

CS-6340, Written Assignment #3
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Question 1

1. **AGENT - John** cleared **THEME - the sidewalk** with his **INSTRUMENT - snow shovel**.
2. **THEME - A raffle** was held for **BENEFICIARY - the local charity**.
3. **AGENT - Joe** teamed up with **CO-AGENT - Susan** to learn how to **THEME - ski**.
4. **RECIPIENT - Tom** was given **THEME - a bike**.
5. **THEME - The dress** was purchased by **AGENT - Lisa** with **CO-THEME - matching shoes**.
6. **AGENT - Julie** mailed her **RECIPIENT - grandmother** **THEME - a letter**.
7. **EXPERIENCER - George** hopes that his **THEME - car** can be fixed.
8. **THEME - The image** was created with **INSTRUMENT - Adobe Photoshop** by **AGENT - a cartoonist**.

Question 2

word1 : <9 2 8 0>

word2 : <6 7 4 5>

word3 : <1 3 9 2>

- (a) Similarity(*word1*, *word2*) using Manhattan Distance.

$$\begin{aligned}\text{We know Manhattan Distance} &= (\vec{X}, \vec{Y}) = \sum_{i=1}^N |x_i - y_i| \\ \text{Thus here Manhattan Distance} &= |(9 - 6)| + |(2 - 7)| + |(8 - 4)| + |(0 - 5)| \\ &= 3 + 5 + 4 + 5 \\ &= 17\end{aligned}$$

- (b) Similarity(*word2*, *word3*) using Manhattan Distance.

$$\begin{aligned}\text{We know Manhattan Distance} &= (\vec{X}, \vec{Y}) = \sum_{i=1}^N |x_i - y_i| \\ \text{Thus here Manhattan Distance} &= |(6 - 1)| + |(7 - 3)| + |(4 - 9)| + |(5 - 2)| \\ &= 5 + 4 + 5 + 3 \\ &= 17\end{aligned}$$

- (c) Similarity(*word1*, *word2*) using Jaccard Similarity.

$$\begin{aligned}\text{We know Jaccard } (\vec{X}, \vec{Y}) &= \frac{\sum_{i=1}^N \min(x_i, y_i)}{\sum_{i=1}^N \max(x_i, y_i)} \\ \text{Thus here Jaccard} &= 6 + 2 + 4 + 0 / 9 + 7 + 8 + 5 \\ &= 12 / 29\end{aligned}$$

- (d) Similarity(*word2*, *word3*) using Jaccard Similarity.

$$\begin{aligned}\text{We know Jaccard } (\vec{X}, \vec{Y}) &= \frac{\sum_{i=1}^N \min(x_i, y_i)}{\sum_{i=1}^N \max(x_i, y_i)} \\ \text{Thus here Jaccard} &= 1 + 3 + 4 + 2 / 6 + 7 + 9 + 5 \\ &= 10 / 27\end{aligned}$$

- (e) Similarity(*word1*, *word2*) using Cosine Similarity.

$$\begin{aligned}\text{We know Cosine } (\vec{X}, \vec{Y}) &= \frac{\sum_{i=1}^N (x_i * y_i)}{\sqrt{\sum_{i=1}^N x_i^2} \sqrt{\sum_{i=1}^N y_i^2}} \\ \text{Thus here Cosine} &= (9*6 + 2*7 + 8*4 + 0*5) / (\sqrt{9^2 + 2^2 + 8^2 + 0^2} * \sqrt{6^2 + 7^2 + 4^2 + 5^2}) \\ &= (100) / (12.20)*(11.22) \\ &= (100) / (136.88)\end{aligned}$$

- (f) Similarity(*word2*, *word3*) using Cosine Similarity.

$$\begin{aligned}\text{We know Cosine } (\vec{X}, \vec{Y}) &= \frac{\sum_{i=1}^N (x_i * y_i)}{\sqrt{\sum_{i=1}^N x_i^2} \sqrt{\sum_{i=1}^N y_i^2}} \\ \text{Thus here Cosine} &= (6*1 + 7*3 + 4*9 + 5*2) / (\sqrt{6^2 + 7^2 + 4^2 + 5^2} * \sqrt{1^2 + 3^2 + 9^2 + 2^2})\end{aligned}$$

Question 5

- (a) List all possible noun phrase (NP) antecedents for the first instance of “He” (underlined) that satisfy gender agreement.
John Smith, John
- (b) List all possible noun phrase (NP) antecedents for “them” (underlined) that satisfy animacy agreement.
- (c) List all possible noun phrase (NP) antecedents for “them” (underlined) that satisfy number agreement.
- (d) List all of the reflexive pronouns in the story.
himself
- (e) List all of the possessive pronouns in the story.
his, his, their, her
- (f) List all of the pleonastic pronouns in the story.
it
- (g) List all instances of appositives in the story.
Mary, his neighbor
her husband, George, who was in the next aisle