Day 1 - Introduction

Introduction to Text Analysis in Python
TRIADS Training Series

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Today

- Introduction
- Course Logistics
- Overview - Text Analysis
- Lab - String Manipulation

Software

- We will be using Python.
- Python materials will be in notebooks and is provided through Google Colab.
- Google Colab allows you to modify and run copies of the notebooks without worrying about installations on your own machines.
- FYI, Google Colab provides free access to GPU and TPU computing, although it is overkill for this course, and we will not be using it.

What we will cover

- Day 1: Overview of the goals and methods of in text analysis, introduction to string manipulation.
- Day 2: NLP "pipelines". General concepts and practical application of NLP labeling tasks like part-of-speech tagging, named entity recognition, Basics of bag-of-words (with emphasis on CountVectorizer).
- Day 3: Dictionary-based analysis (using tools like VADER), introduction to topic modeling methods (such as Latent Dirichlet Allocation or LDA)
- Day 4: Text classification (using Naïve Bayes)

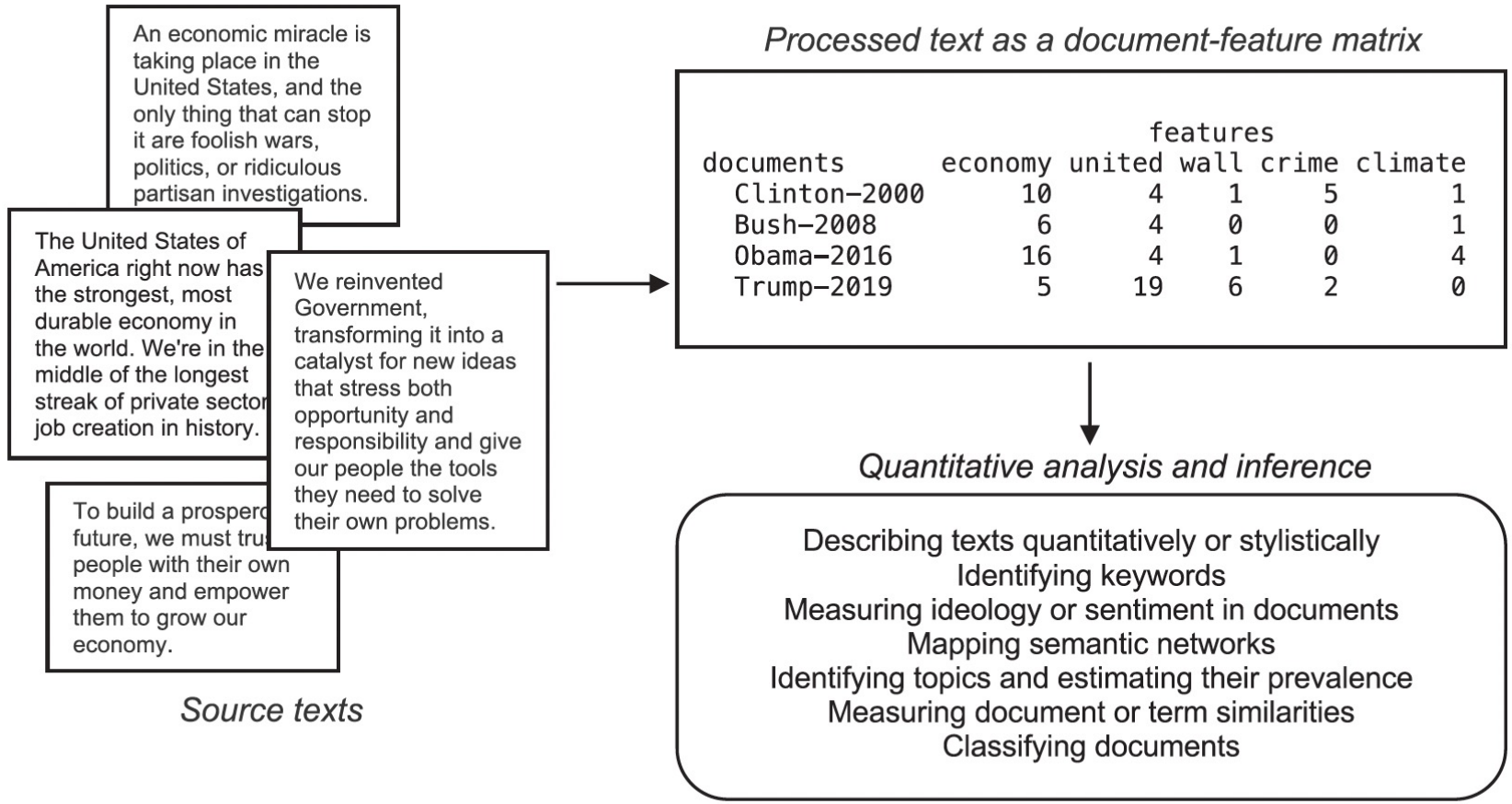


Figure 26.1 From text to data to data analysis

Source: Benoit. 2020

Typical text-as-data pipeline

(1) divides the text into the units we might care about,

(2) throws out some we're pretty sure we don't care about, and

(3) combines units that we're pretty sure should count as the same thing.

