Digitalization and the Organization of Work in the Digital Government Research Library v17.5: A Topic Model

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Abstract

Digital Government is a growing and vibrant multidisciplinary field of research, the fast increase in research output has challenged researchers to explore and use novel computational ways and methods to perform evidence synthesis on the extant literature and be able to map a scientific discipline, explore the thematic evolution over time and identify potential avenues for further research. The exploration of the linkages between digitalization and the organization of work remains relatively unexplored in a public sector context. Topic modeling has emerged as a powerful computational technique that contributes to the examination of large amounts of text data. This chapter aims to perform a 'smart literature review' on a subset of the Digital Government Reference Library (DGRL) version 17.5, by using text as data approach and a topic modeling technique known as Latent Dirichlet Allocation (LDA). To our best knowledge, this is the first attempt to use unsupervised machine learning techniques with this data set. This effort may contribute to creating a map of the field, identify the evolving themes in the literature and help to identify promising areas of research.

Introduction

Recent trends in global scientific output demonstrate a rapid and sustained increase in the production of vast amounts of unstructured data in the form of digitized text. This bounty in research content is challenging researchers to explore and pursue novel methodological approaches and techniques to examine massive volumes of scientific publications. Essentially, the ever-growing amounts of bibliographic information available in almost any field of research exceed human capacity making it necessary to explore computational-assisted approaches for research synthesis. Studies in the history of science have identified a relatively sustained growth pattern in scientific publications over time, this exponential growth rate means a doubling in scientific output every 17 years approximately (Bornmann, Haunschild, and Mutz 2021). This level of growth might be attributed to the increased resources dedicated to the global scientific endeavor and consequently the communication of science via publications. However, it may also be due to what has been dubbed "salami sliced publishing" or the multiple publications of a single research study (Bornmann and Daniel 2007; Bornmann and Mutz 2015).

Digital Government Research (DGR) as a multidisciplinary research field is experiencing rapid growth in its research output. Contributions to this research domain come from established disciplines such as information science, computer science, organization science, sociology, public administration, and political science (Scholl 2021). The diversity in scope and methods of these disciplines converge in the field of Digital Government enriching it, but at the same time, raising questions as regards the lack of native theoretical developments, thus relying upon frameworks, theories, and conceptualizations from related disciplines (Bannister and Connolly 2015).

The advent of computerization and digitalization has had broad impacts in most aspects of contemporary life, including scientific research. Digitalization has influenced how research is designed and conducted, allowing

for the creation and increased availability of ever-growing data sets that require powerful computational methods and enhanced tools to handle abundant information (Meyer and Schroeder 2015). Case in point is unsupervised machine learning techniques for text analysis, this research technology can be used in a wide range of disciplines to examine databases, repositories and corpora thus expanding the methodological repertoire of scholars and opening an opportunity to explore large troves of data.

Research synthesis is part of the literature review process in which the extant scientific knowledge in each academic field is examined to help scholars understand the conceptual structure, themes, and debates to identify trends in the literature and potential areas for further research. This crucial task is labor-intensive, time-consuming, and restricted to a limited number of documents if conducted by traditional "manual" methods (Antons et al. 2020; Asmussen and Møller 2019). Still, computer-assisted text analysis does not substitute human intervention, instead it "augments our reading ability" (Grimmer, Roberts, and Stewart 2022), human judgement is deemed necessary for the evaluation and validation of the outcome of these models (Barberá et al. 2021).

This chapter explores the contents of The Digital Government Research Library in its version 17.5 (Scholl, 2021a), using a text as data approach and an unsupervised machine learning technique known as Latent Dirichlet Allocation (LDA). In its raw form, version 17.5 of the dataset contains 16531 references related to the Digital Government Research (DGR) domain, the most prevalent categories of references are conference papers (33%) and journal articles (50%). Previous explorations of this reference library using bibliometric and scientometric approaches have revealed the thematic evolution (Alcaide–Muñoz et al., 2017), and identified the most influential journals, conferences and leading scholars in the field (Scholl, 2021b). To our best knowledge this is the first attempt to run a topic model for a corpus in the field of Digital Government Research.

Scholars exploring labor-saving technologies have applied similar techniques expanding the methodological repertoire available and inspiring a similar pursuit for the exploration of the impact of technological change in a public sector context (Arduini and Zanfei 2014; Montobbio et al. 2022).

