

BC COMS 2710: Computational Text Analysis

BARNARD COLLEGE OF COLUMBIA UNIVERSITY

Lecture 6 – Bag of Words

Announcements – Assignments



- Homework 01
 - Due tonight
- Readings:
 - Reading 02 – link course site, due Sunday
- Week 2 Tutorials:
 - 2.1 – Tokenization, lemmatization, stopwords, etc
 - Based on yesterday's lecture
 - 2.2 – Exploring dictionary-based methods
 - Based on Wednesday's and Thursday's lecture



- Tokenization
- Lemmatization
- Stemming
- Stopwords
- Part of Speech
- Dependency Parsing
- Named Entities



— Zipf's law —



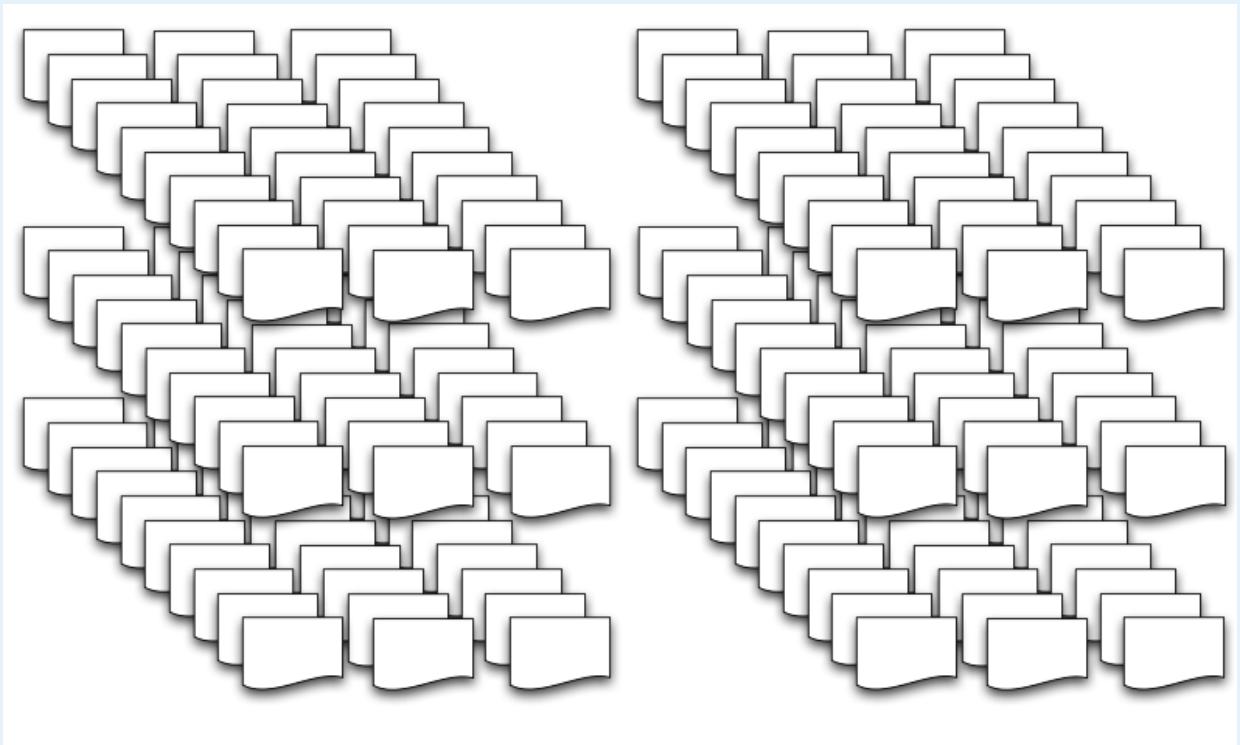
Documents & Corpora



Terminology - Corpus

■ **Corpus:**

- A collection of documents
- ***Corpora*** – plural of corpus





Terminology - Document

- **Document:**
 - Unit of text of interest
 - Often represents one data point
- **Examples:**
 - Book
 - Chapter
 - News article
 - Tweet
 - Product Review
 -