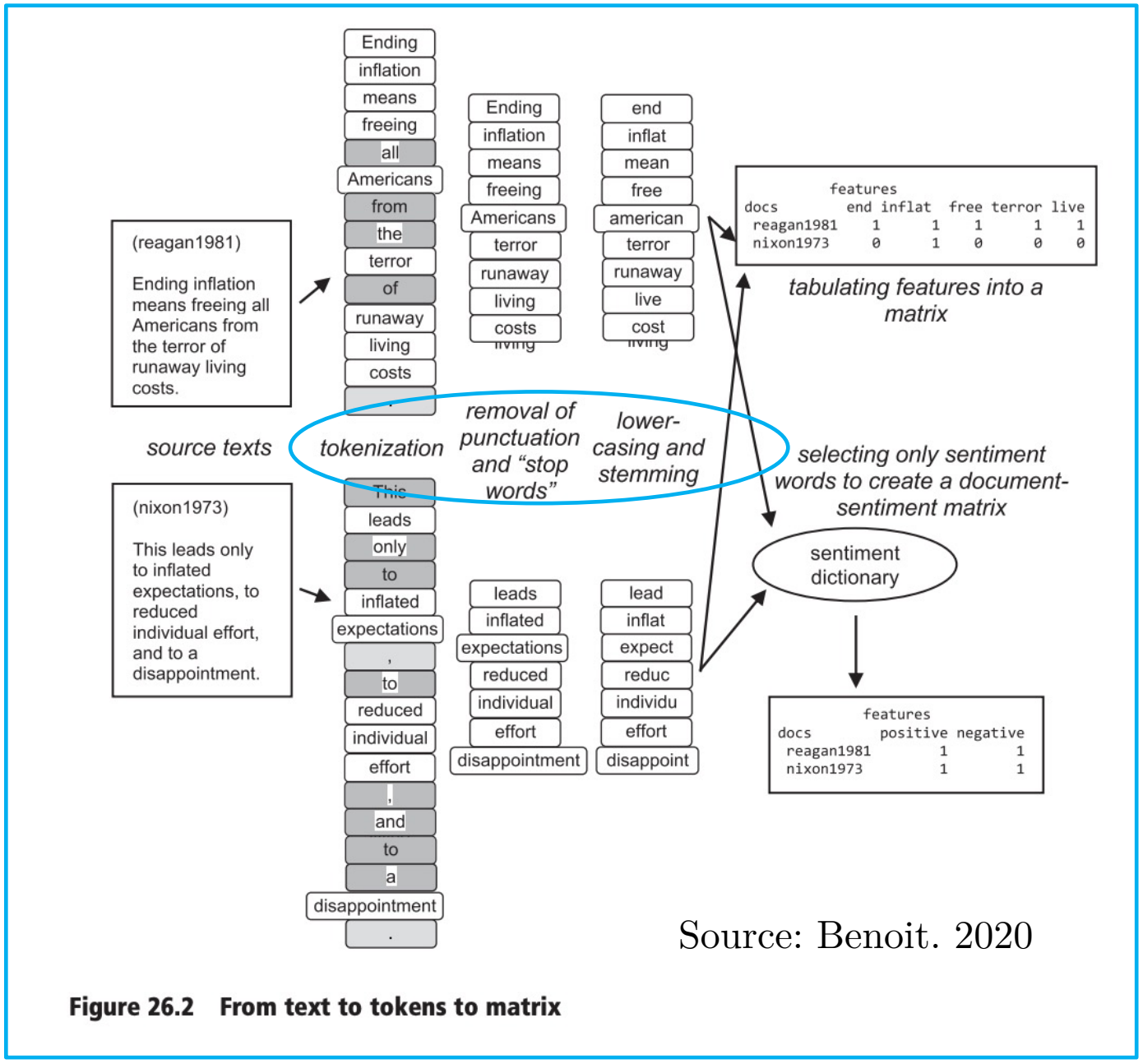
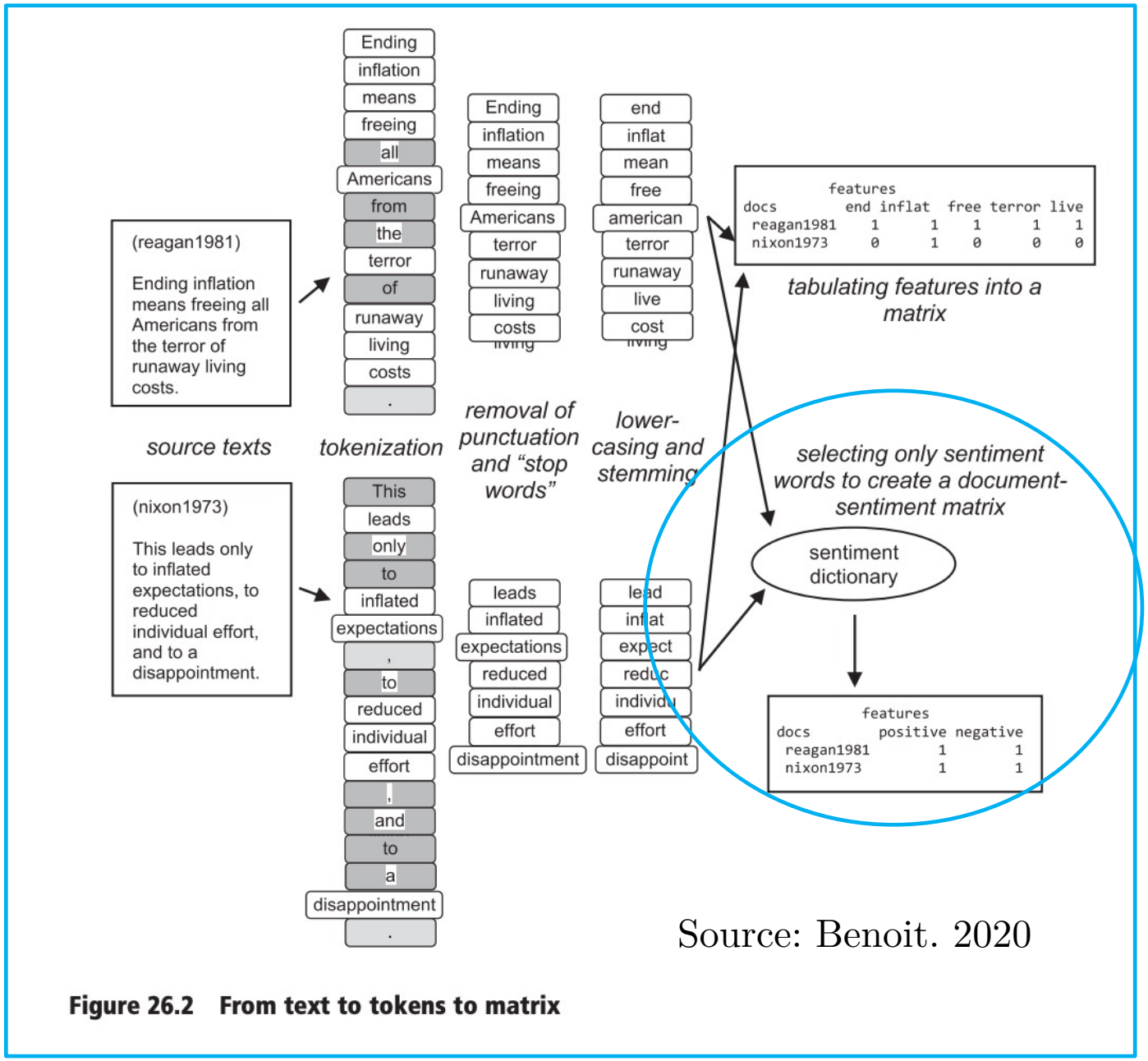


Figure 26.2 From text to tokens to matrix

Dictionary Methods

- Most basic - you have a list of words that count, or have a predetermined "score" for each category and you have the computer count/add them up.

