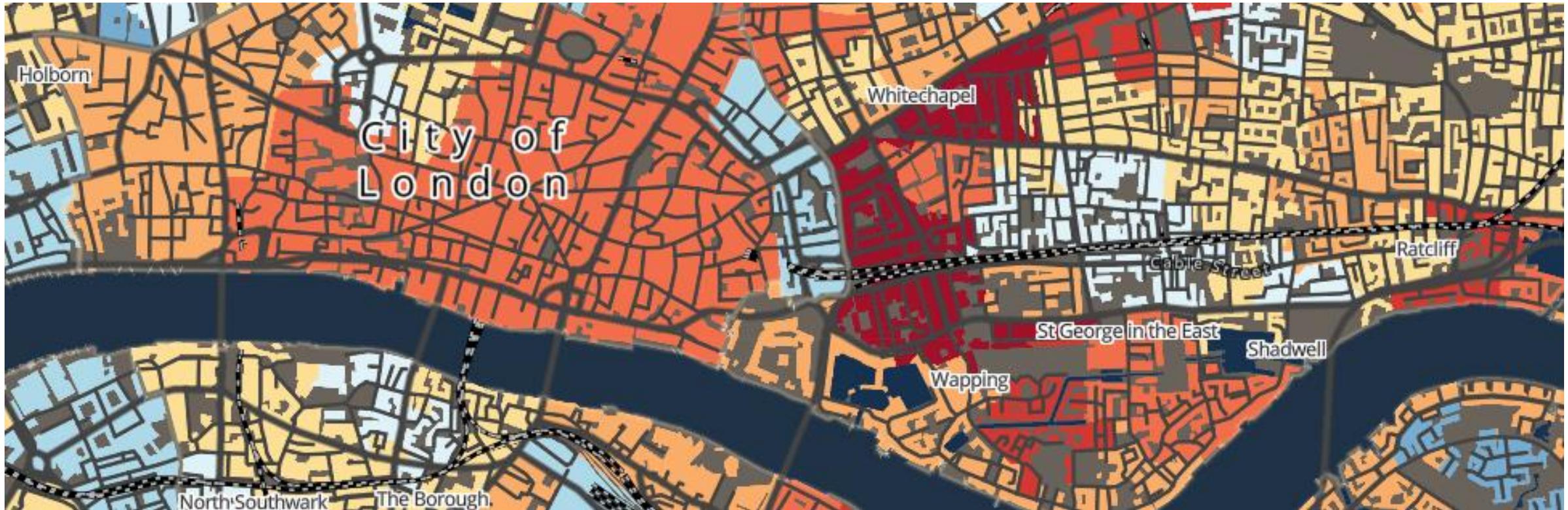


Methods in Human Geography

Quantitative Methods: Foundations



Dr Justin van Dijk



j.t.vandijk@ucl.ac.uk



This week

Part I

- Module overview.
- Introduction to Quantitative Research methods.

Part II

- Describing data.
- R for data analysis.

Module overview

Module overview



Teaching format

- Lectures: Concepts and the bigger picture (Tuesday).
- Tutorials: Hands-on working with quantitative data (Wednesday, Thursday).
- Support: *Optional.* See UCL Timetable.
- Homework: Reading material, short assignments.

Practicalities

The screenshot shows a web browser displaying the UCL Timetable website at timetable.ucl.ac.uk/tt/customTimet.do. The page is titled "November 2024".

Tuesday
12 November 2024

11:00 - 13:00
LECTURE
Methods in Human Geography [GEOG0018-A5U-T1](#)
JONES, Jonny (Dr), VAN DIJK, Justin (Dr)
∅ Gordon Square (31-34) & (14) Taviton St Archaeology G6 LT

Wednesday
13 November 2024

09:00 - 10:00
COMPUTER PRACTICAL
Methods in Human Geography [GEOG0018-A5U-T1](#)
Practical Group 1
VAN DIJK, Justin (Dr)
∅ IOE - Bedford Way (20) 429 - PC Lab 1

10:00 - 11:00
COMPUTER PRACTICAL
Methods in Human Geography [GEOG0018-A5U-T1](#)
Practical Group 2
VAN DIJK, Justin (Dr)
∅ IOE - Bedford Way (20) 429 - PC Lab 1

11:00 - 12:00
COMPUTER PRACTICAL
Methods in Human Geography [GEOG0018-A5U-T1](#)
Practical Group 3
VAN DIJK, Justin (Dr)
∅ IOE - Bedford Way (20) 429 - PC Lab 1

12:00 - 13:00

Practicalities

- Lecture slides will be online available before each lecture.
- During the computer tutorials you are expected to work independently through the material for that week – main opportunity to ask questions and get assistance.
- Output of the homework tasks at the end of each of the computer tutorials is to be included in the appendix of your assignment.

Assessment

To explore one of this year's course themes (gentrification, identity, migration) in the context of London, submitted as a 1,500-word report (50% of module grade):

1. Outline a research question and hypothesis (200-250 words).
2. Obtain data and identify appropriate methods to use (200-250 words).
3. Present and interpret results (700-800 words).
4. Briefly evaluate your approach (200-300 words).

Deadline 13th of January 2025 at 12 noon GMT.

Workbook

The screenshot shows a web browser window displaying a Moodle course page. The title bar reads "Course: GEOG0018: Methods". The URL in the address bar is "moodle.ucl.ac.uk/course/view.php?id=41288".

Module Overview

This module is divided into two parts. The first half of the module focuses on qualitative research methods and will be taught by Dr Jonny Jones and Will Stewart. The second half of the module focuses on quantitative research methods and will be taught by Dr Justin van Dijk and Michal Iliev.

The topics for the module are scheduled as follows:

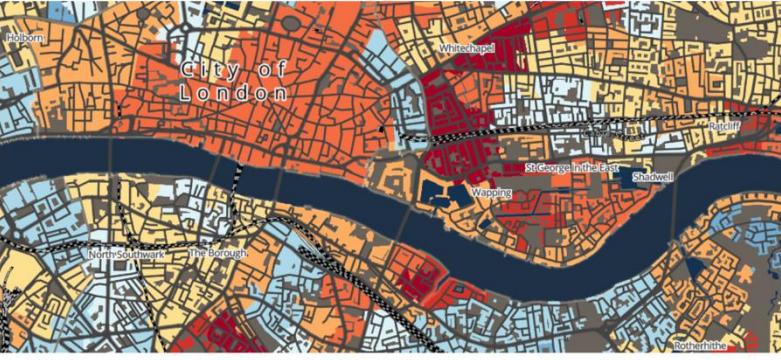
w/c	Week	Topic	Reading Material
30th Sep	1	Introduction to qualitative research methods	Week 01
7th Oct	2	Interviewing and ethnographic methods	Week 02
14th Oct	3	Focus groups and discourse analysis	Week 03
21st Oct	4	Working with images and qualitative analysis	Week 04
28th Oct	5	Questionnaires and mixed methods	Week 05
4th Nov		- Reading Week -	
11th Nov	6	Introduction to quantitative research methods	Week 06
18th Nov	7	Statistical Analysis I	Week 07
25th Nov	8	Statistical Analysis II	Week 08
2nd Dec	9	Spatial Analysis I	Week 09
9th Dec	10	Spatial Analysis II	Week 10

Assessment

[↑ Back to top](#)

Workbook

GEOG 0018



Methods in Human Geography

Welcome

Welcome to the second half of **Methods in Human Geography**. In this part of the module, you will delve into essential statistical analysis techniques and gain a basic foundation in creating thematic maps. We will be using R and the RStudio environment for statistical analysis, and the open-source programme QGIS for handling spatial data.

Moodle

On this page

- Methods in Human Geography
- Welcome
- Moodle
- Module overview
- Major updates
- Acknowledgements

[Report an issue](#)

Workbook

The screenshot shows a web browser window with the title bar "GEOG0018" and the URL "jtvdijk.github.io/GEOG0018/01-recap.html". The page content is as follows:

**GEOG
0018**

Module overview

- Welcome
- Getting Started
- Statistical Analysis
 - 1 R for Data Analysis**
 - 2 Statistical Analysis I
 - 3 Statistical Analysis II
- Spatial Analysis
 - 4 Spatial Analysis I
 - 5 Spatial Analysis II

1 R for Data Analysis

This week, we will start easy with a refresher on how to use R and RStudio for working with quantitative data. We will revisit some key concepts introduced in [Geography in the Field I](#) and [Geography in the Field II](#), but from next week we will build on these foundations by introducing more advanced statistical techniques.

1.1 Lecture slides

You can download the slides of this week's lecture here: [\[Link\]](#).

1.2 Reading list

Essential readings

- Brundson, C. and Comber, A. 2020. Opening practice: Supporting reproducibility and critical spatial data science. *Journal of Geographical Systems* 23: 477–496. [\[Link\]](#)
- Franklin, R. 2023. Quantitative methods III: Strength in numbers? *Progress in Human Geography*. Online First. [\[Link\]](#).

Suggested readings

- Field, A. Discovering Statistics using R, **Chapter 1: Why is my evil lecturer forcing me to learn statistics?**, pp. 1-31. [\[Link\]](#)
- Hadley, W. 2017. *R for Data Science*. Chapter 2: Workflow basics. [\[Link\]](#)

On this page

- 1 R for Data Analysis**
 - 1.1 Lecture slides
 - 1.2 Reading list
 - 1.3 Age groups in Camden
 - 1.4 Homework task
 - 1.5 Before you leave

[Report an issue](#)

Communication

- All important information will be communicated through **Moodle**.
- Academic Support and Feedback (ASF) Office Hours:
 - Mondays 11h00-13h00 [North-West Wing Room 118].
 - Thursdays 12h00-13h00 [Microsoft Teams].
 - Slots can be booked through Microsoft Bookings: [\[Link\]](#)

Troubleshooting and support

- Come prepared to the weekly computer tutorials.
- Drop by the Departmental Coding Therapy sessions.
- Attend the **GEOG0018 Drop-In Support** sessions. See UCL Timetable.
- Teaching staff will not respond to e-mails with coding questions.

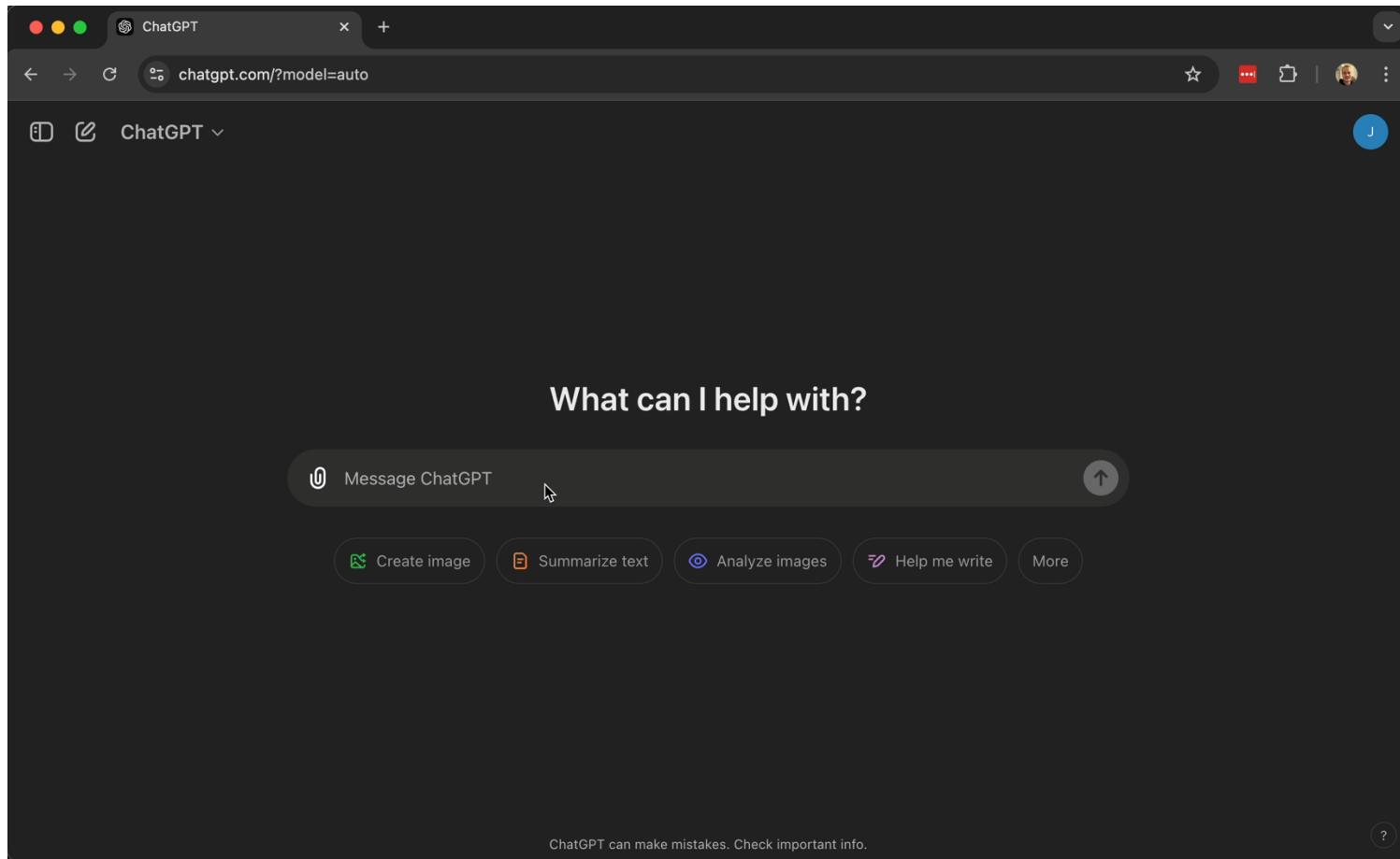
Mentimeter

- Go to www.menti.com.
- Use code: 7323 1874



Quantitative Research Methods

Qualitative methods



Qualitative methods

- Exploratory and descriptive in nature.
- Seeks to understand underlying reasons, opinions, and motivations.
- Depth over breadth.
- Crafting a context.
- Non-numerical data.