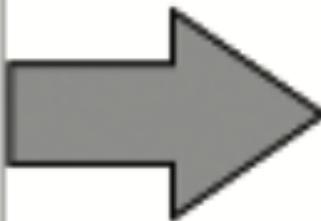


— How do we represent documents? —

Dictionaries of word counts



COUNT WORDS



```
{  
}
```

```
'shakespeare': 6,  
'in': 20,  
'love': 6,  
'is': ...  
}
```

Often called *Bag of Words*

Bag of Words – Start with document

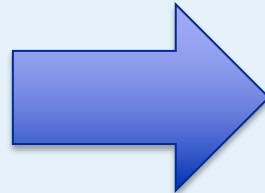


Very good drama although it appeared to have a few blank areas leaving the viewers to fill in the action for themselves. I can imagine life being this way for someone who can neither read nor write. This film simply smacked of the real world: the wife who is suddenly the sole supporter, the live-in relatives and their quarrels, the troubled child who gets knocked up and then, typically, drops out of school, a jackass husband who takes the nest egg and buys beer with it. 2 thumbs up... very very very good movie.

Bag of Words – Break document into words



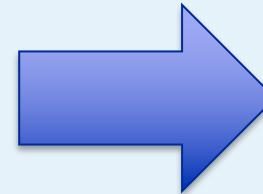
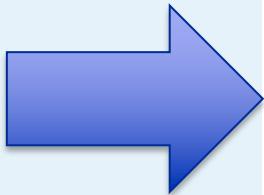
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Bag of Words – compute word counts



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('the', 8),
(',', 5),
('very', 4),
('.', 4),
('who', 4),
('and', 3),
('good', 2),
('it', 2),
('to', 2),
('a', 2),
('for', 2),
('can', 2),
('this', 2),
('of', 2),
('drama', 1),
('although', 1),
('appeared', 1),
('have', 1),
('few', 1),
('blank', 1)
.....

Bag of Words



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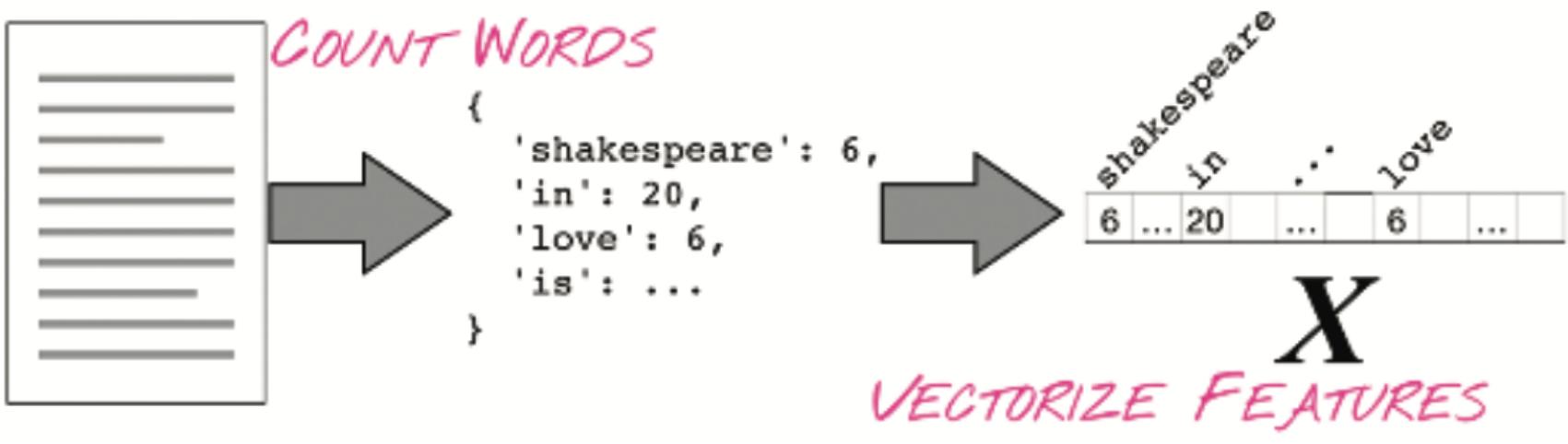


