =& \frac{1+1}{14+7}\end{aligned} \tag{10}$$

$$\begin{aligned}\hat{P}(table|DB) =& \frac{2+1}{9+7} \\ \hat{P}(table|NLP) =& \frac{0+1}{14+7}\end{aligned} \tag{11}$$

$$\begin{aligned}\hat{P}(DB) =& \frac{9}{24} \\ \hat{P}(NLP) =& \frac{15}{24}\end{aligned} \tag{12}$$

$$\begin{aligned}B = retrieval, text, model, query, table& \\ P(DB|B) =& \frac{P(B|DB)P(DB)}{P(B)} \\ =& \frac{1}{P(B)} \frac{1+1}{9+7} \times \frac{1+1}{9+7} \times \frac{0+1}{9+7} \\ & \times \frac{2+1}{9+7} \times \frac{2+1}{9+7} \times \frac{2}{5} \\ =& \frac{1}{P(B)} \frac{9}{655360} \\ \approx& 1.3732 \times 10^{-5} \times \frac{1}{P(B)}\end{aligned} \tag{13}$$

$$\begin{aligned}B = retrieval, text, model, query, table& \\ P(NLP|B) =& \frac{P(B|NLP)P(NLP)}{P(B)} \\ =& \frac{1}{P(B)} \frac{3+1}{14+7} \times \frac{3+1}{14+7} \times \frac{2+1}{14+7} \\ & \times \frac{1+1}{14+7} \times \frac{0+1}{14+7} \times \frac{3}{5} \\ =& \frac{1}{P(B)} \frac{32}{2268945} \\ \approx& 1.4103 \times 10^{-5} \times \frac{1}{P(B)}\end{aligned} \tag{14}$$

$$P(NLP|B) > P(DB|B) \tag{15}$$

This article is NLP article.