Quantitative methods

- Generalising results to a broader population.
- Seeks to describe and understand patterns.
- Breadth over depth.
- Testing hypotheses and looking for relationships.
- Numerical data.

Philosophical foundations

Nomothetic geography	Idiographic geography
Uncover generalisable laws that explain patterns and processes.	Describe difference and particularity.
Focus on the population, either directly or by representative sampling.	Focus on the specific and context dependence.
Geographer as a detached, rational observer who uses scientific methods to 'find and explain'.	Openness to embedded research methods, subjectivity, positionality, recognition of social constructions.

A very brief history

1950s-70s: The Quantitative Revolution

- Response to the perceived lack of scientific rigour in geography.
- Sought to make geography more scientific, objective, and systematic by adopting methods from natural sciences (e.g. regression analysis, gravity models).
- Focus on discovering spatial patterns, laws, and generalisable theories.

A very brief history

1980s-90s: The Cultural Turn

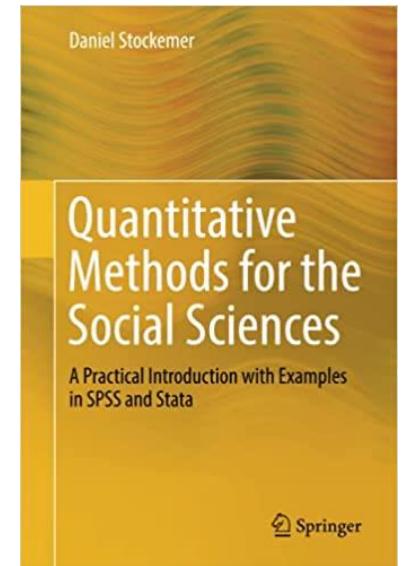
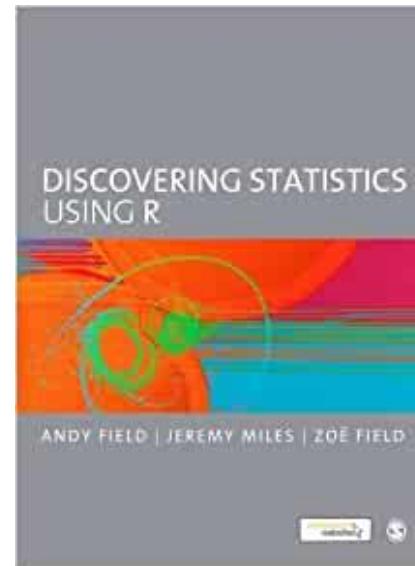
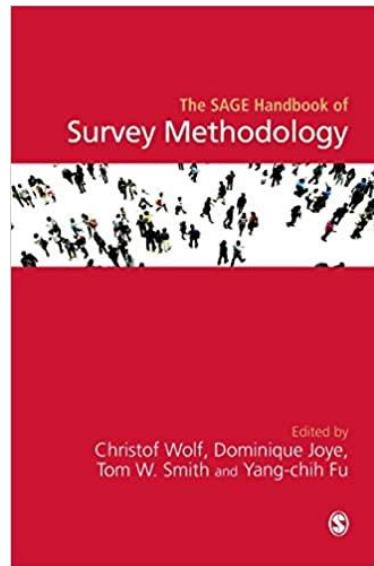
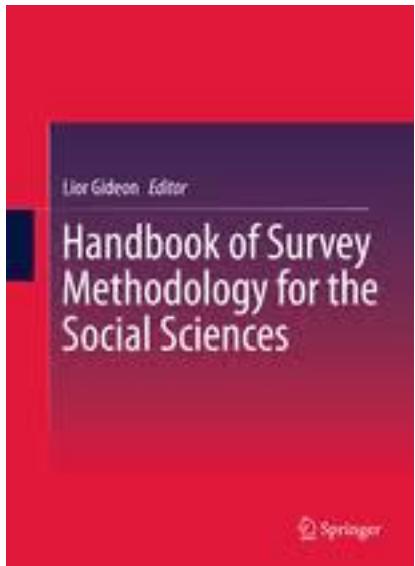
- Response to the limitations of the Quantitative Revolution.
- Emphasis on the importance of culture, meaning, and human subjectivity in understanding socio-spatial phenomena.
- Focus on meaning and representation, attention to power and social justice (e.g. perspectives from critical theory, feminism, postcolonialism).

A very brief history

2000s-Present: Data-driven Geography?

- Proliferation of data, vastly increased computational power, new methods.
- Greater sensitivity to diversity and difference.
- Geographic Data Science? Quantitative human geography? GeoAI? Urban analytics?
Geocomputation? Urban data science?
- See Miller and Goodchild (2015), Franklin (2023).

A very brief history



What are data?

Kitchen 2014:

"Data are commonly understood to be the raw material produced by abstracting the world into categories, measures and other representational forms – numbers, characters, symbols, images, sounds, electromagnetic waves, bits – that constitute the building blocks from which information and knowledge are created." (p.2)

Quantitative data

- Quantitative: Numeric, properties of phenomena.
 Measurement scale (nominal, ordinal, interval, ratio).
- Qualitative: Non-numeric.

Quantitative data

- Structured: Data that is easily organised, defined data model.
- Semi-structured: Loosely structured data, often hierarchical (XML).
- Unstructured: Data without an identifiable structure (not per se qualitative).

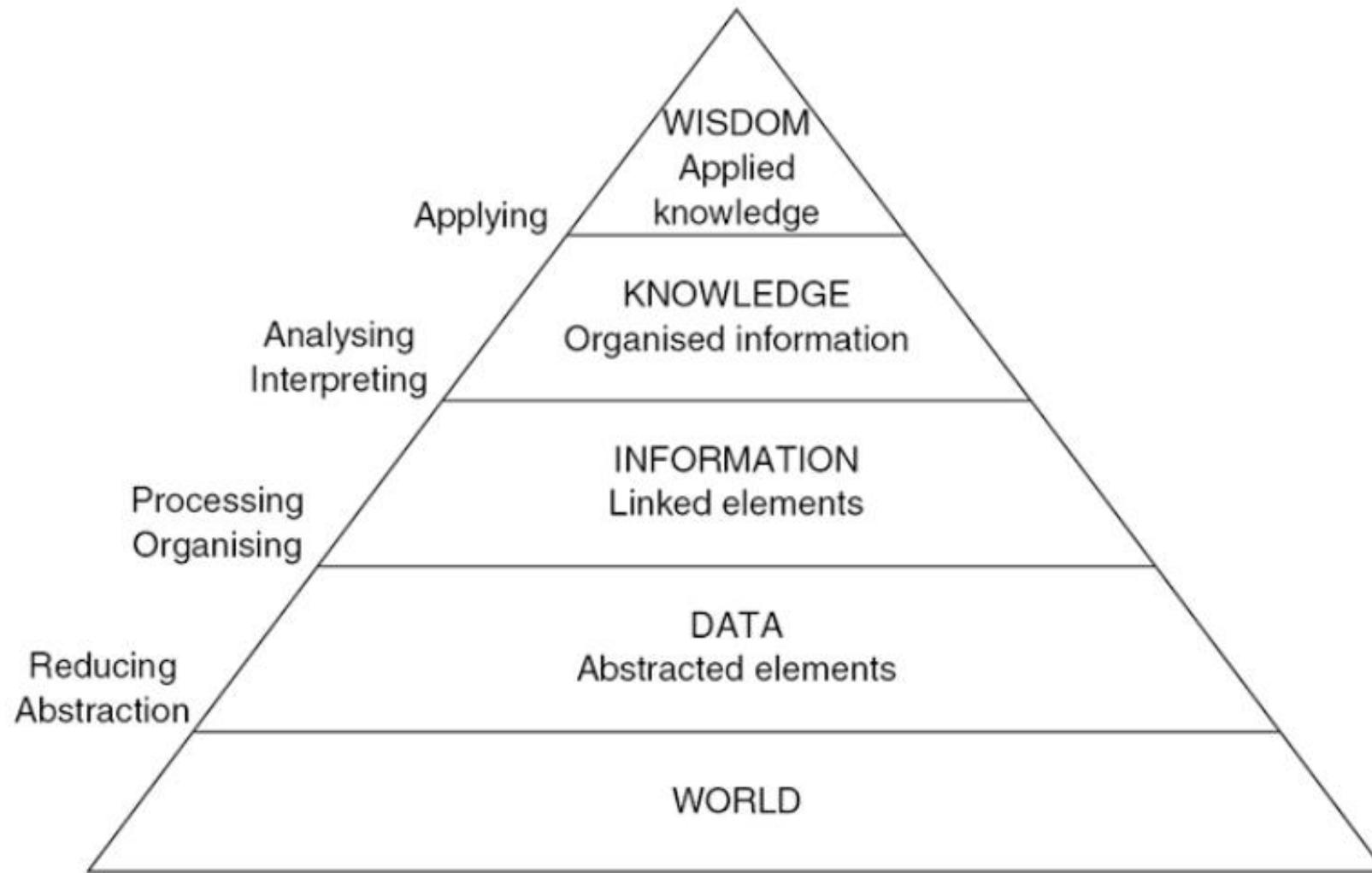
Quantitative data

- Captured: Data that is measured with some instrument (e.g. survey).
- Exhausted: Data as a by-product (e.g. transaction data).
- Derived: Data derived from other data (e.g. model output).

Quantitative data

- Primary: Data captured by a researcher.
- Secondary: 'Analysis-ready' dataset, pre-processed, cleaned.
- Tertiary: 'Amplified data' (e.g. geodemographics).

Quantitative data



Kitchen. 2014. Knowledge pyramid adapted from Adler (1986) and McCandless (2010)

Research examples

The screenshot shows a PDF document window titled "Trasberg, Cheshire 2021.pdf – Page 1 of 21". The document is from the journal "Urban Studies".
Special Issue: *Urban Public Health Emergencies and the COVID-19 Pandemic (1): Social and Spatial Inequalities in the COVID-city*
Urban Studies
Spatial and social disparities in the decline of activities during the COVID-19 lockdown in Greater London
Terje Trasberg University College London, UK
James Cheshire University College London, UK
Abstract
We use data on human mobility obtained from mobile applications to explore the activity patterns in the neighbourhoods of Greater London as they emerged from the first wave of COVID-19 lockdown restrictions during summer 2020 and analyse how the lockdown guidelines have exposed the socio-spatial fragmentation between urban communities. The location data are spatially aggregated to 1 km² grids and cross-checked against publicly available mobility metrics (e.g. Google COVID-19 Community Report, Apple Mobility Trends Report). They are then linked to geodemographic classifications to compare the average decline of activities in the areas with different sociodemographic characteristics. We found that the activities in the deprived areas dominated by minority groups declined less compared to the Greater London average, leaving those communities more exposed to the virus. Meanwhile, the activity levels declined more in affluent areas dominated by white-collar jobs. Furthermore, due to the closure of non-essential stores, activities declined more in premium shopping destinations and less in suburban high streets.
Keywords
COVID-19, location data, regression analysis, smartphone applications, socioeconomic inequalities

Research examples

Coulter, Clark 2019.pdf – Page 1 of 16

INTERNATIONAL JOURNAL OF URBAN AND REGIONAL RESEARCH
DOI:10.1111/1468-2427.12697 947

– ETHNIC DISPARITIES IN NEIGHBOURHOOD SELECTION: Understanding the Role of Income

