Text Similarity

- Taylor Swift, Blank Space

**Text Similarity**

*tf-idf* is a classical measure of text similarity, allowing us to establish a base similarity metric between similar regions of text.

*tf*, term frequency asks “how often does the word appear?”

*idf*, inverse document frequency asks “how rare is the world?”

**Calculating tf-idf**

**First**, we calculate the tf-idf for every word in every line:

(a): How many regions does our document have? \( \# \text{ regions} \):

(b): How many regions does [it’s] appear? \( \#(\text{it’s}) \text{ regions} \):

(c): How many times does [it’s] appear in \( L_1 \)? \( \text{tf} = L_1(\text{it’s}) \):

(d): Calculate the idf of [it’s] on \( L_1 \): \( \text{idf} = \log \left( \frac{\text{(#regions)}}{\#(\text{it’s} \text{ regions})} \right) \):

(e): Calculate tf-idf of [it’s] on \( L_1 \): \( \text{tf-idf} = (c) \times (d) \):

Second, we calculate the **cosine similarity** of each tf-idf:

\[
\text{similarity} = \cos(\theta) = \frac{A \cdot B}{\|A\| \|B\|} = \frac{\sum_{i=1}^{n} A_i \times B_i}{\sqrt{\sum_{i=1}^{n} (A_i)^2} \times \sqrt{\sum_{i=1}^{n} (B_i)^2}}
\]

How often does [it’s] appear in \( L_1 \)?

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How do we set up a cosine similarity?