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NLP
HW7

Q1:

Training with these five sentences, we see that we have to find the odds of $np = n$ and $np = n\ pp$

We also have to find the odds of $vp = v\ np\ pp$ and $vp = v\ np$

We have a total of 15 np 's. 12 are $np = n$ and 3 are $np = n\ pp$. This means that

$$np = n \rightarrow 0.8$$

and

$$np = n\ pp \rightarrow 0.2$$

For vp 's, we have 5 total vp 's. 2 are $vp = v\ np\ pp$ and 3 are $vp = v\ np$. This means that

$$vp = v\ np\ pp \rightarrow 0.4$$

and

$$vp = v\ np \rightarrow 0.6$$

Here are the probabilities of each of these 5 productions.

- (a) (s (np (n Men) (pp (p of) (np (n distinction)))) (vp (v like) (np (n broccoli))))

$$0.2 * 0.8 * 0.6 * 0.8 = 0.0768$$

- (b) (s (np (n Men)) (vp (v like) (np (n ham) (pp (p with) (np (n eggs))))))

$$0.8 * 0.6 * 0.2 * 0.8 = 0.0768$$

- (c) (s (np (n Men)) (vp (v serve) (np (n ham) (pp (p with) (np (n eggs))))))

$$0.8 * 0.6 * 0.2 * 0.8 = 0.0768$$

(d) (s (np (n Men)) (vp (v serve) (np (n eggs)) (pp (p with) (np (n gusto))))))

$$0.8 * 0.4 * 0.8 * 0.8 = 0.2048$$

(e) (s (np (n Men)) (vp (v serve) (np (n eggs)) (pp (p to) (np (n customers))))))

$$0.8 * 0.4 * 0.8 * 0.8 = 0.2048$$

Part 2

Now we must analyze:

Delis serve pizza with relish.

Here are the two different parses for this sentence

1. (s (np (n Delis)) (vp (v serve) (np (n pizza)) (pp (p with) (np (n relish))))))

2. (s (np (n Delis)) (vp (v serve) (np (n pizza) (pp (p with) (np (n relish))))))

Here are the different probabilities that would be assigned to the two different parses of **Delis serve pizza with relish.**

Same numbering as the numbering right above

1. $0.8 * 0.4 * 0.8 * 0.8 = 0.2048$

2. $0.8 * 0.6 * 0.2 * 0.8 = 0.0768$

Problem 2 on next page

Q2:

Now we will be conditioning the *vp* on the head.

All the verb phrases have two possible heads, which are: *like* or *serve*.

$$\begin{aligned}vp &= v \text{ np } pp \rightarrow (1.0 \text{ chance serve}) \text{ and } (0.0 \text{ chance like}) \\vp &= v \text{ np } \rightarrow (0.3333 \text{ chance serve}) \text{ and } (0.6666 \text{ chance like})\end{aligned}$$

Now we must multiply the probability of each verb head to the $P(r(n))$ in each *vp* calculation

(a) Delis serve pizza with relish

We know have to analyze each of the *vp* possibilities with the head possibilities.

1. (s (np (n Delis)) (vp (v serve) (np (n pizza)) (pp (p with) (np (n relish)))))

2. (s (np (n Delis)) (vp (v serve) (np (n pizza) (pp (p with) (np (n relish)))))

Here are the different probabilities that would be assigned to the two different parses of **Delis serve pizza with relish**.

Same numbering as the numbering right above

1. $0.8 * (0.4 * 1.0) * 0.8 * 0.8 = 0.2048$

2. $0.8 * (0.6 * 0.3333) * 0.2 * 0.8 = 0.02559744$

(b) Men like pizza with relish

1. (s (np (n Men)) (vp (v like) (np (n pizza)) (pp (p with) (np (n relish)))))

2. (s (np (n Men)) (vp (v like) (np (n pizza) (pp (p with) (np (n relish)))))

Here are the different probabilities that would be assigned to the two different parses of **Men like pizza with relish**.

Answer on next page

Same numbering as the numbering right above

1. $0.8 * (0.4 * 0.0) * 0.8 * 0.8 = 0.0$

2. $0.8 * (0.6 * 0.6666) * 0.2 * 0.8 = 0.05119488$