

Quantitative Text Analysis – Essex Summer School

Introduction to text as data

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University of Groningen

Today's plan

- Getting to know each other
- Setting up the course
- What is quantitative text analysis and principles of developing a corpus
- Practice working with text in RStudio Cloud

Who am I?

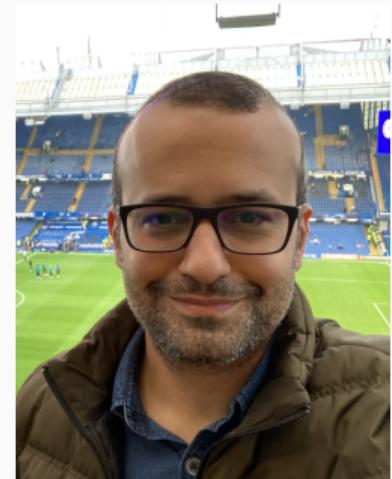
Assistant professor in European Politics & Society at University of Groningen

- Work on automated text analysis of **rhetoric of political leaders**
 - Understanding political rhetoric. Political logic? Personality? Responsiveness?
- Also interested in non-verbal communication (images as data, emotions and voice pitch)
- Email: martijn.schoonvelde@rug.nl; Twitter: @hjms



Second-year PhD student & Assistant lecturer at the Department of Government, University of Essex

- Research interests: Civil wars, terrorism, political violence
- Contact: m.e.arslan@essex.ac.uk



Contact

- Ask questions, come talk to us – happy to help / set up a Zoom meeting
 - Mehmet is the first person to ask your questions – and I will follow after that.
- Use the Slack workspace for this module to communicate with each other: essqta2022.slack.com
 - Both of us will regularly check the workspace and comment on any issues you raise.
- All materials (slides / code scripts / etc) available at
https://github.com/hjmschoonvelde/essex_summer_school_qta



Who are you?

- Background, interests
- What would make this a successful course for you?
- What book are you currently reading?



The New York Times

Opinion

I Am Part of the Resistance Inside the Trump Administration

I work for the president but like-minded colleagues and I have vowed to thwart parts of his agenda and his worst inclinations.

Sept. 5, 2018



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Written by “Anonymous”

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“We may no longer have Senator McCain. But we will always have his example – a **lodestar** for restoring honor to public life and our national dialogue.”

“Lodestar”



‘a person or thing that serves as an inspiration or guide’

Quantitative text analysis

Different approach that does not *a priori* rely on most noticeable words (aka **features** in text as data parlance)

1. Collect textual data from a range of potential authors
2. Compare their relative use of words across the entire vocabulary
3. Calculate the predicted probability that the unknown document was written by each one of the authors
4. Inspect which features are **most predictive** (which may or may not be the most noticeable words)



David Mimno @dmimno · Sep 6, 2018

Now might be a good time to remind everyone that "distinctive phrases" and rare words (high TF-IDF) are not as good for stylometry as subtle differences like "and" vs "the" ratios. If you can easily notice it, someone can easily spoof it.



David Mimno
@dmimno

That means you need a pretty large sample to not have large error bars. Don't expect conclusive or even suggestive evidence here.

35 2:00 AM - Sep 6, 2018

[See David Mimno's other Tweets](#)



“Anonymous”



In October 2020, “Anonymous” revealed himself to be Miles Taylor, a former senior Trump administration official in the DHS.

What is quantitative text analysis

An approach to learning from text that relies on **quantification of its textual contents**.

- Different from, for example, discourse analysis, which is generally more interested in interpretation, in reading **between the lines** (Benoit, 2020)

We can distinguish between **manual approaches** and **computational approaches** to qta

- ... or a combination of both – e.g., **computational grounded theory** (Nelson, 2020); **hybrid content analysis** (Baden *et al.*, 2020)

Our focus in this class is on learning about such **computational approaches** (we'll distinguish between dictionary methods, supervised methods, unsupervised methods)

What is quantitative text analysis

Computational quantitative text analysis is not **one-size-fits all**, but highly **application-dependent** but, generally, an application follows three steps

1. Identify texts and units of texts for analysis
 - Developing a **corpus**
2. Extract quantitatively measured features from these texts and convert them to a **quantitative feature matrix**
 - Decide on the most informative way to represent the text for the question at hand
3. Analyse this matrix with statistical methods to draw inferences about these texts

Why quantitative text analysis?