RORY COULTER AND WILLIAM A.V. CLARK

Abstract

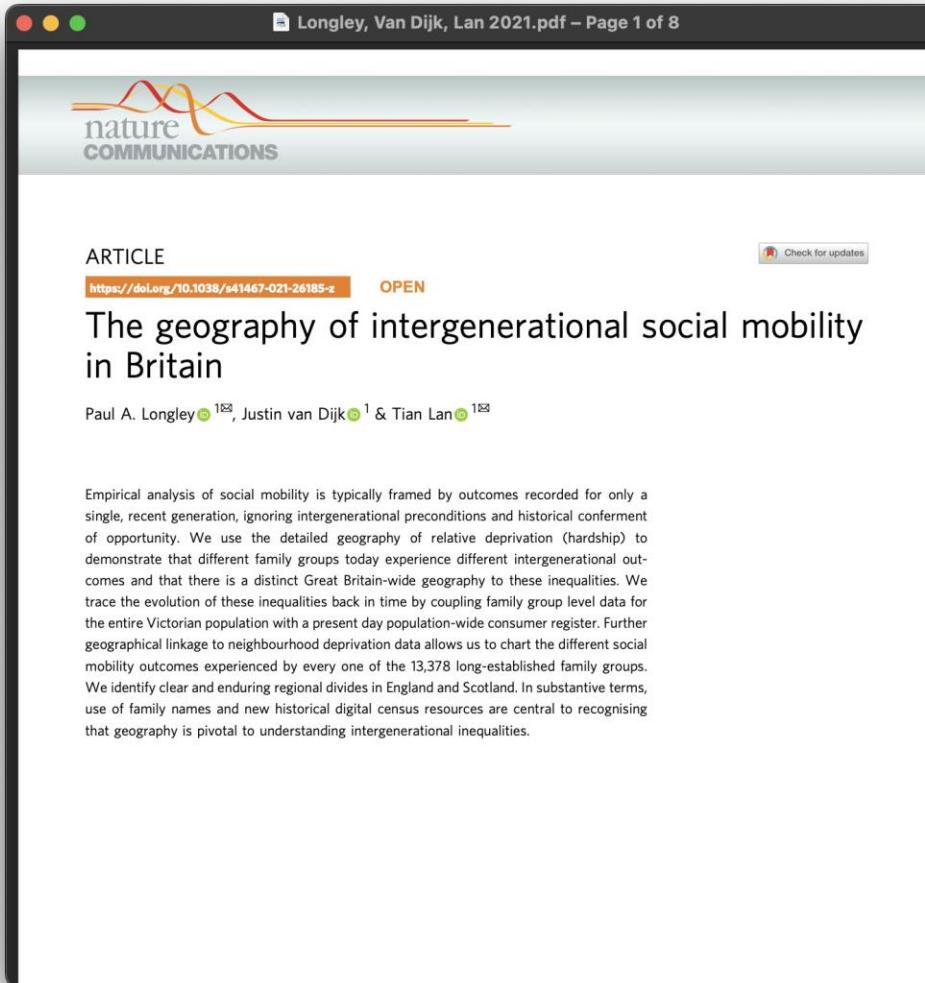
Resurgent fears that segregation could undermine the cohesion, prosperity and security of British society require re-examining how ethnicity and economic resources interact to structure the types of neighbourhoods people relocate to when they move. This article uses the United Kingdom Household Longitudinal Study and 2011 census data to assess how ethnicity and income intersect to stratify the ethnic and socio-economic composition of the neighbourhoods people move to in England and Wales. The results suggest that greater access to resources allows people from most ethnic groups to act on shared residential preferences by moving to more advantaged locales. Furthermore, higher incomes accelerate ethnic deconcentration by carrying Asians into neighbourhoods with a greater share of White Britons. However, there is also considerable inertia and ethnic inequality in neighbourhood destinations. The geography of local opportunity structures constrains the types of neighbourhood people relocate to and ethnic minorities tend to move to less advantaged neighbourhoods than their White British peers. Although Britain is not 'sleepwalking to segregation', there are persistent ethnic and socio-economic disparities in neighbourhood outcomes.

Introduction

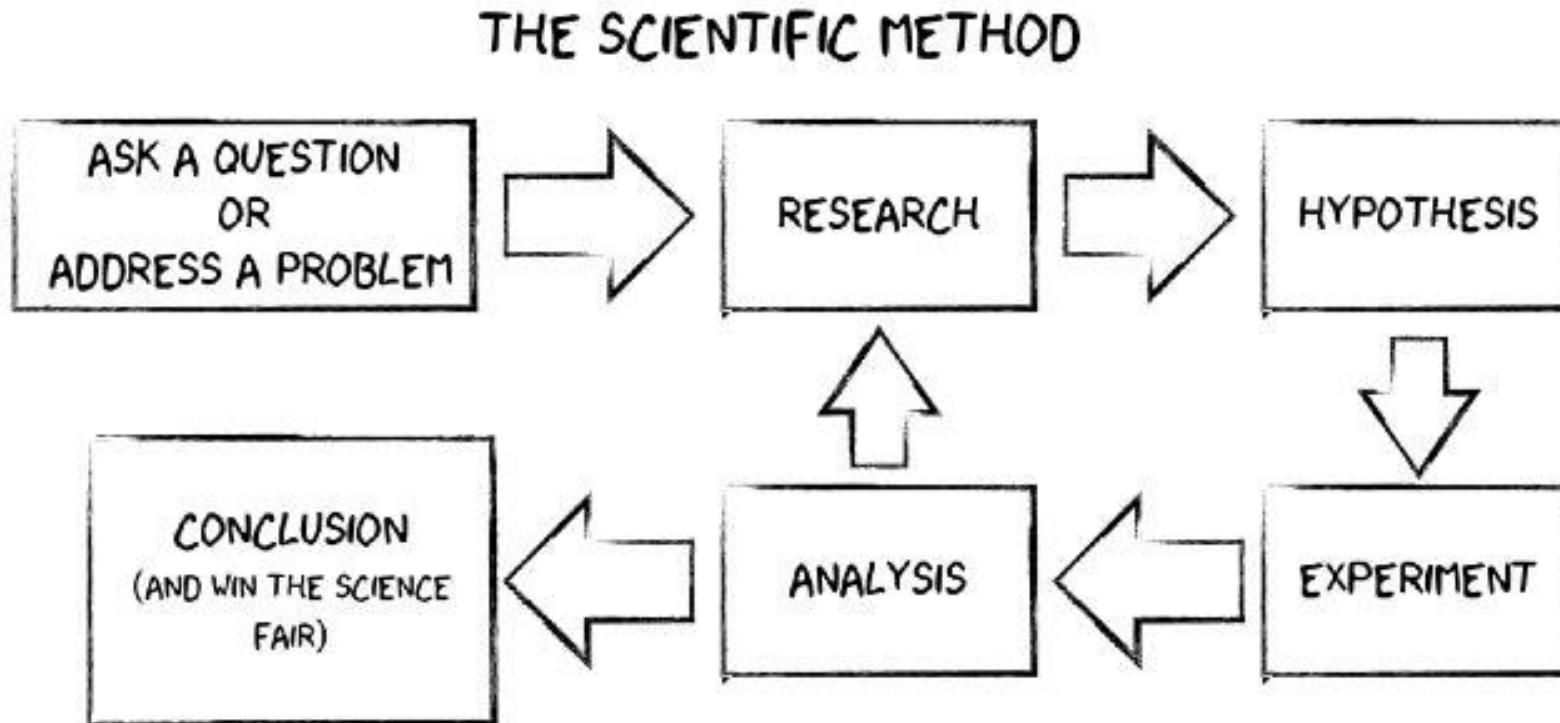
Polarized immigration debates, urban disturbances such as the 2011 riots in English cities and recent terrorist atrocities have all revived anxiety about the connections between segregation, the nature of British citizenship and national security (Sturgis *et al.*, 2014). These concerns have led policymakers to identify the residential clustering of ethnic minorities (especially South Asian Muslims) in often deprived areas as a threat to social integration, community cohesion and ultimately national identity (Phillips, 2006; Cameron, 2015). In 2016, the wide-ranging *Casey Review into Opportunity and Integration* suggested that a host of social ills—including mutual mistrust, extremism, prejudice, inequality and limited social mobility—are all exacerbated when people live in divided communities where they do not interact with individuals from different backgrounds. To tackle these issues, urban policymakers in Britain and elsewhere have espoused a commitment to combat residential segregation by creating more 'mixed communities' (see Imbrosio, 2012).

In Britain, political interpretations of ethnic residential patterns have tended to emphasize minorities' self-segregating choices rather than other demographic

Research examples

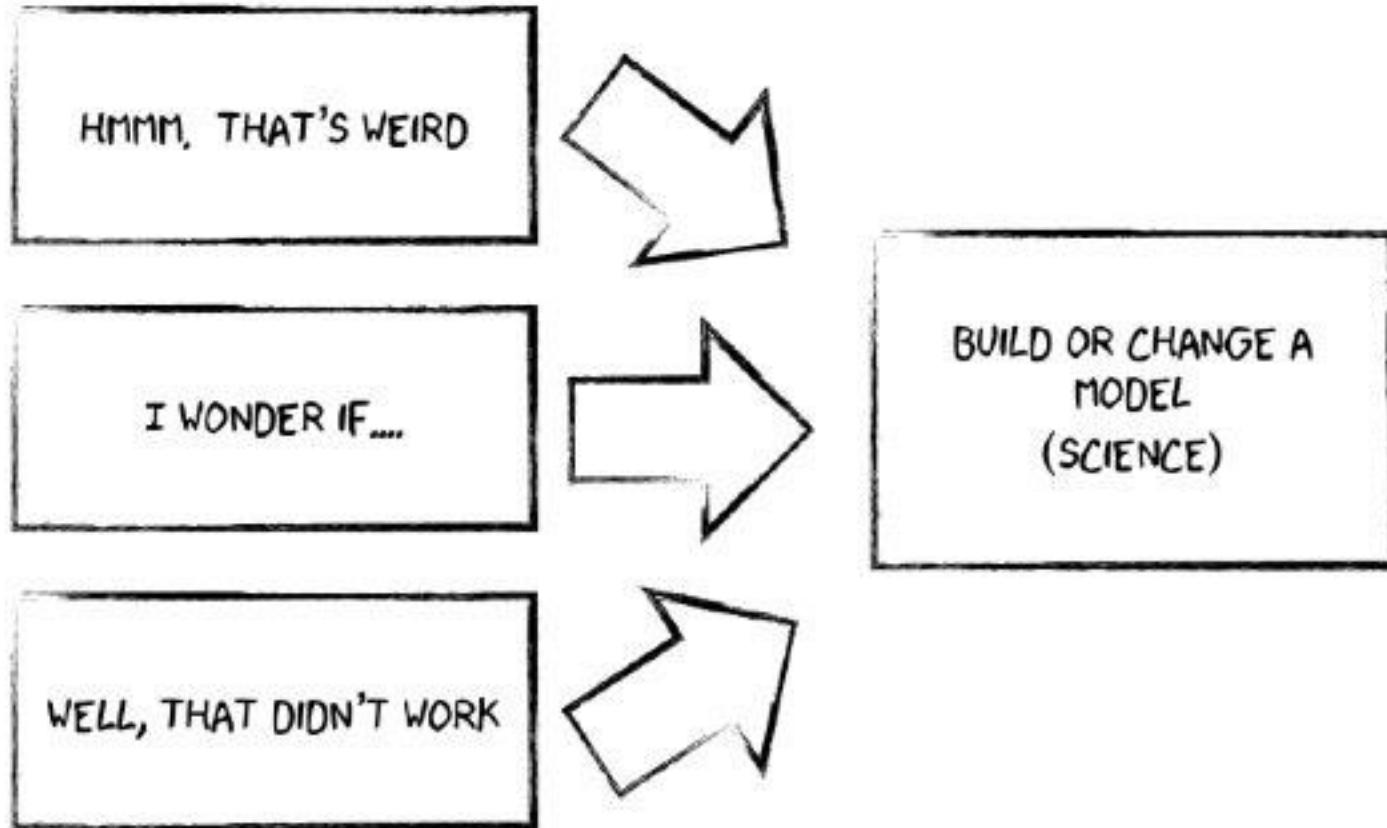


Research questions



Allain. 2013. What's wrong with the scientific method? *Wired* 01/04/2013.

Research questions



Allain. 2013. What's wrong with the scientific method? *Wired* 01/04/2013.

Research questions

Research questions should:

- Contribute to theory, improve methods, or provide new evidence.
- Build on existing knowledge.
- Be concisely and precisely stated.
- Be feasible given the time, resources, and data available.

Research questions

Research questions can:

- Aim to describe a phenomenon.
- Compare different groups or variables.
- Seek to explain causes or effects.
- Investigate new or under-researched areas.
- Assess the effectiveness of a policy or intervention.

Break

Describing data

Variables

- Used to test hypotheses and answer questions.
- Dependent variable (y): the phenomenon we want to describe, explain, or predict.
- Independent variables (x): the things that might cause or affect variations in Y .
- Different types of variables.

