Python for Data Science

Introduction to Natural Language Processing

Introduction to Natural Language Processing

Reading Assignment

Read Wikipedia Article on Natural Language Processing

NLP

Imagine you work for Google News and you want to group news articles by topic

Or you work for a legal firm and you need to sift through thousands of pages of legal documents to find relevant ones.

This is where NLP can help!

NLP

We will want to:

- Compile Documents
- Featurize Them
- Compare their features

NLP

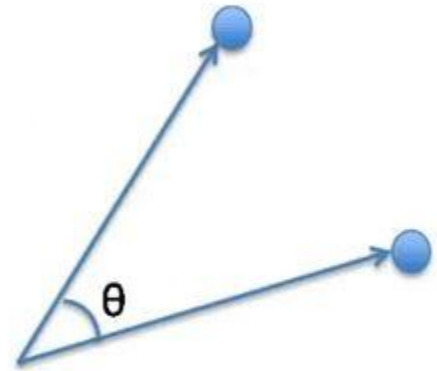
Simple Example:

- You have 2 documents:
  - “Blue House”
  - “Red House”
- Featurize based on word count:
  - “Blue House” -> (red,blue,house) -> (0,1,1)
  - “Red House” -> (red,blue,house) -> (1,0,1)

NLP

- A document represented as a vector of word counts is called a “Bag of Words”
  - “Blue House” -> (red,blue,house) -> (0,1,1)
  - “Red House” -> (red,blue,house) -> (1,0,1)
- You can use cosine similarity on the vectors made to determine similarity:

$$sim(A,B) = \cos(\theta) = \frac{A \cdot B}{\|A\|\|B\|}$$



NLP

- We can improve on Bag of Words by adjusting word counts based on their frequency in corpus (the group of all the documents)
- We can use TF-IDF (Term Frequency - Inverse Document Frequency)

NLP

- Term Frequency - Importance of the term within that document
  - TF(d,t) = Number of occurrences of term t in document d
- Inverse Document Frequency - Importance of the term in the corpus
  - IDF(t) = log(D/t) where
    - D = total number of documents
    - t = number of documents with the term

NLP

- Mathematically, TF-IDF is then expressed:

$$w_{x,y} = tf_{x,y} \times \log\left(\frac{N}{df_x}\right)$$

TF-IDF

Term x within document y

$tf_{x,y}$ = frequency of x in y

df_x = number of documents containing x

N = total number of documents

Example with Python

Before we get started with Natural Language Processing and Python we'll need to download an additional library, go to your terminal or command line and use:

conda install nltk

Or

pip install nltk

Example with Python

We'll start our example by building a spam filter with Python then your portfolio project will have you working with real data from Yelp, an online review site.

Thanks!

Any questions ?