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HW1

Problem 1

a) $W = [woof, meow, squeak]$
 $D1 = [2, 1, 0]$
 $D2 = [2, 0, 1]$

$$\cos \text{ similarity} = \frac{D1 \cdot D2}{||D1|| * ||D2||}$$

$$||D1|| = ||D2|| = \sqrt{2^2 + 1^2 + 0^2} = \sqrt{5}$$

$$D1 \cdot D2 = 4$$

$$\text{Solution} = \frac{4}{5}$$

b) $IDF = \log(\frac{N}{n_i})$
 $W = [woof, meow, squeak]$
 $IDF \text{ Vector} = [\log(\frac{2}{2}), \log(\frac{2}{1}), \log(\frac{2}{1})]$
 $\mu D1 = [0, 0.6931, 0]$
 $\mu D2 = [0, 0, 0.6931]$

$$\cos \text{ similarity} = \frac{\mu D1 \cdot \mu D2}{||\mu D1|| * ||\mu D2||}$$

$$\mu D1 \cdot \mu D2 = 0$$

$$\text{Solution} = 0$$

c) $W = [woof, meow, squeak]$
 $IDF \text{ Vector} = [\log(\frac{3}{2}), \log(\frac{3}{2}), \log(\frac{3}{2})]$
 $\mu D1 = [0.811, 0.405465, 0]$
 $\mu D2 = [0.811, 0, 0.405465]$

$$\mu D1 \cdot \mu D2 = 0.65761$$

$$||\mu D1|| = \sqrt{5} \log(\frac{3}{2})$$

$$||\mu D2|| = \sqrt{5} \log(\frac{3}{2})$$

$$Solution = 0.800003$$

Problem 2 on next page

Problem 2

a) $P(+ \mid \text{"great food served"}) =$

$$P(+) * P(\text{"great"} \mid +) * P(\text{"food"} \mid +) * P(\text{"served"} \mid +) =$$

$$\left(\frac{5}{10}\right) * \left(\frac{5}{10}\right) * \left(\frac{5}{10}\right) * \left(\frac{0}{10}\right) =$$

$$\text{Solution} = 0$$

$$P(- \mid \text{"great food served"}) =$$

$$P(-) * P(\text{"great"} \mid -) * P(\text{"food"} \mid -) * P(\text{"served"} \mid -) =$$

$$\left(\frac{5}{10}\right) * \left(\frac{0}{11}\right) * \left(\frac{5}{11}\right) * \left(\frac{1}{11}\right) =$$

$$\text{Solution} = 0$$

b) **If we were to apply Laplace smoothing, then $P(+ \mid \text{"great food served"})$ will be larger**

c) Using Jet, added Noun friend, and Verb types

Sentence:	My old friend types
Seeking sentence	+
Seeking np	+
Seeking n	+
Seeking art	+
Found art = My	===
Seeking n	+
Seeking art	+
Found art = My	===
Seeking adj	+
Found adj = old	====
Seeking n	+
Found n = friend	=====

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Found    np = My old friend      =====
Seeking  vp                      +
Seeking  v                        +
Found    v = types               =====
Found    vp = types              =====
Found    sentence = My old friend types =====
Sentence parsed.
Seeking  v                      +
Found    v = types              =====
Seeking  np                      +
Seeking  n                      +
Seeking  art                    +
Seeking  art                    +
1 parse(s) obtained
Parse:
sentence
  np
    art = My
    adj = old
    n = friend
  vp
    v = types

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Sentence:      My cat chases friends
Seeking sentence +
Seeking np      +
Seeking n       +
Seeking art     +
Seeking n       +
Seeking vp      +
Seeking v       +
Seeking v       +
Seeking np      +
Seeking n       +
Sentence recognized.

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