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HW1

Problem 1

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

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

$||D1|| = ||D2|| = \sqrt{2^2 + 1^2 + 0^2} = \sqrt{5}$
$D1 \cdot D2 = 4$

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

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

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

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

$$Solution = 0$$

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

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

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

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

$$Solution = 0.800003$$

Problem 2

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

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

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

$$Solution = 0$$

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

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

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

$$Solution = 0$$

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

c) Using Jet

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Sentence:                                Cats run with friends
Seeking sentence                         +
Seeking np                               +
Seeking n                                +
Found   n = Cats                         =====
Found   np = Cats                        =====
Seeking vp                                    +
Seeking v                                     +
Found   v = run                               ====
Found   vp = run                              ====
Found   sentence = Cats run              =========
Seeking v                                     +
Found   v = run                               ====
Seeking np                                        +
Seeking n                                         +
Seeking art                                       +
Seeking art                                       +
Seeking art                              +
Seeking art                              +
0 parse(s) obtained
---------
Sentence:                                My young cat types with mice
Seeking sentence                         +
Seeking np                               +
Seeking n                                +
Seeking art                              +
Found   art = My                         ===
Seeking n                                   +
Seeking art                              +
Found   art = My                         ===
Seeking adj                                 +
Found   adj = young                         ======
Seeking n                                         +
Found   n = cat                                   ====
Found   np = My young cat                =============
Seeking vp                                              +
Seeking v                                               +
Found   v = types                                       ======
Found   vp = types                                      ======
Found   sentence = My young cat types    ==================
Seeking v                                               +
Found   v = types                                       ======
Seeking np                                                    +
Seeking n                                                     +
Seeking art                                                   +
```

```
Seeking art                                                    +
0 parse(s) obtained
```