Computational Analysis of Classical Texts

Marc E. Canby

Lati 318 — Cicero: *De Re Publica*
Rice University

Outline

1. Getting and Cleaning the Data
2. Exploratory Text Analysis
3. Keyword Extraction: Frequency Count and TextRank
4. Predicting Missing Text: LSTM Neural Networks

Outline

Getting and Cleaning the Data

- Text obtained from *The Latin Library* at the sentence level:
  - `['nempe', 'ab', 'iis', 'qui', 'haec', 'disciplinis', 'informata', 'alia', 'moribus', 'confirmarunt', ',', 'sanxerunt', 'autem', 'alia', 'legibus', '.']`
- Cleaned up messy elements of data:
  - Line numbers: `[1,2,...,71]`
  - Angle brackets: `['&', 'lt', ';', 'im&gt', ';', 'petu', 'liberavissent', ',', 'nec',...]`
    - `<` should be < `>` should be >
  - Hyphens encoded as `&#`
  - English words: `['Cicero', 'The', 'Latin', 'Library', 'The', 'Classics', 'Page']`

Outline

Exploratory Text Analysis: Tokenization and POS Tagging

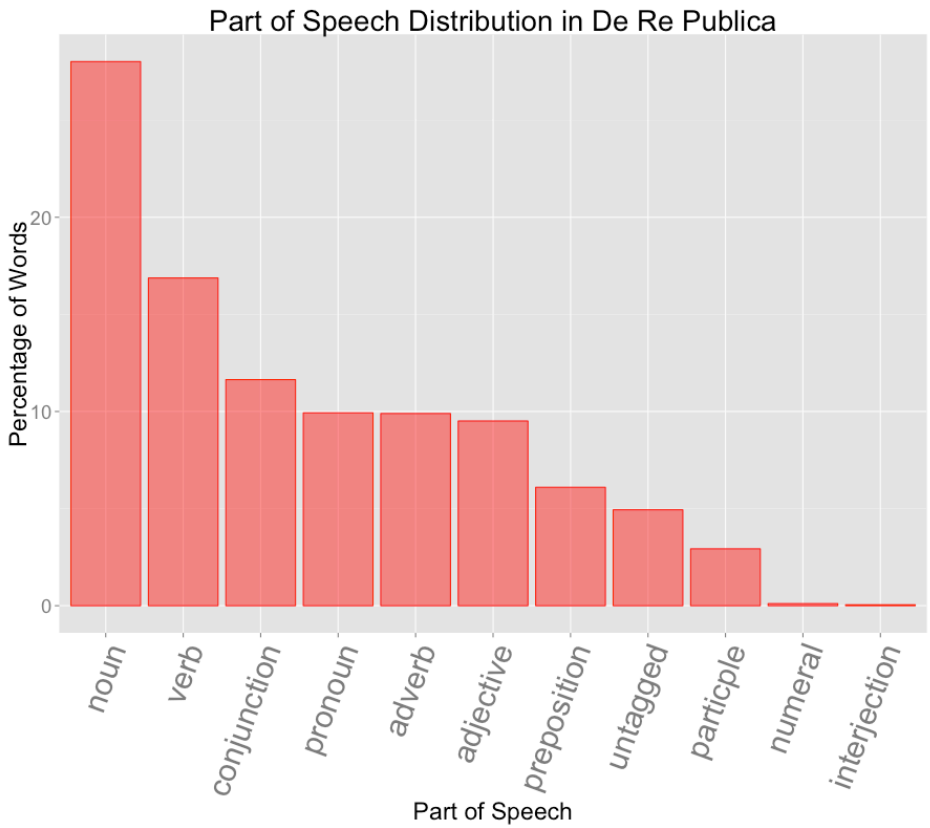
- Map each word to its base form (*lemma* or *token*) and its POS
- Often ignore *stop words* ('et', 'sum', etc.) – highlighted in red