Document vectors

Document vectors



- Vector is just an array of numbers

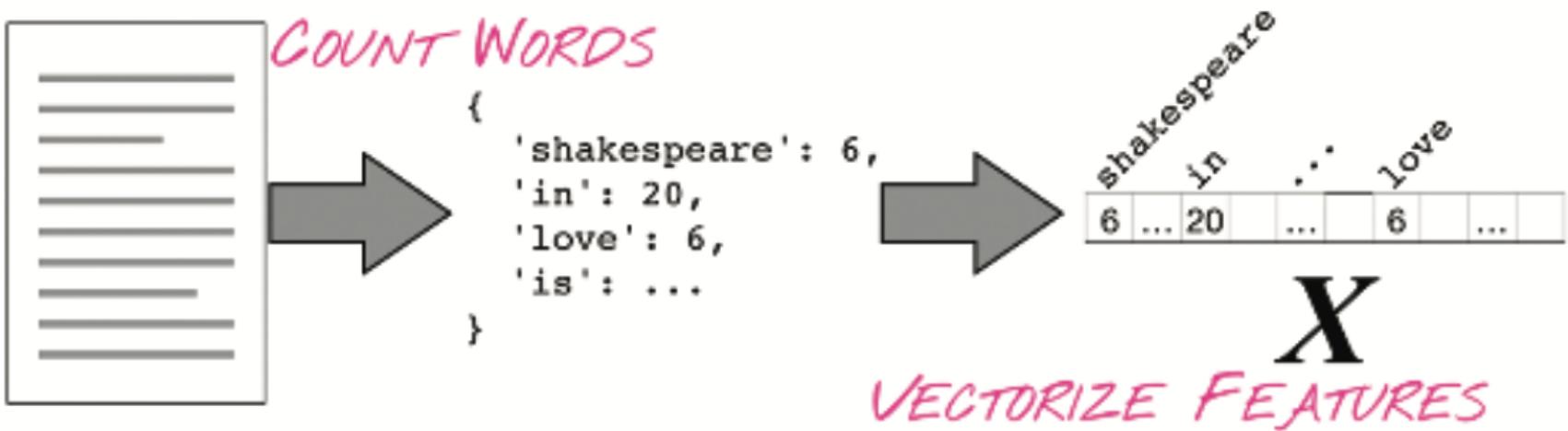


- Index represents a word
- Value represents

Document vectors

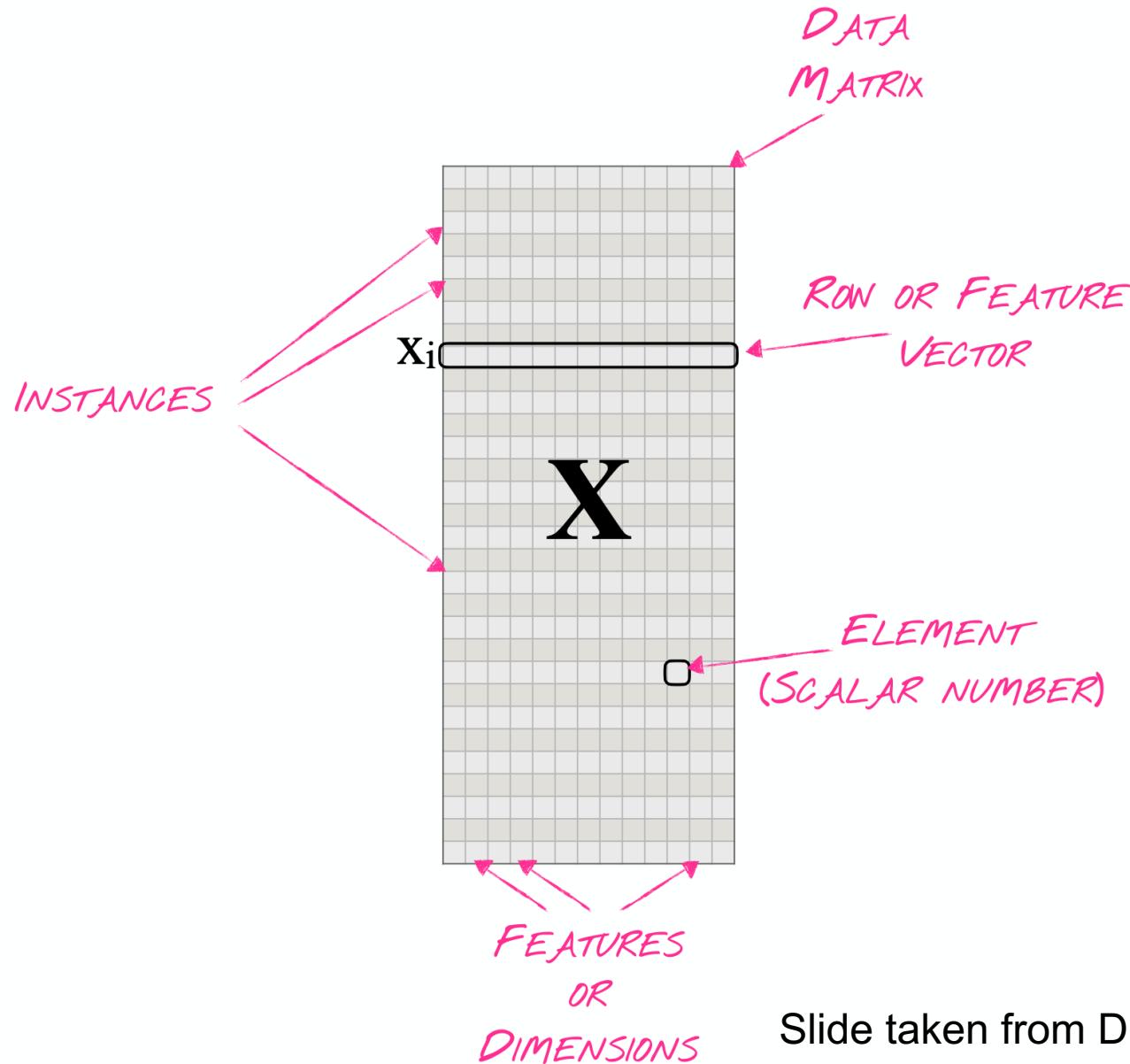


- Vector is just an array of numbers



- Index represents a word
- Value represents something about that word
 - For now word count

Document Matrix





Term Frequency (tf):

tf of word ***w*** in document ***d***:

