

# CS 6320 MIDTERM

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CHARNIAK MEHTOD :

$$p(S(sat) \rightarrow NP(dog)VP(sat)) = [p(S(sat) \rightarrow NPVP(sat)|S(sat))] * [p(dog|S(sat) \rightarrow NPVP(sat))]$$

$$p(S(sat) \rightarrow NP VP(sat)|S(sat)) = \frac{1}{2}[p(S(sat) \rightarrow NP VP(sat)|S(sat))] + \frac{1}{2}[p(S \rightarrow NPVP|S)]$$

$$p(S(sat) \rightarrow NPVP(sat)|S(sat)) = 1$$

$$p(S \rightarrow NPVP|S) = 1$$

$$p(S(sat) \rightarrow NP VP(sat)|S(sat)) = 1$$

$$p(dog|S(sat) \rightarrow NPVP(sat))$$

$$= \frac{1}{3}[p(dog|S(sat) \rightarrow NPVP(sat))] + \frac{1}{3}[p(dog|S \rightarrow NPVP)] + \frac{1}{3}[p(dog|NP)]$$

$$p(dog|S(sat) \rightarrow NPVP(sat)) = \frac{2}{4} = \frac{1}{2}$$

$$p(dog|S \rightarrow NPVP) = \frac{2}{4} = \frac{1}{2}$$

$$p(dog|NP) = \frac{3}{8}$$

$$p(dog|S(sat) \rightarrow NPVP(sat)) = \frac{1}{3}[\frac{1}{2} + \frac{1}{2} + \frac{3}{8}]$$

$$= \frac{1}{3}[\frac{11}{8}]$$

$$= \frac{11}{24}$$

$$\begin{aligned}
p(S(sat) \rightarrow NP(dog)VP(sat)) \\
&= [p(S(sat) \rightarrow NPVP(sat)|S(sat))] * [p(dog|S(sat) \rightarrow NPVP(sat))] \\
&= 1 * \frac{11}{24} \\
&= \frac{11}{24}
\end{aligned}$$

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Cross Entropy  $H(p, q) = E_p[-\log(q)]$

$$\begin{aligned} &= -[\frac{1}{2}\log(\frac{1}{8}) + \frac{1}{4}\log(\frac{1}{4}) + \frac{1}{8}\log(\frac{1}{2}) + \frac{1}{8}\log(\frac{1}{8})] \\ &= [\frac{3}{2} + \frac{1}{2} + \frac{1}{8} + \frac{3}{8}] \\ &= 2.5 \end{aligned}$$