- Very popular approach to sentiment analysis.
  - VADER
  - LIWC
  - Lexicoder



Source: Benoit. 2020

Figure 26.2 From text to tokens to matrix

Supervised Learning - Classification

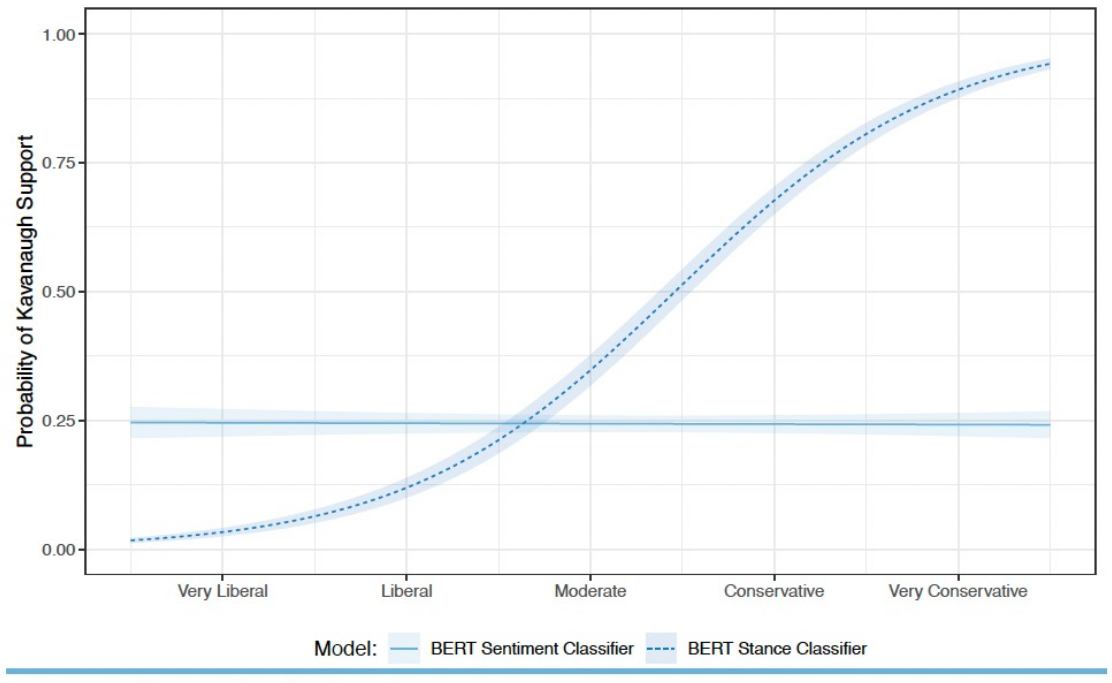
- We have labeled examples (documents) - training data.
- Input text (which can be a speech, tweet, email etc.) is paired with corresponding output labels (negative sentiment, mentions of COVID, identification as spam email).
- The task is to assign predefined categories or labels to input data.

Table 6. Classifier Performance: Kavanaugh Tweets

Classifier	F1 Score (Predicting Sentiment)	F1 Score (Predicting Stance)
Lexicoder	0.788 (0.005)	0.572 (0.014)
VADER	0.754 (0.005)	0.514 (0.011)
SVM (sentiment-trained)	0.943 (0.003)	0.514 (0.012)
BERT (sentiment-trained)	0.954 (0.002)	0.582 (0.005)
SVM (stance-trained)		0.935 (0.006)
BERT (stance-trained)		0.938 (0.002)

Reported figures are the average F1 score over 5-fold cross validation
Standard Errors in parentheses

Figure 5. Predicting Kavanaugh Support from Ideology



Source: Bestvater and Monroe, 2020.

Unsupervised Learning

- We don't have labeled examples (documents) - no training data.
- This is often used as an exploratory / discovery exercise or for theory testing.
- Some of the main variants:
  - Clustering
  - Topic modeling
  - Word embeddings

Unsupervised Learning - Topic Modeling

- Unlike a classification problem, you don't have pre-defined categories.
- But one main output of a topic model is a measure of how words are associated with the topic.
- When a topic model really works well, the appropriate label is obvious.
- A model of speeches in the US Senate contained the topic to the right ... what label would you give it?

school
teacher
educ
student
children
test
local
learn
district
class
account
classroom
achiev
teach
better

Table 4: *Key Words on* [redacted]

Today

- Basics of String Manipulation in Python.

- Google Colab notebook linked below: https://colab.research.google.com/drive/1RxcNLqLsAxl25CBdaRcdBtTFUKorCF1T?usp=sharing