

“Collaboration” and “Competition” of θ_d and θ_B

$$\begin{aligned} p(d|\Lambda) &= p(\text{"text"}|\Lambda) p(\text{"the"}|\Lambda) \\ &= [0.5 * p(\text{"text"}|\theta_d) + 0.5 * 0.1] \times \\ &\quad [0.5 * p(\text{"the"}|\theta_d) + 0.5 * 0.9] \end{aligned}$$

Note that $p(\text{"text"}|\theta_d) + p(\text{"the"}|\theta_d) = 1$

If $x + y = \text{constant}$, then xy reaches maximum when $x = y$.

$$0.5 * p(\text{"text"}|\theta_d) + 0.5 * 0.1 = 0.5 * p(\text{"the"}|\theta_d) + 0.5 * 0.9$$

$\rightarrow p(\text{"text"}|\theta_d) = 0.9 \gg p(\text{"the"}|\theta_d) = 0.1 !$

$d =$ text the

text ? θ_d

$P(\theta_d) = 0.5$

the 0.9 θ_B

$P(\theta_B) = 0.5$

Behavior 1: if $p(w_1|\theta_B) > p(w_2|\theta_B)$, then $p(w_1|\theta_d) < p(w_2|\theta_d)$