Nominal data

- Nominal data represents categories or labels with no inherent order or ranking.
- Categories are mutually exclusive.
- "How do you normally travel to UCL?"

Nominal data

Respondent	Answer
1	Bus
2	Bike
3	Tube
4	Tube
5	Tube
6	Walk
7	Walk
8	Bike

Ordinal data

- Ordinal data represents categories with a clear order or ranking.
- Intervals between the categories are not necessarily equal.
- "How likely are you to use quantitative methods in your dissertation?"

Ordinal data

Respondent	Answer*				
1	1	2	3	4	5
2	1	2	3	4	5
3	1	2	3	4	5
4	1	2	3	4	5
5	1	2	3	4	5
6	1	2	3	4	5
7	1	2	3	4	5
8	1	2	3	4	5

* 1 is very likely, 2 is likely, 3 is neutral, 4 is unlikely, 5 is very unlikely

Interval data

- Interval data is numeric and the intervals between values are equal.
- Interval data lacks a true zero point.
- "What was the maximum temperature in London the past days?"

Interval data

Measurement	Temperature (C)
1	17
2	17
3	14
4	14
5	15
6	16
7	15
8	12

Ratio data

- Ratio data is numeric and the intervals between values are equal.
- Ratio data have a true zero point.
- “How much do you bench?”

Ratio data

Respondent	Bench press (kg)
1	28
2	50
3	70
4	15
5	65
6	70
7	40
8	10

Describing data

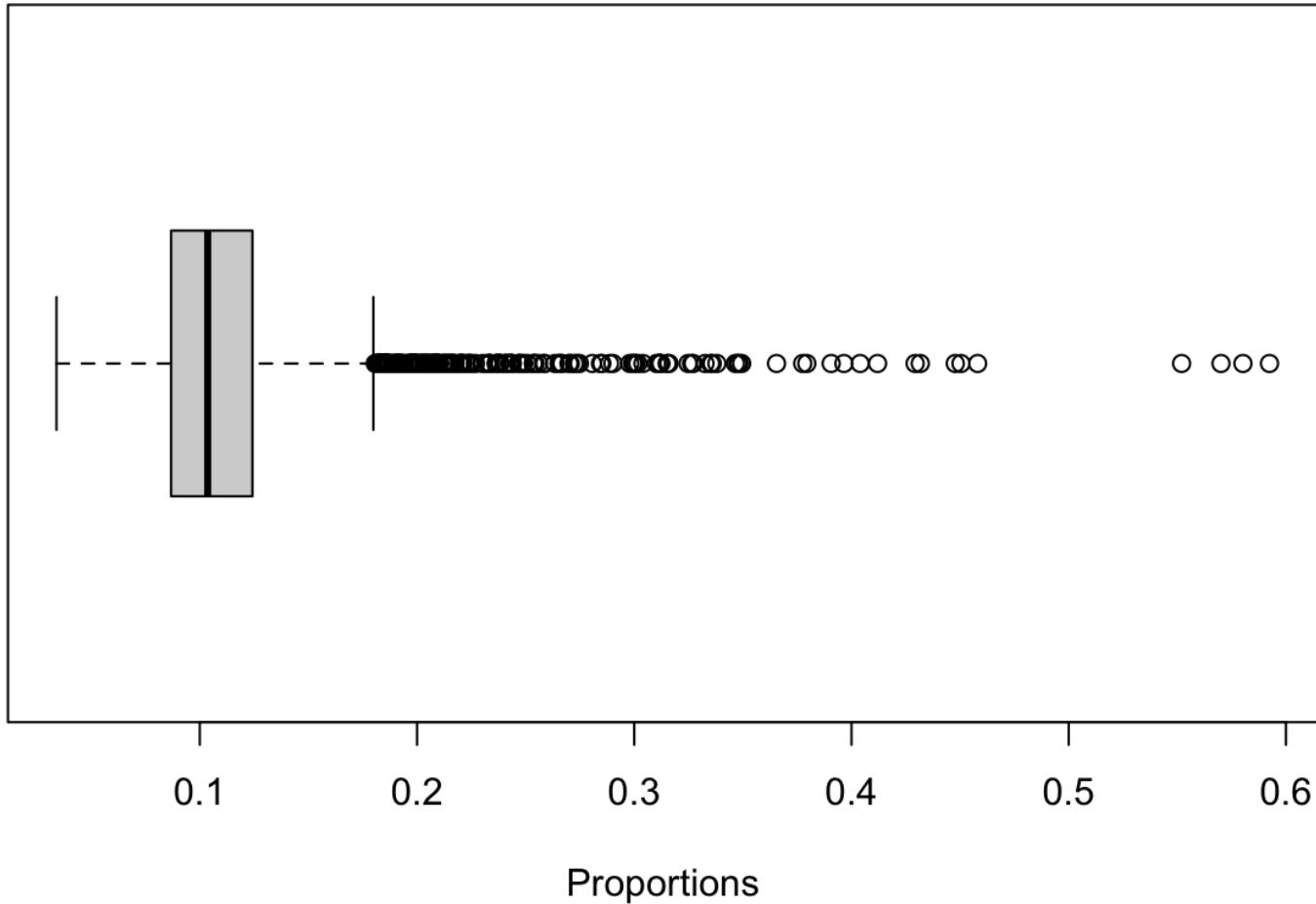
- Why do we care? Different data types, different methods.
- Describing data is important to understand the data distribution, identify possible errors, decide on appropriate methods.
- How to describe?
 - Measures of central tendency.
 - Measures of dispersion.
 - Plots and maps.

Describing data

Statistic	Definition
Mean	Sum of values divided by total number of cases. Vulnerable to extremes.
Median	Middle ranked observation.
Mode	Most common observation.
Range	Difference between lowest and highest value.
Interquartile range	Difference between the 25 th and 75 th percentile of values.
Standard deviation	The average deviation from the average.

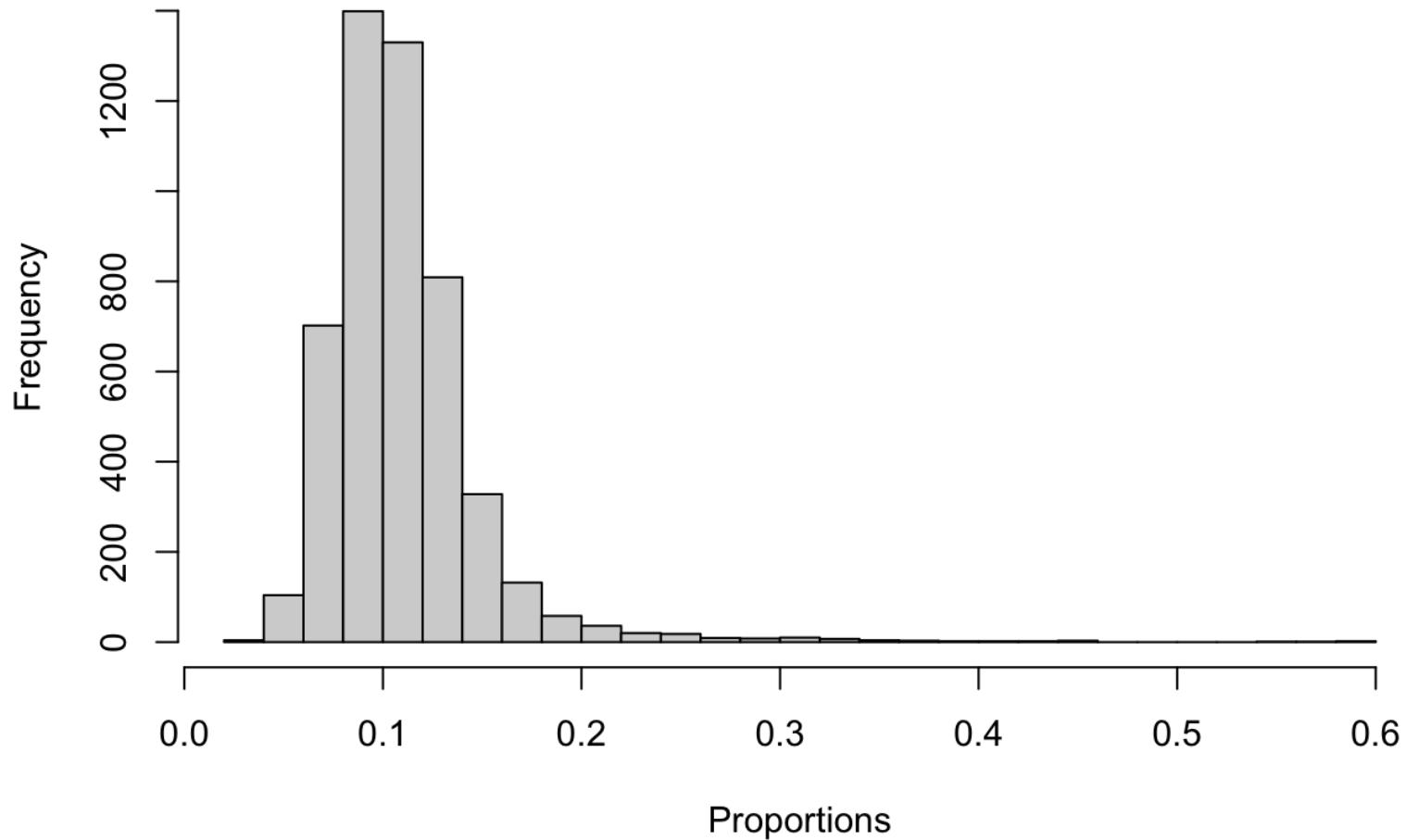
Describing data

Proportion of people aged between 16 and 24



Describing data

Proportion of people aged between 16 and 24

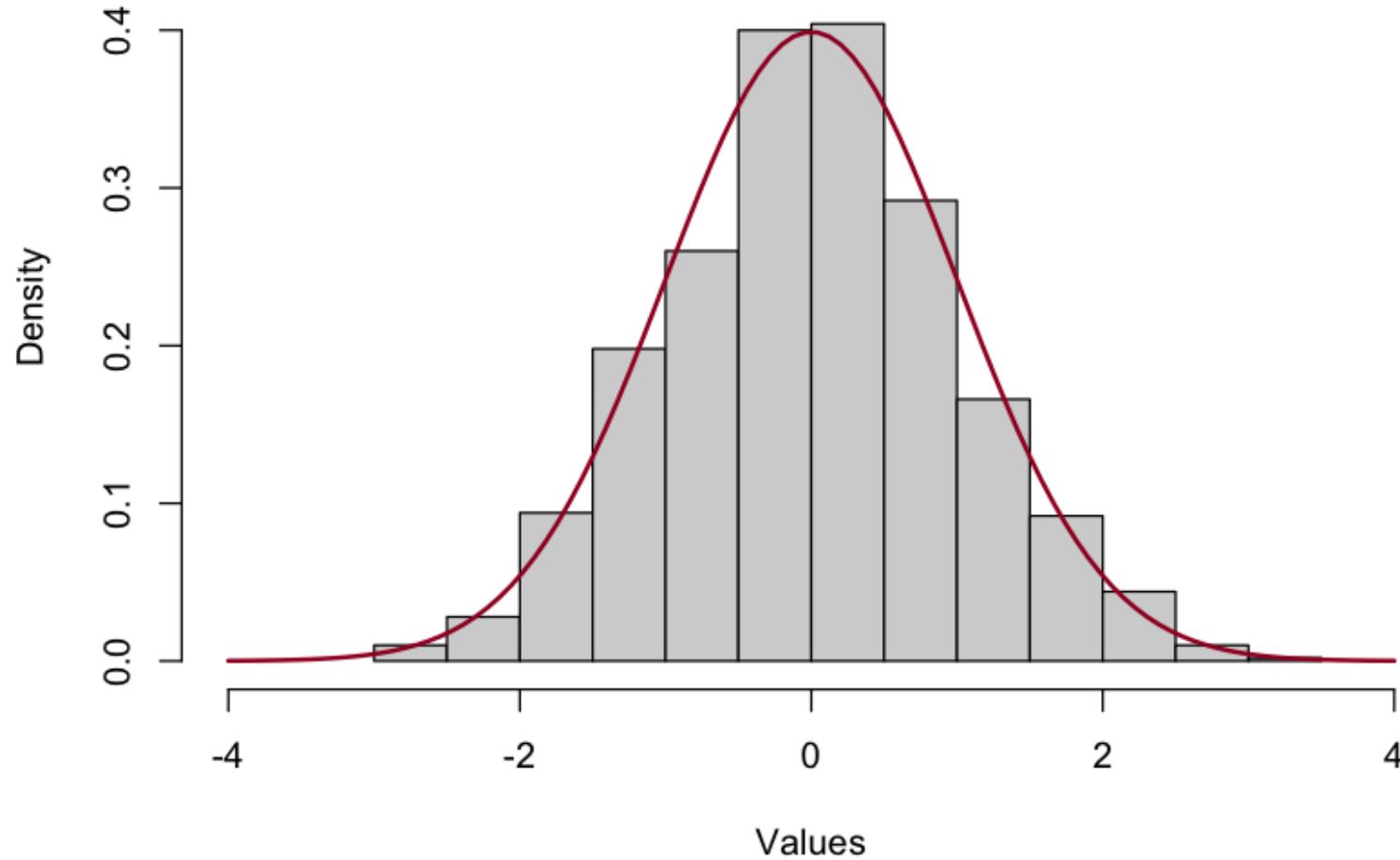


Normal distribution

- The normal distribution is a symmetric, bell-shaped probability distribution which has properties that allows us to make inferences about a sample through the standard normal distribution.
- The mean, median, and mode of a normal distribution are equal.
- About 68% of the data falls within one standard deviation of the mean, 95% within two standard deviations.