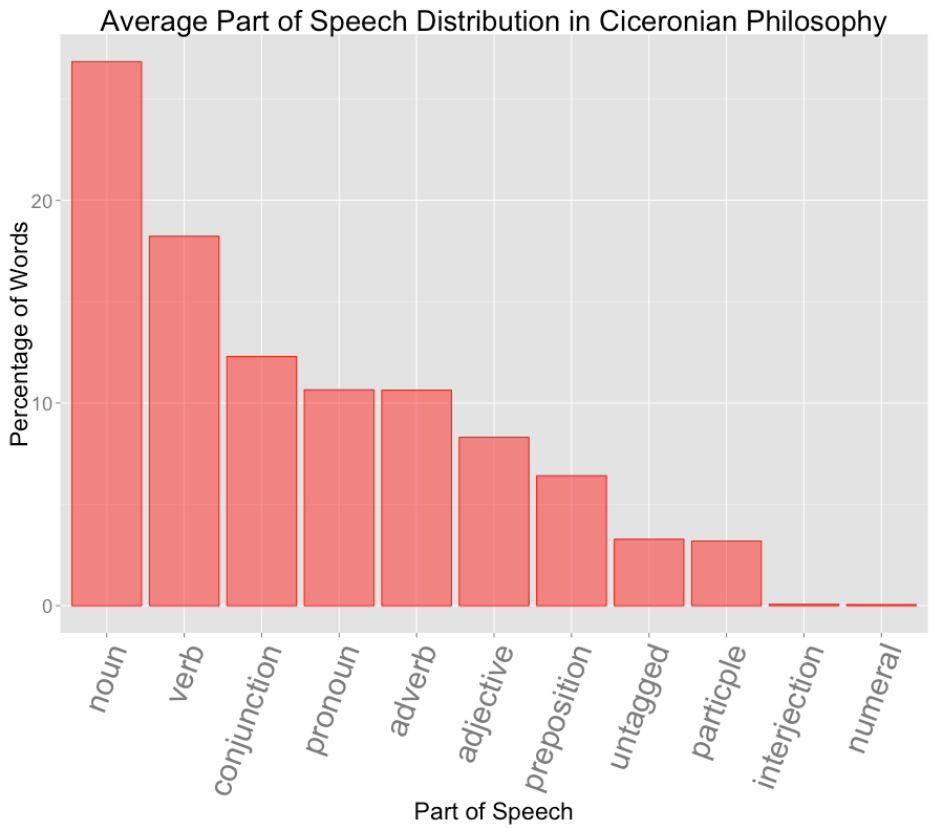
```
['nempe', 'ab', 'iis', 'qui', 'haec', 'disciplinis',
'informata', 'alia', 'moribus', 'confirmarunt', ',',
   'sanxerunt', 'autem', 'alia', 'legibus', '.']
```

```
[('nempe', 'adverb'), ('ab', 'preposition'), ('is',
'pronoun'), ('qui', 'pronoun'), ('hic', 'pronoun'),
('disciplina', 'noun'), ('informo', 'noun'), ('alius2',
'adjective'), ('mos', 'noun'), ('confirmo', 'verb'),
('sancio', 'verb'), ('autem', 'conjunction'), ('alius2',
            'adjective'), ('lex', 'noun')]
```

Exploratory Text Analysis

- Number of characters: 109,777 (*average:* 136,893)
- Number of words: 20,067 (*average:* 24,924)
- Number of sentences: 820 (*average:* 1,059)





Outline

Keyword Extraction: Frequency Count

- Goal: Determine a set of keywords that summarizes the text
- Naive approach: Take words in text with highest frequency

Word	**Frequency**	**Word**	**Frequency**
res	191	magnus	74
publicus	163	civitas	72
Scipio	110	bonus	70
populus	103	Laelius	66
homo	94	rex	51

Note: Restricted to nouns and adjectives only

- Problem: Does not account for structure of text and relationships between words

Keyword Extraction: TextRank

TextRank is a popular keyword extraction algorithm that determines the importance of a keyword based on its relationship to other keywords.

- Step 1: Build graph representing text
- Step 2: Run keyword extraction algorithm on graph
- Step 3: Merge neighboring keywords and recompute scores

TextRank: Step 1 (Build graph representing text)

Outline