RQ

Process

```
summary(DGRLv17_5_zotero)
```

```
##      Key            Item Type        Publication Year    Author
##  Length:16531    Length:16531      Min.   :1981      Length:16531
##  Class :character  Class :character  1st Qu.:2008      Class :character
##  Mode  :character  Mode  :character  Median :2013      Mode  :character
##                                      Mean   :2013
##                                      3rd Qu.:2018
##                                      Max.   :2022
##                                      NA's   :4165
##     Title         Publication Title     ISBN              ISSN
##  Length:16531    Length:16531      Length:16531      Length:16531
##  Class :character  Class :character  Class :character  Class :character
##  Mode  :character  Mode  :character  Mode  :character  Mode  :character
##
##
##
##
##     DOI             Url            Abstract Note        Date
##  Length:16531    Length:16531      Length:16531      Length:16531
##  Class :character  Class :character  Class :character  Class :character
##  Mode  :character  Mode  :character  Mode  :character  Mode  :character
##
```

```
##
##
##
##      Date Added                  Date Modified
##  Min.    :2022-02-17 12:47:09   Min.    :2022-02-17 12:47:09
##  1st Qu.:2022-02-17 12:51:19    1st Qu.:2022-02-17 12:51:19
##  Median :2022-02-17 12:55:04    Median :2022-02-17 12:55:04
##  Mean    :2022-02-17 12:55:16   Mean    :2022-02-17 12:55:16
##  3rd Qu.:2022-02-17 12:59:11    3rd Qu.:2022-02-17 12:59:11
##  Max.    :2022-02-17 13:03:57   Max.    :2022-02-17 13:03:57
##
##     Access Date                      Pages            Num Pages
##  Min.    :0006-01-01 00:00:00   Length:16531       Length:16531
##  1st Qu.:2015-11-05 00:00:00    Class :character    Class :character
##  Median :2017-11-07 00:00:00    Mode  :character    Mode  :character
##  Mean    :2016-08-26 08:09:30
##  3rd Qu.:2019-05-07 18:41:30
##  Max.    :2020-12-29 18:46:28
##  NA's    :13705
##     Issue             Volume          Number Of Volumes  Journal Abbreviation
##  Length:16531      Length:16531      Min.    :1.000      Length:16531
##  Class :character   Class :character   1st Qu.:2.000      Class :character
##  Mode  :character   Mode  :character   Median :3.000      Mode  :character
##                                        Mean    :2.732
##                                        3rd Qu.:3.000
##                                        Max.    :3.000
##                                        NA's    :16337
##   Short Title          Series          Series Number       Series Text
##  Length:16531      Length:16531      Length:16531       Mode:logical
##  Class :character   Class :character   Class :character   NA's:16531
##  Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##   Series Title     Publisher           Place             Language
##  Mode:logical     Length:16531      Length:16531      Length:16531
##  NA's:16531       Class :character   Class :character   Class :character
##                   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##   Rights           Type             Archive           Archive Location
##  Mode:logical     Mode:logical     Length:16531      Length:16531
##  NA's:16531       NA's:16531       Class :character   Class :character
##                                    Mode  :character   Mode  :character
##
##
##
##
##  Library Catalog    Call Number          Extra              Notes
##  Length:16531      Length:16531      Length:16531       Length:16531
##  Class :character   Class :character   Class :character   Class :character
```