Normal distribution

Histogram with Normal Distribution Curve



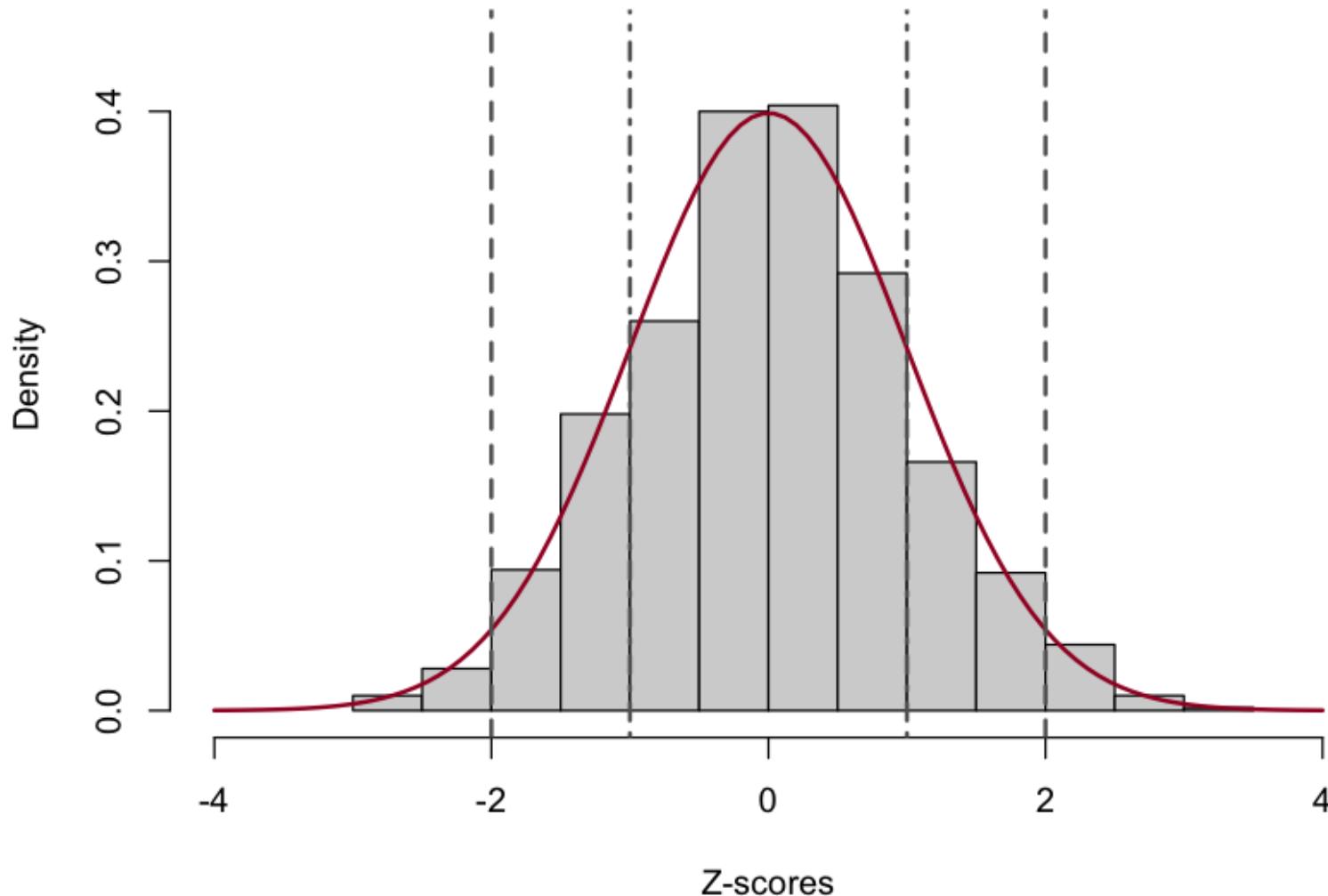
Normal distribution

- Special case of a normal distribution: standard normal distribution.
- Standard normal distribution has a mean of 0 and a standard deviation of 1.
- All normal distributions can be transformed into this standard form using **z-scores**.
- A z-score represents the number of standard deviation units an observation is from the mean:

$$z = \frac{x - \mu}{\sigma}$$

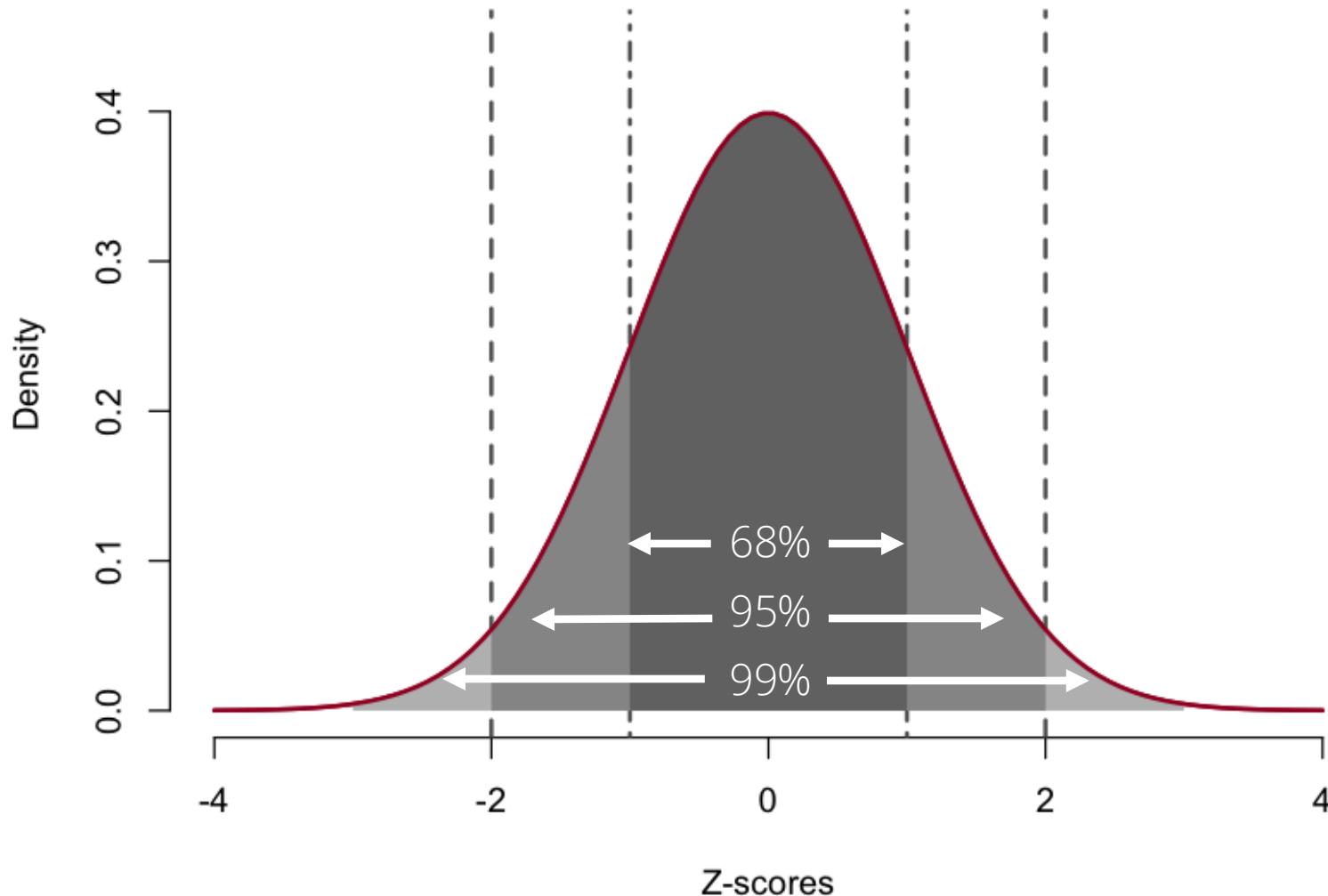
Normal distribution

Histogram with Normal Distribution Curve



Normal distribution

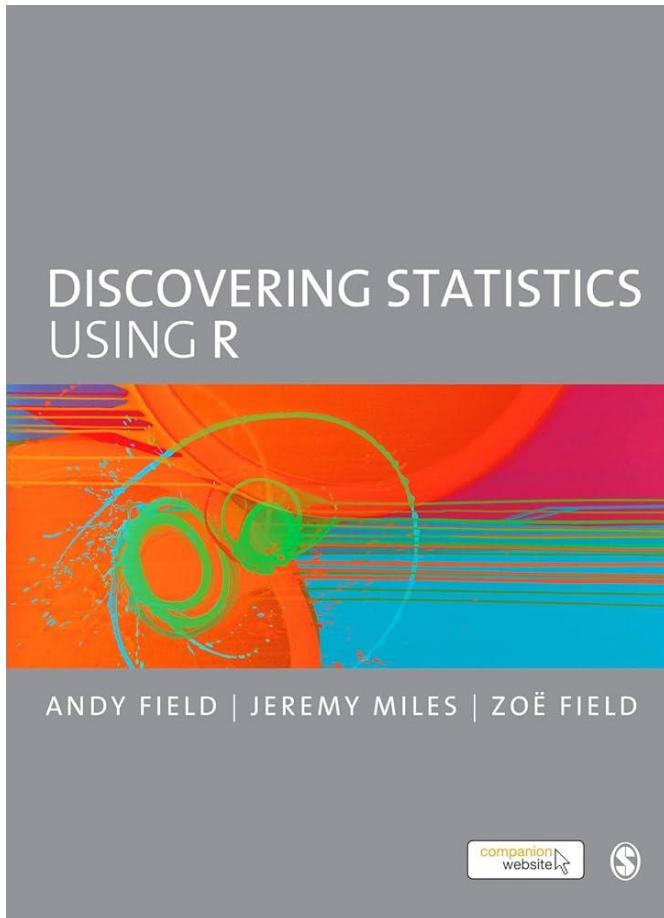
Histogram with Normal Distribution Curve



Normal distribution

- Many phenomena follow the normal distribution.
- It is foundational in statistical analysis, particularly in inferential statistics (e.g. confidence intervals, hypothesis testing): used to determine how far sample means are likely to vary from each other and from the population mean.

Suggested reading



R for data analysis

Programming languages

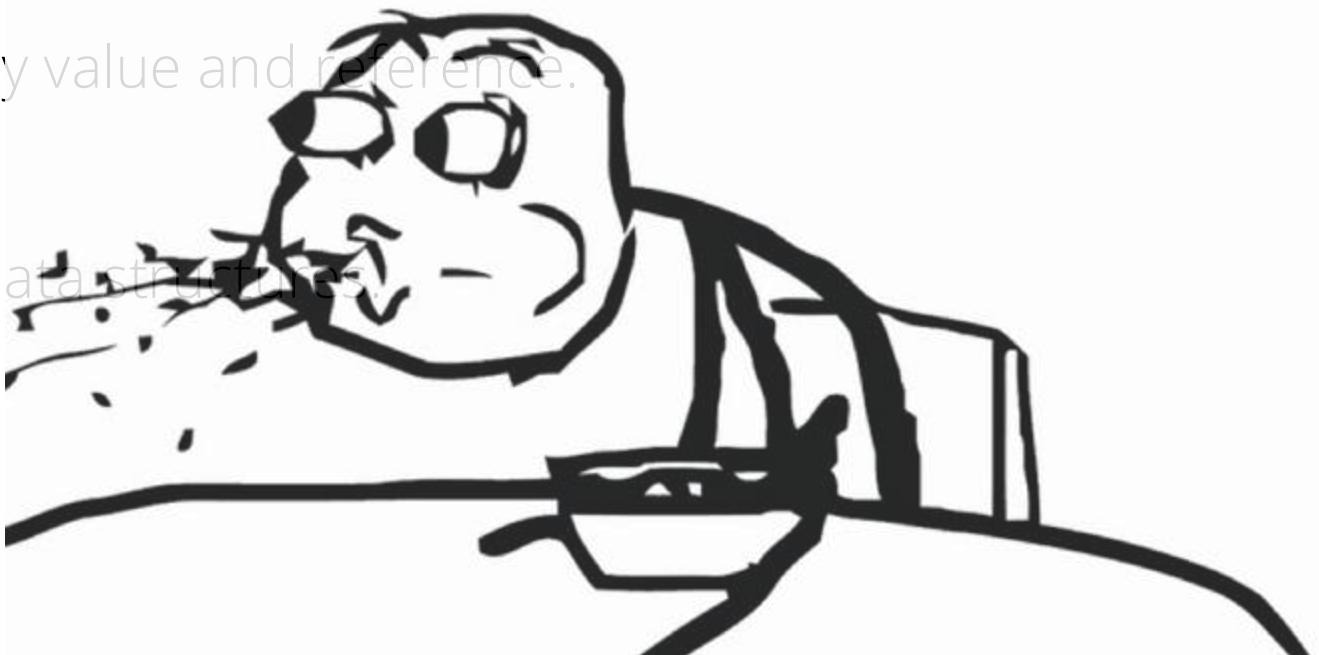
- Consist of a formal set of instructions in the form of code that you can use to write software or perform computational tasks.
- Allow for custom solutions, automation, and complex operations.

