Introduction to Computation for the Humanities and Social Sciences

CS 3
Chris Tanner
Lecture 15

New Tweet, Who Dis?
Lecture 15

- Regular Expressions — Continued
- Sentiment Analysis
- Unigrams / Bigrams / Language Models
• You define a regular expression (a String of text representing a pattern), and `findall()` or `sub()` tries to repeatedly fit it to a specified text, in a left-to-right fashion.
Regex — Recap

• \[ \] denotes that you want to match any of the characters within it

• + denotes that the previous character or \[ \] block should appear 1 or more times

• * same as above but 0 or more times (meaning it’s optional)

• ? denotes the prev. character or \[ \] block should appear 0 or 1 times, and it also designates a non-greedy approach
REAL-TIME CODING

let’s work through the homework together
Can you identify the authors by comparing the style of writing?
Text Analysis

Text Comparison

• How do you discuss analytical differences between different texts?

• You need computable metrics that have a grounded meaning
Text Analysis

# Unique Words (Ratio)

- Fraction of words that occur only a single time
- Measures richness of vocabulary
- Shakespeare’s plays include 28,829 different words, 12,493 which occur only a single time
- 1 in 70 words in plays written by Shakespeare are single occurrence words!
Text Analysis

Word Length (Ratio)

• Ratios between short words to medium-length words, and long words to medium-length words

• Measures difficulty of vocabulary

I do not like them, Sam-I-am.
I do not like green eggs and ham.
Text Analysis

Emotional Sentiment

• Words are assigned an emotional sentiment score

• Whether a text has a positive or negative sentiment is simply a summation over the words’ individual sentiment scores
Emotional Sentiment

- positive_words = {“happy”, “good”, “great”, “amazing” …}

- negative_words = {“bad”, “horrible”, “crappy”, “poor”, “janky”}
Emotional Sentiment

- \text{positive\_words} = \{"happy", "good", "great", "amazing" \ldots\}

- \text{negative\_words} = \{"bad", "horrible", "crappy", "poor", "janky"\}

\[
sentence\ score = \frac{(#poswords - #negwords)}{#totalwords}\]
Text Analysis

Language Models

• a **Language Model** is a representation of the language used by a given entity (e.g., a person or a genre or any other well-defined author of text)

• Typically, these models are represented by statistics that are largely focused on just **word counts**
Text Analysis

Unigram Language Models

• The most simple approach involves counting all of the individual words that an author uses (i.e., unigram counts).

• You’ve already done this before!  \texttt{word\_counts} = {}

• Then, you can construct probabilities by just dividing by the total # of words the author uses. e.g., maybe she/he uses the words:

  ‘reductionist’ = 0.01\% of the time
  ‘imperialism’ = 0.04\% of the time
  ‘capital’ = 0.06\% of the time

  etc
Text Analysis

Unigram Language Models

• With these probabilities, you can do several fun things:
  • compare the model of one author to a different author
  • measure the likelihood that a given body of text was generated from a given user
“Coming less than two weeks before the midterm elections, the discovery of the pipe bombs reverberated across a country already on edge, stirring anew questions about whether political discourse had grown too vitriolic”
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Unigram Language Models

0.06%

“Coming less than two weeks before the midterm elections, the discovery of the pipe bombs reverberated across a country already on edge, stirring anew questions about whether political discourse had grown too vitriolic”
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Unigram Language Models

0.09%

“Coming less than two weeks before the midterm elections, the discovery of the pipe bombs reverberated across a country already on edge, stirring anew questions about whether political discourse had grown too vitriolic”
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If we assume each word is independent from another, we could just multiply every word’s probability to come up w/ how likely the entire sequence came from the particular author.
Unigram Language Models

Weaknesses with this unigram model?
Text Analysis

Bi-gram Language Models

• The word order doesn’t matter

• Context is way too narrow

• Instead, we could look at every pair of two consecutive words! That’ll help some!
“Coming less than two weeks before the midterm elections, the discovery of the pipe bombs reverberated across a country already on edge, stirring anew questions about whether political discourse had grown too vitriolic”
Bi-gram Language Models — Let’s first count all bigrams!

1

“Coming less than two weeks before the midterm elections, the discovery of the pipe bombs reverberated across a country already on edge, stirring anew questions about whether political discourse had grown too vitriolic”
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Bi-gram Language Models

For your Project #2, we only require you to build a dictionary of the bi-gram counts. You do not need to further turn those into probabilities.
LAB TIME