$$\frac{|w|}{|\text{Document}|}$$

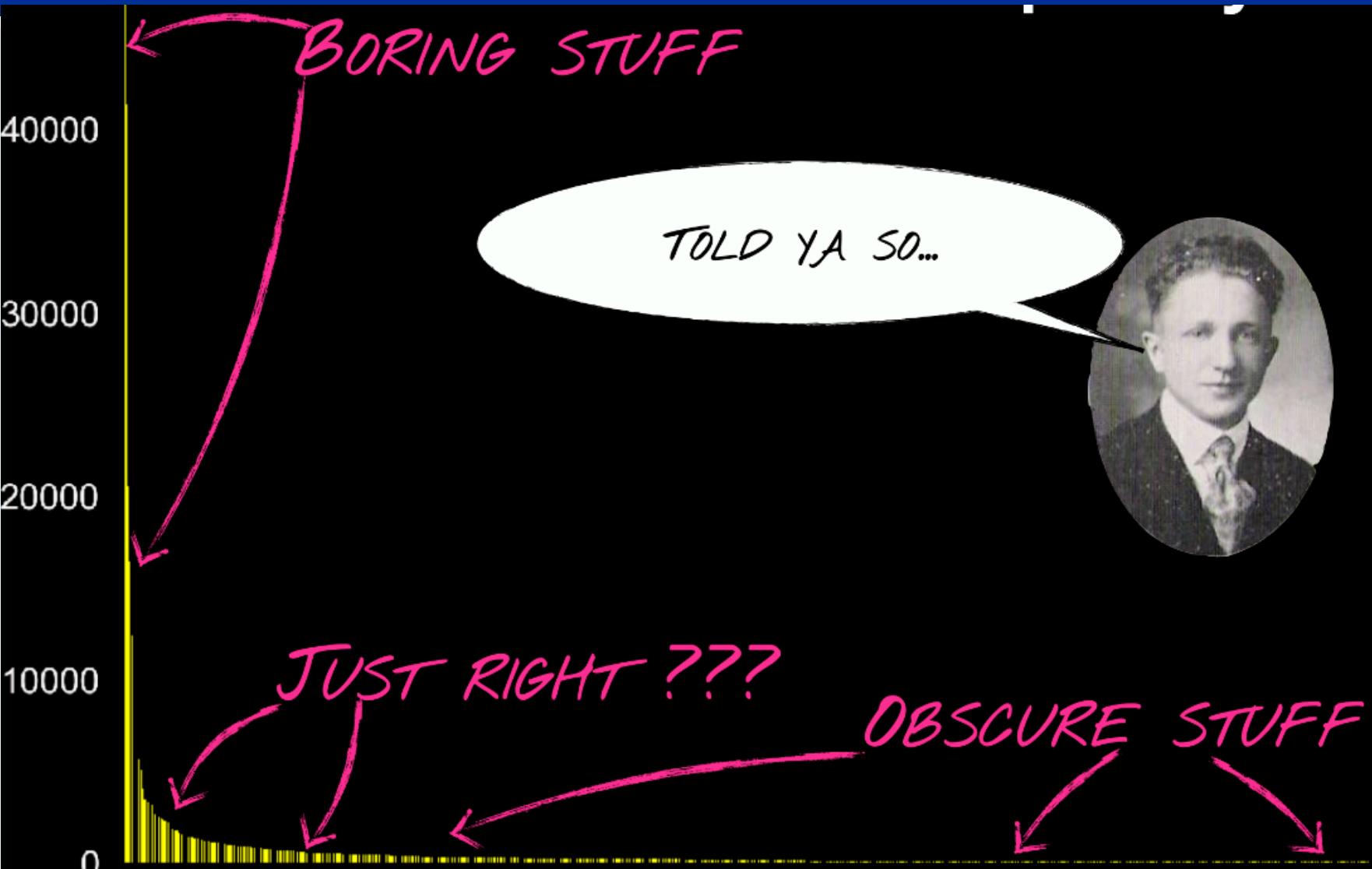
*number of times w appears in D
divided by of number tokens in D*



Inverse Document Frequency



Problem with Term Frequency



Some words are more interesting than others





Inverse Document Frequency (idf)

idf of word w in document D :

$$\log \frac{|D|}{|\{tf(w,d) \neq 0\}|}$$

*number of documents divided
by number of documents that
contain w*



TF-IDF



TF-IDF:

Term Frequency - Inverse Document Frequency

TF-IDF of word w in document D :

Term Frequency * Inverse Document Frequency

Captures terms that are frequent in a document
and specific to the document in the corpus



Inverse Document Frequency (idf)

idf of word w in document D :

$$\log \frac{|D|}{|\{tf(w,d) \neq 0\}|}$$

*number of documents divided
by number of documents that
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