- As humans we produce **huge amounts of text**, much of which is stored online
 - Speeches, books, interviews, blog posts, manifestos, social media posts, institutional documents, etc.
- These texts are often rich in information, but we'll have to separate the **signal from the noise**
- Doing so requires a new set of tools and methods, which **quantitative text analysis** provide



This course

- Introduction of (computational) quantitative text analysis methods using R
- We'll cover the **bigger picture** of doing research using text – use this course to figure out what interests you and what you want to **pursue further**
- Ask questions – and help each other out

This course

- No better time to learn these methods than **now**
- We'll mostly focus on various **bag-of-words** models but spend some time on **word embeddings**, as well as images as data
- Lots of cool developments **across disciplines!**
 - In computer science and computational linguistics (natural language processing)
 - But also in communication science and psychology, economics and history (digital humanities)

This course

- Day 1: What is QTA?
- Day 2: Core assumptions in QTA.
- Day 3: Going from text to data.
- Day 4: Comparing documents in a corpus.
- Day 5: What are dictionaries and how can we validate them?
- Day 6: Human coding and document classification using supervised machine learning.
- Day 7: Scaling methods.
- Day 8: Topic models.
- Day 9: New developments in data.
- Day 10: Word embeddings.

Requirements: grit



Requirements: fun

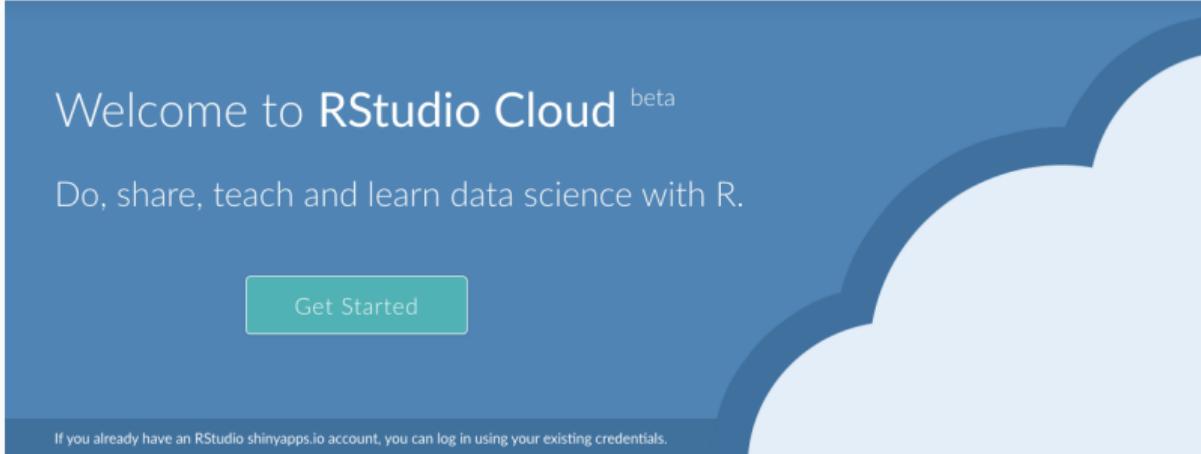


Course objectives

- Learn how computational text analysis methods are used in social science
- Practice preprocessing and analyzing text using R
- Critically evaluate existing text as data research
- Get to know fellow aspiring text analysts

Why R?

- Encompasses all steps of the research process (from scraping to data visualization / analysis)
- Tremendously helpful user community
- Lots of developments, new packages
 - We'll mostly rely on **quanteda** (Benoit *et al* 2018), **tidyverse** (Wickham *et al.*, (2019), **ggplot2** (Wickham, 2016), and **stringr** (Wickham, 2019)
- Other languages such as Python have a head-start in natural language processing – but developers are building wrappers to access their functionality in R, such as, **spacyR** (Benoit & Matsuo, 2020) for sentence parsing.



The screenshot shows the R Studio Cloud homepage. At the top left is the R Studio Cloud logo. To its right are 'Log In' and 'Sign Up' buttons, followed by a menu icon. The main content area has a blue background with white text. It says 'Welcome to RStudio Cloud ^{beta}' and 'Do, share, teach and learn data science with R.' Below this is a green 'Get Started' button. At the bottom of the page, in a smaller white box, is the text: 'If you already have an RStudio shinyapps.io account, you can log in using your existing credentials.'

R Studio Cloud

Log In Sign Up 

Welcome to RStudio Cloud ^{beta}

Do, share, teach and learn data science with R.

Get Started

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A canonical text project

1. Identify texts and units of texts for analysis
 - Developing a **corpus**
2. Extract quantitatively measured features from these texts and convert them to a **quantitative feature matrix**
 - Decide on the best, most informative way to **represent the text**
3. Analyse this matrix with statistical methods to draw inferences about these texts

Developing a corpus

Principles of selection (Grimmer, Roberts and Stewart, 2022)

1. The usefulness of a corpus depends on the question the researcher wants to answer and the population they want to study
 - The preponderance of textual data **doesn't mean all text is useful**. E.g., Twitter data may be less useful for studying public opinion.
2. There is no values-free construction of a corpus. Selecting which documents to include has ethical ramifications
 - Just because it is **found data** (Salganik, 2018) doesn't mean you can just run with it

Developing a corpus

Be mindful of four types of possible bias (Grimmer, Roberts and Stewart, 2022)