Programming languages

- Identifiers and primitive data types.
- Assignment, arithmetic, logical and relational operators.
- Expression and statements, debugging.
- Flow of control: selection and repetition.
- Functions, parameters passing, call by value and reference.
- Object-oriented programming.
- 1/2 dimensional arrays, strings and data structures.

Programming languages

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Programming languages

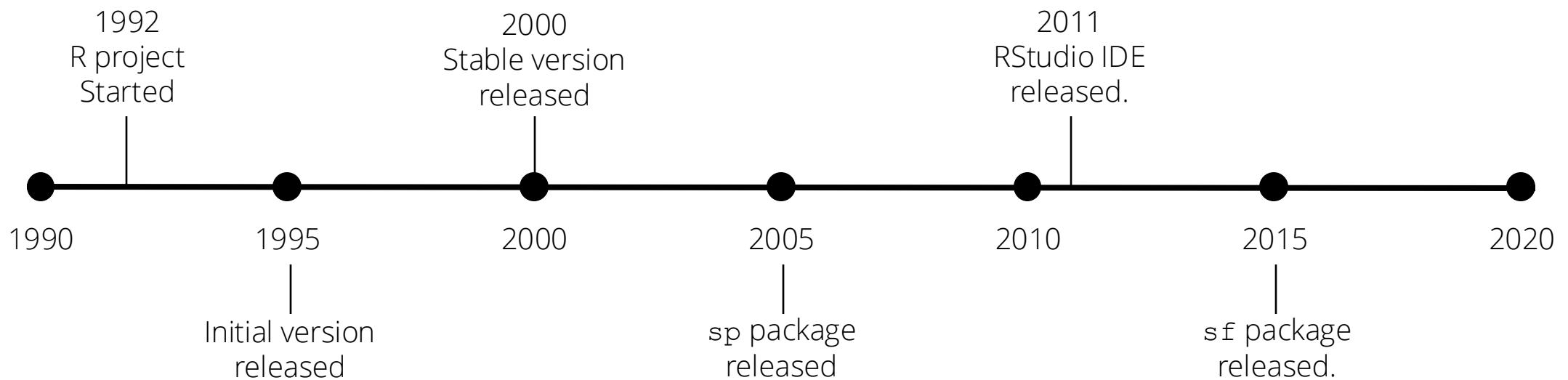
- Ιδεντιφιερς ανδ πριμιτι~~fe~~ δατα τψπες.
- Ασσιγνμεντ, αριτημετιξ, λογιξαλ ανδ ρελατιοναλ οπερατορς.
- Εχπρεσσιον ανδ στατεμεντς, δεβυγγινγ.
- Φλω~~o~~ οφ ξοντρολ· σελεξτιον ανδ ρεπετιτιον.
- Φυνξτιονς, παραμετερς πασσινγ, ξαλλ βψ α~~f~~λυε ανδ ρεφερενξε.
- Οβσεξτ-οριεντεδ προγραμμινγ.
- 1/2 διμενσιοναλ αρραψς, στρινγς ανδ δατα στρυξτυρες.

The absolute basics

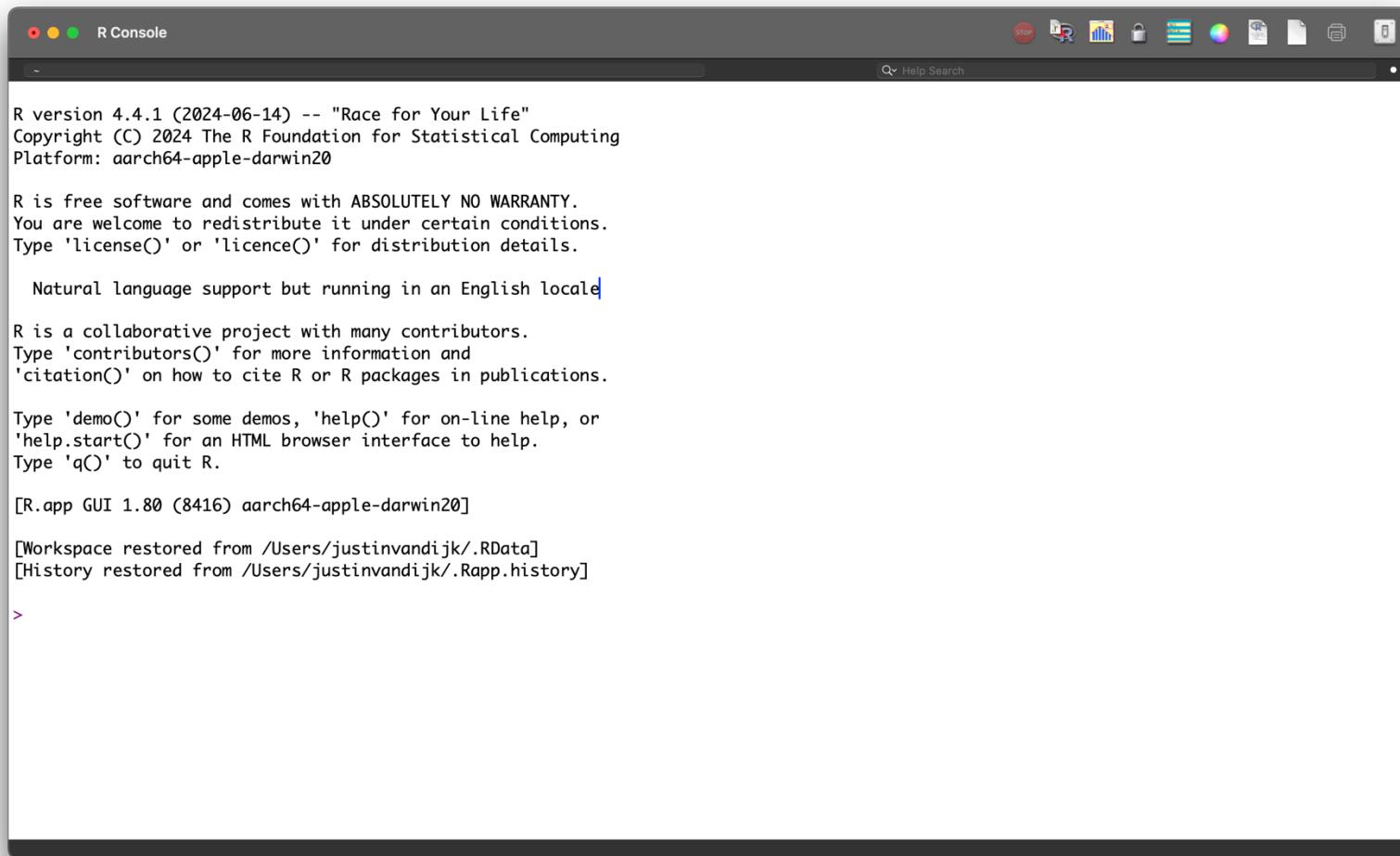
- R is primarily used through interactive command-line interfaces and scripts.
- R is the programming language, but we can interact with it using other software.
- R efficiently handles various data types, particularly vectors and tables.
- R's functionality can be extended through a vast ecosystem of packages.
- R is free and open source.

A little history

- R is programming language originally developed for statistical purposes.
- 1975: Bell Labs develops a language for Statistical Analysis ("S").
- 1992: Ross Ihaka and Robert Gentleman develop opensource version of "S".



Working with R



R version 4.4.1 (2024-06-14) -- "Race for Your Life"
Copyright (C) 2024 The R Foundation for Statistical Computing
Platform: aarch64-apple-darwin20

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

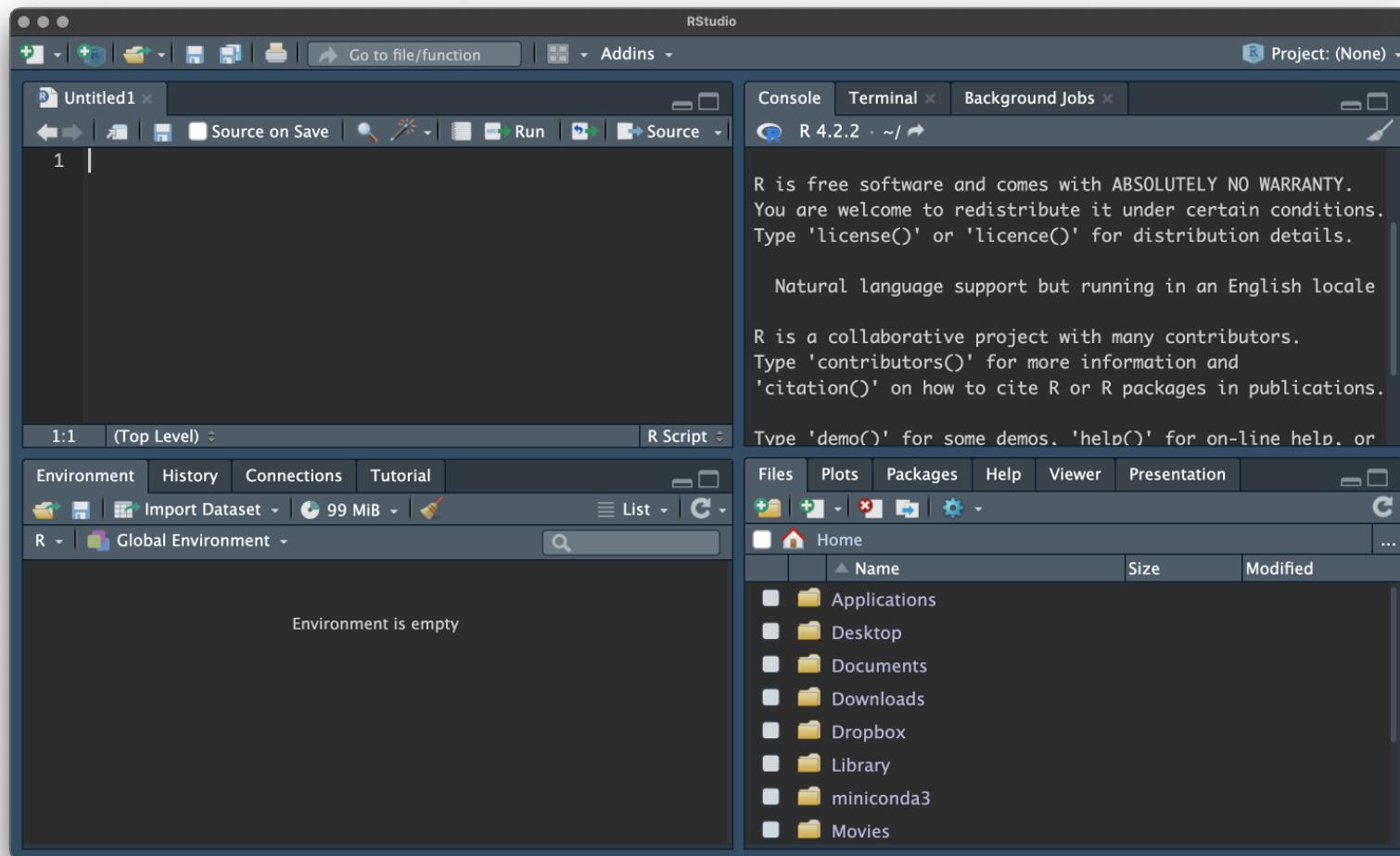
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[R.app GUI 1.80 (8416) aarch64-apple-darwin20]