```
##   Mode   :character    Mode   :character    Mode   :character    Mode   :character
##
##
##
##
##   File Attachments Link Attachments Manual Tags      Automatic Tags
##   Mode:logical     Mode:logical     Length:16531     Mode:logical
##   NA's:16531       NA's:16531       Class :character  NA's:16531
##                                     Mode  :character
##
##
##
##
##      Editor           Series Editor      Translator       Contributor
##   Length:16531       Length:16531       Mode:logical     Mode:logical
##   Class :character   Class :character   NA's:16531       NA's:16531
##   Mode  :character   Mode  :character
##
##
##
##
##   Attorney Agent Book Author     Cast Member     Commenter       Composer
##   Mode:logical   Mode:logical    Mode:logical    Mode:logical    Mode:logical
##   NA's:16531     NA's:16531      NA's:16531      NA's:16531      NA's:16531
##
##
##
##
##   Cosponsor      Counsel         Interviewer     Producer        Recipient
##   Mode:logical   Mode:logical    Mode:logical    Mode:logical    Mode:logical
##   NA's:16531     NA's:16531      NA's:16531      NA's:16531      NA's:16531
##
##
##
##
##   Reviewed Author Scriptwriter    Words By        Guest           Number
##   Mode:logical    Mode:logical    Mode:logical    Mode:logical    Mode:logical
##   NA's:16531      NA's:16531      NA's:16531      NA's:16531      NA's:16531
##
##
##
##
##     Edition          Running Time    Scale           Medium          Artwork Size
##   Length:16531      Mode:logical    Mode:logical    Mode:logical    Mode:logical
##   Class :character  NA's:16531      NA's:16531      NA's:16531      NA's:16531
##   Mode  :character
##
##
##
##
##   Filing Date     Application Number Assignee       Issuing Authority
```

```
##   Mode:logical    Mode:logical      Mode:logical    Mode:logical
##   NA's:16531      NA's:16531        NA's:16531      NA's:16531
##
##
##
##
##
##   Country         Meeting Name    Conference Name    Court           References
##   Mode:logical    Mode:logical    Length:16531       Mode:logical    Mode:logical
##   NA's:16531      NA's:16531      Class :character   NA's:16531      NA's:16531
##                                   Mode  :character
##
##
##
##
##   Reporter        Legal Status    Priority Numbers Programming Language
##   Mode:logical    Mode:logical    Mode:logical      Mode:logical
##   NA's:16531      NA's:16531      NA's:16531        NA's:16531
##
##
##
##
##
##   Version         System          Code            Code Number     Section
##   Mode:logical    Mode:logical    Mode:logical    Mode:logical    Mode:logical
##   NA's:16531      NA's:16531      NA's:16531      NA's:16531      NA's:16531
##
##
##
##
##
##   Session         Committee       History         Legislative Body
##   Mode:logical    Mode:logical    Mode:logical    Mode:logical
##   NA's:16531      NA's:16531      NA's:16531      NA's:16531
##
##
##
##
##
```
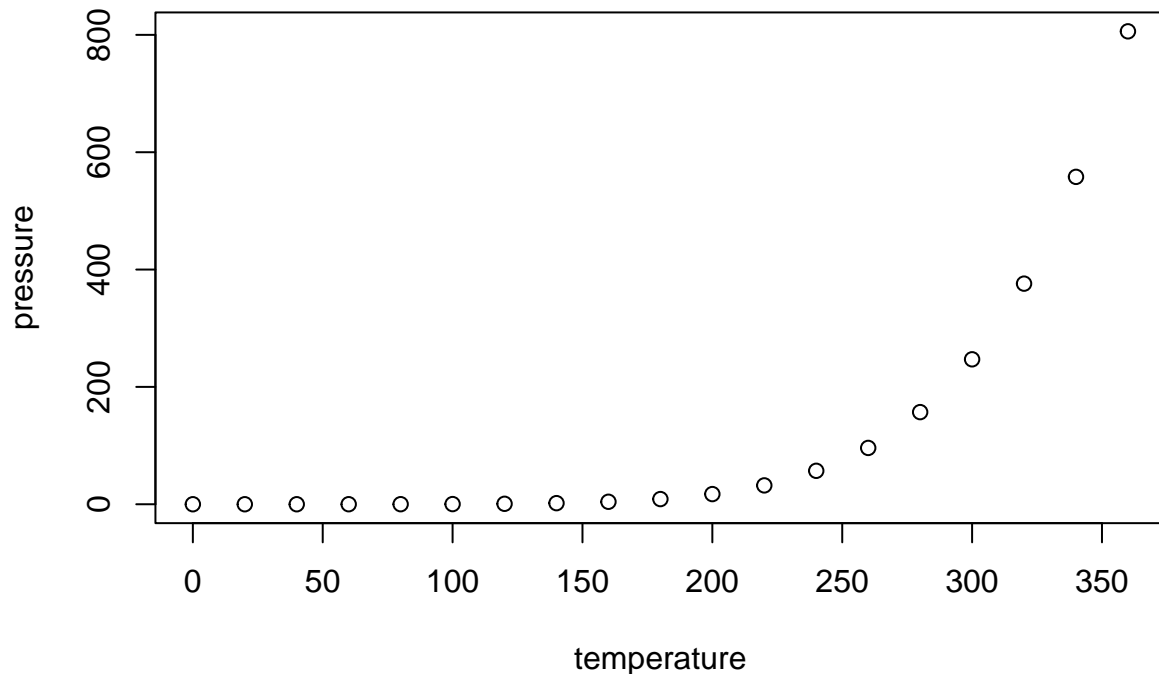
Literature Review // Conceptual framework

You can also embed plots, for example:

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

Methods and Data

The DGRL v 17.5 is a curated repository of publications contributing to the field of Digital Government Research (DGR), in its raw form this library has

Results

Discussion

Conclusions

References

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