1. **Resource bias** – texts often better reflect populations with more resources to produce, record and store documents
2. **Incentive bias** – strategic behavior can drive the production and retention of documents
 - E.g., skydive pictures on Instagram; hot takes on Twitter
3. **Medium bias** – medium in which text is produced may constrain its content
 - E.g., more polite political discussions on Twitter after doubling of character limit (Jaidka *et al.*, 2019). See also **algorithmic drift** (Salganik, 2018)
4. **Retrieval bias** – our methods to sample documents may have biases baked into them
 - E.g., searching for newspaper articles about ‘the economy’ using ‘economy’ as a keyword

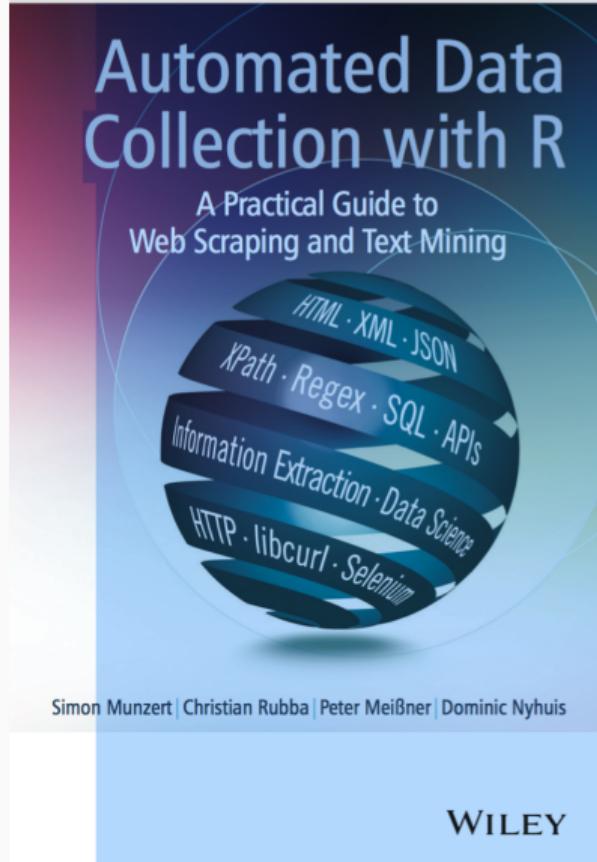
Where to find text data?

- Repositories such as Lexis Nexis or Factiva (newspaper data)
- Existing text datasets. For example:
 - EUSpeech (Schumacher *et al.*): Harvard Dataverse
 - Parlspeech (Rauh *et al.*): Harvard Dataverse
 - Party manifestos: <https://manifesto-project.wzb.eu/>
 - A general repository of political datasets: <https://github.com/erikgahner/PolData>
- Replication data repositories
- Getting data from the web

Getting data from the web

- APIs (Application Program Interface) – make data sitting on a website available to you
 - Various R libraries to access such APIs: **GuardianR**, **RTweet**, **academictwitteR**, **WikidataR**
- Web scraping / screen scraping
 - **rvest**
- Data in APIs or scraped from webpages often stored in JSON, HTML and XML format – expect lots of data wrangling
 - **rjson**, **jsontools**

Getting data from the web



Representations of text

There are many different ways to **represent text**: **bag of words, word embeddings, sentence embeddings, document embeddings, dependency trees**, to name just a few

- These representations vary in their complexity and in the information they contain.

There is no one right way to represent text for all research questions (Grimmer, Roberts, Stewart, 2022) – it really depends on the question

- What is the **quantity of interest** that you are trying to measure? How will it manifest itself in the text?

Goals of quantitative text analysis

Goals are much in line with more general social science research objectives

- Exploration – discover a question of interest, generate hypotheses, and formulate a conceptualization
- Measurement – use text as an expression of a latent concept of interest
- Inference – using text to make causal or descriptive statements about a social phenomenon

- Read the assigned papers
- Make sure you are up to speed with using RStudio Cloud
- Look at the following snippet of text and list all the ways (you can think of) that it needs to be cleaned:

```
<p>Ladies and gentlemen,</p><p>It is an honour to be here today to introduce the theme of 'recession and recovery'. If you will permit, I would like to suggest that this afternoon we focus more on recovery than on recession. I think we know enough about the recession side of the story.</p><p>It started with the fall of Lehman Brothers on 15 September 2008.. I happened to be here, at the Blouin Creative Leadership Summit, only ten days later. Everyone was talking about the collapse of Lehman. They were shocked and alarmed. But even then we could hardly imagine that its impact would be so dramatic, so historic.</p><p>As we now know, this event triggered a global financial and economic crisis. Governments were forced to give cash injections running into billions to prevent an economic and financial meltdown. When credit dried up and demand fell, businesses struggled to keep their heads above water, and many went under. Ordinary people's jobs, homes and pensions were at risk.</p><p>
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