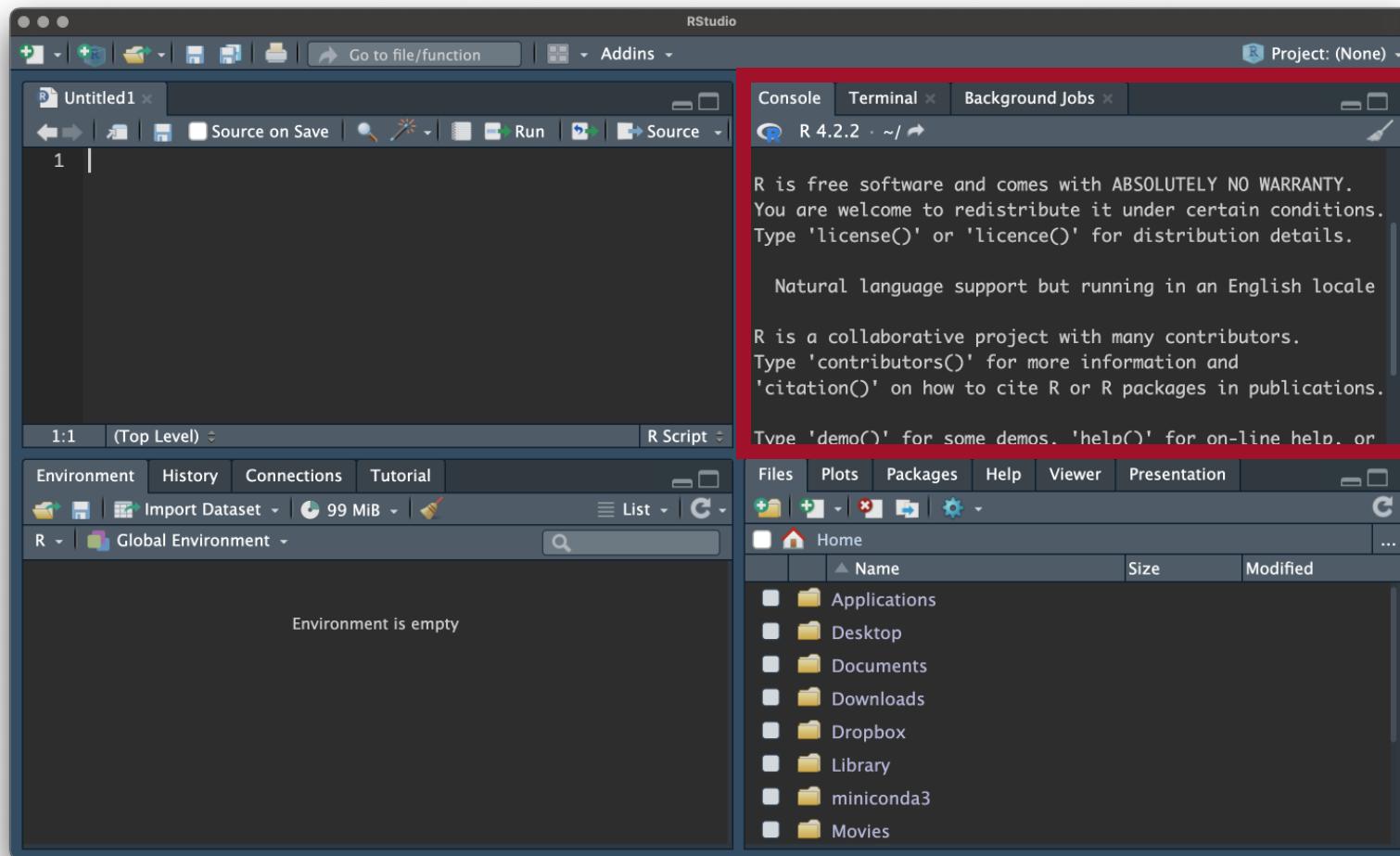
[Workspace restored from /Users/justinvandijk/.RData]
[History restored from /Users/justinvandijk/.Rapp.history]

>

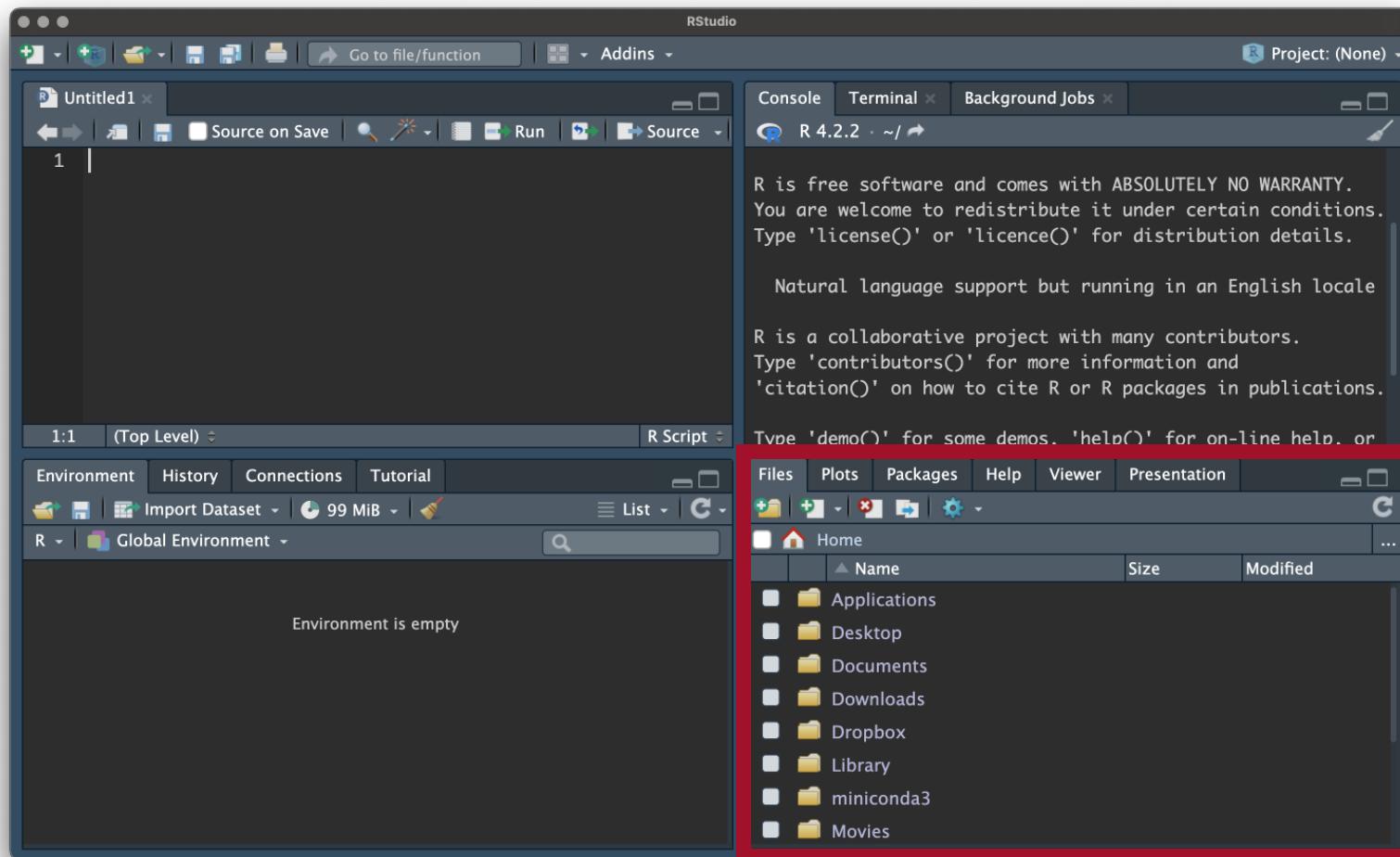
Working with R



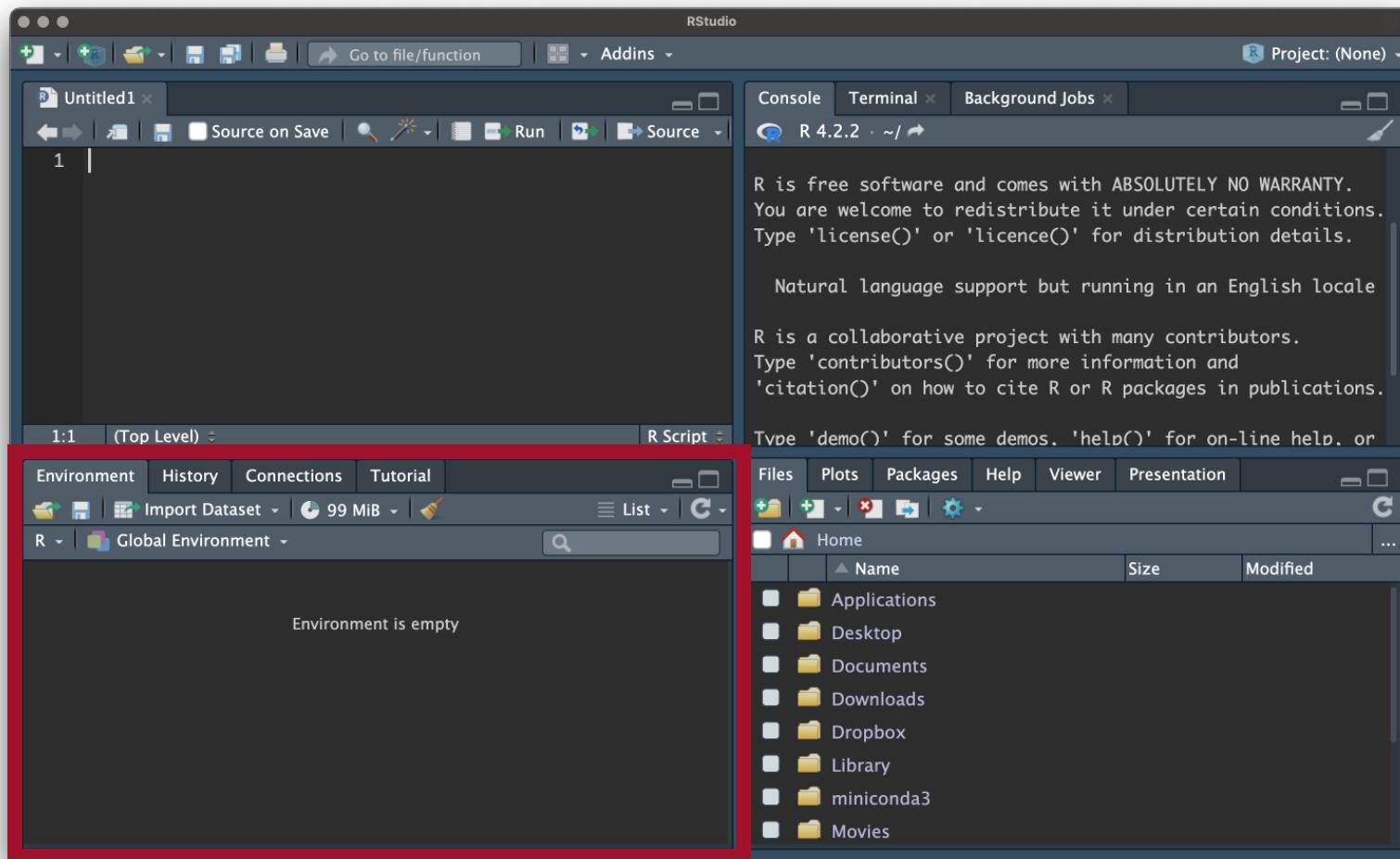
Working with R



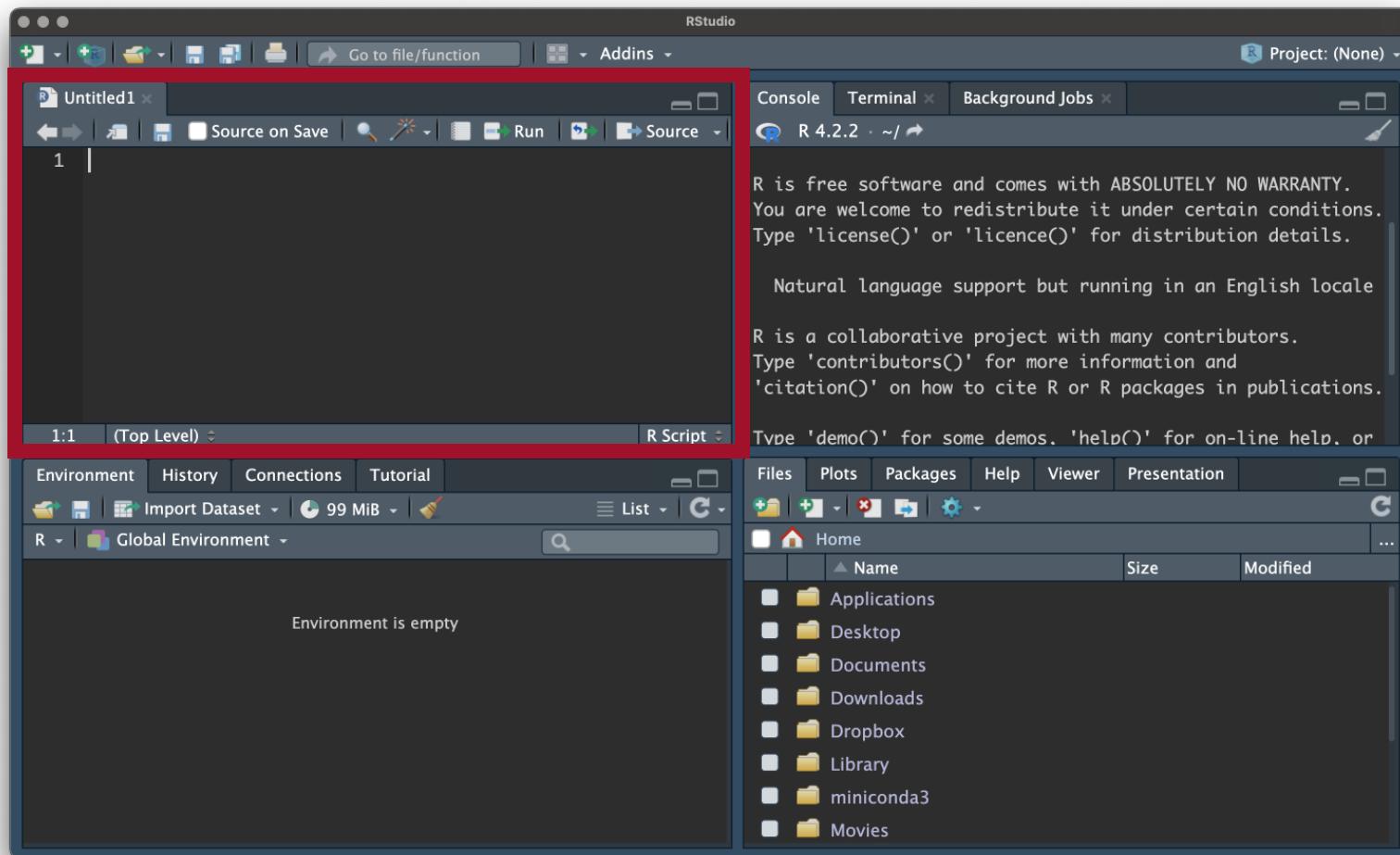
Working with R



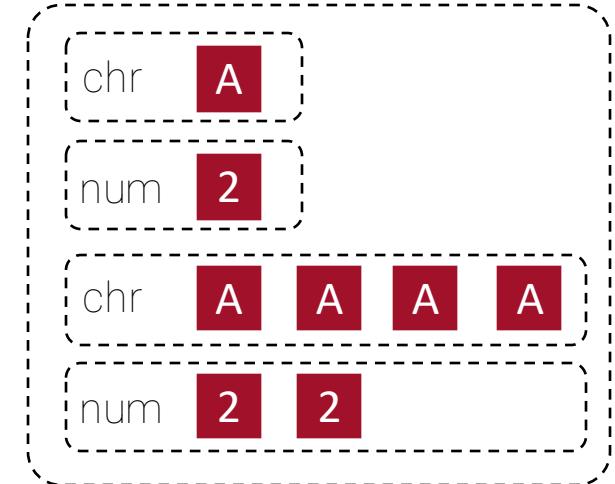
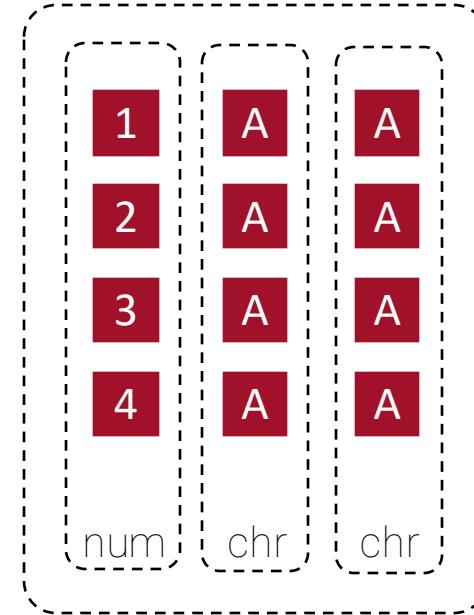
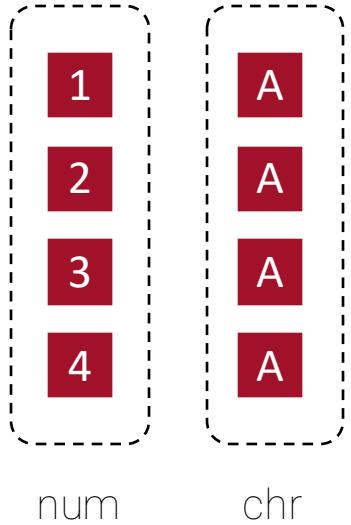
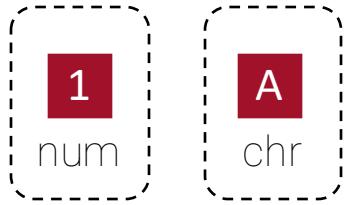
Working with R



Working with R



Principles of R: Data types



Scalar

Vector

Dataframe

List

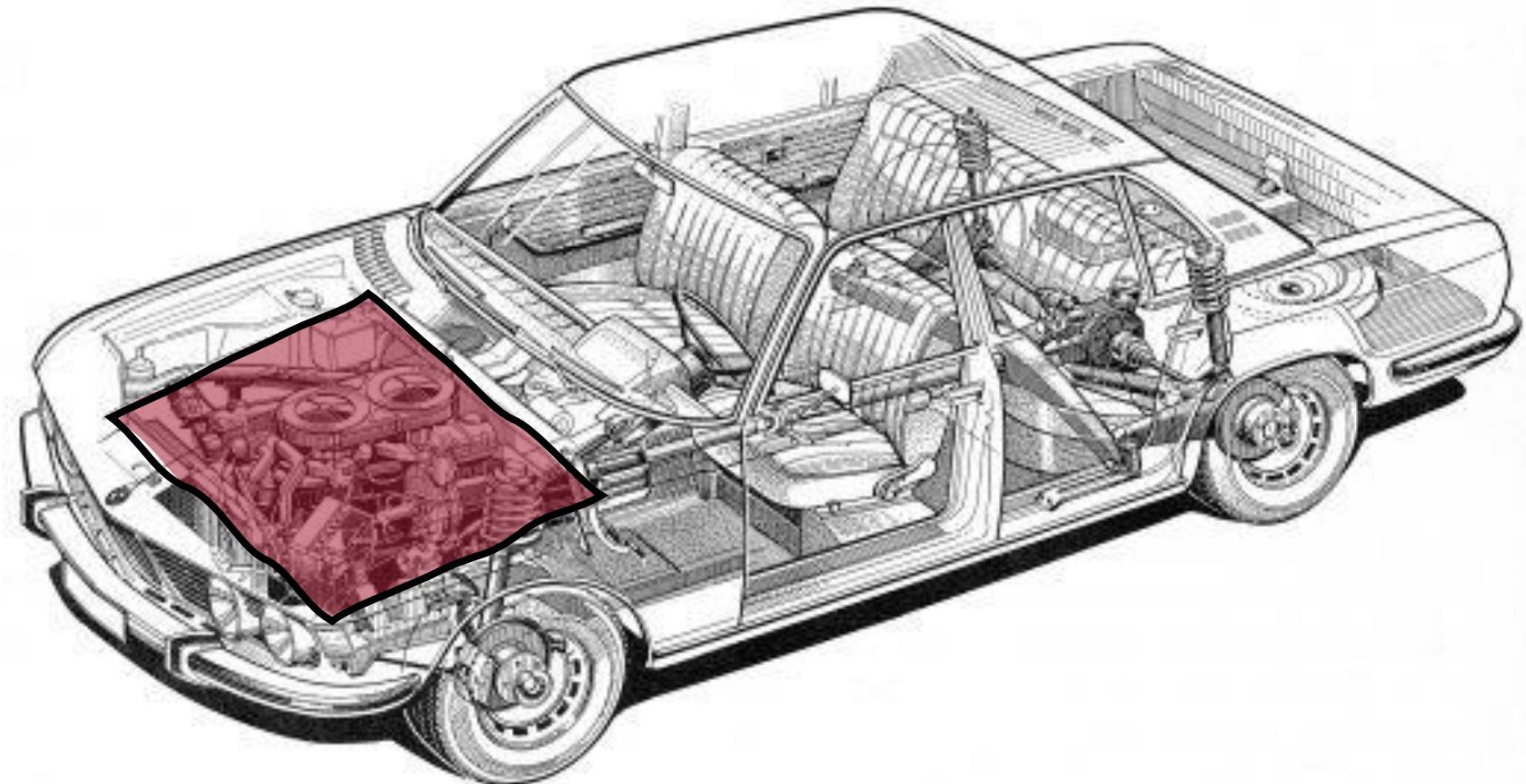
Principles of R: Variables

- All scalars, vectors, tables, and lists can be assigned to a variable.
- Variables are used to store information to be referenced and manipulated in a computer programme.

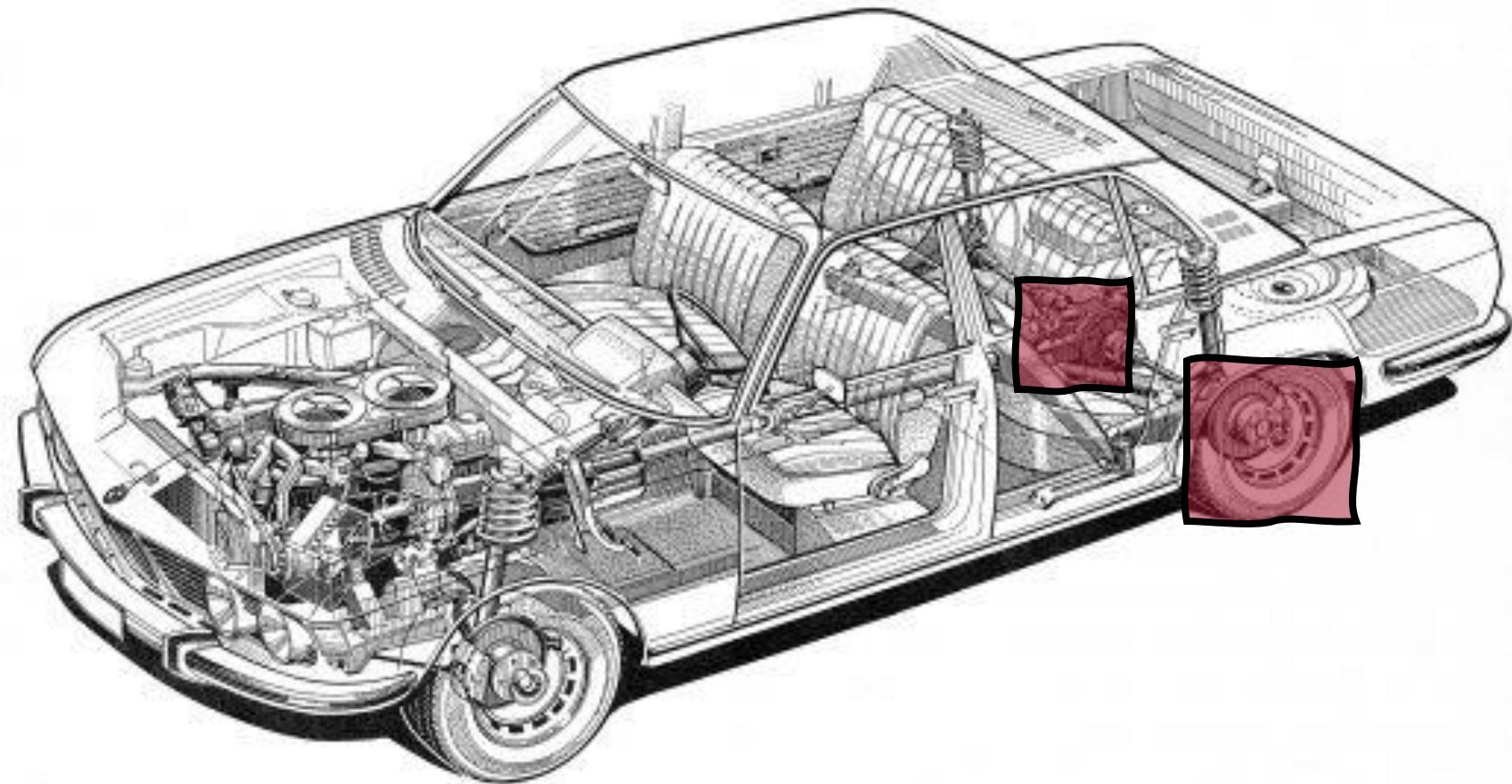
Principles of R: Functions

- Variables can be used as an input for functions.
- Functions are pieces of code designed to accomplish specific tasks.
- Once a function is written, it can be reused.

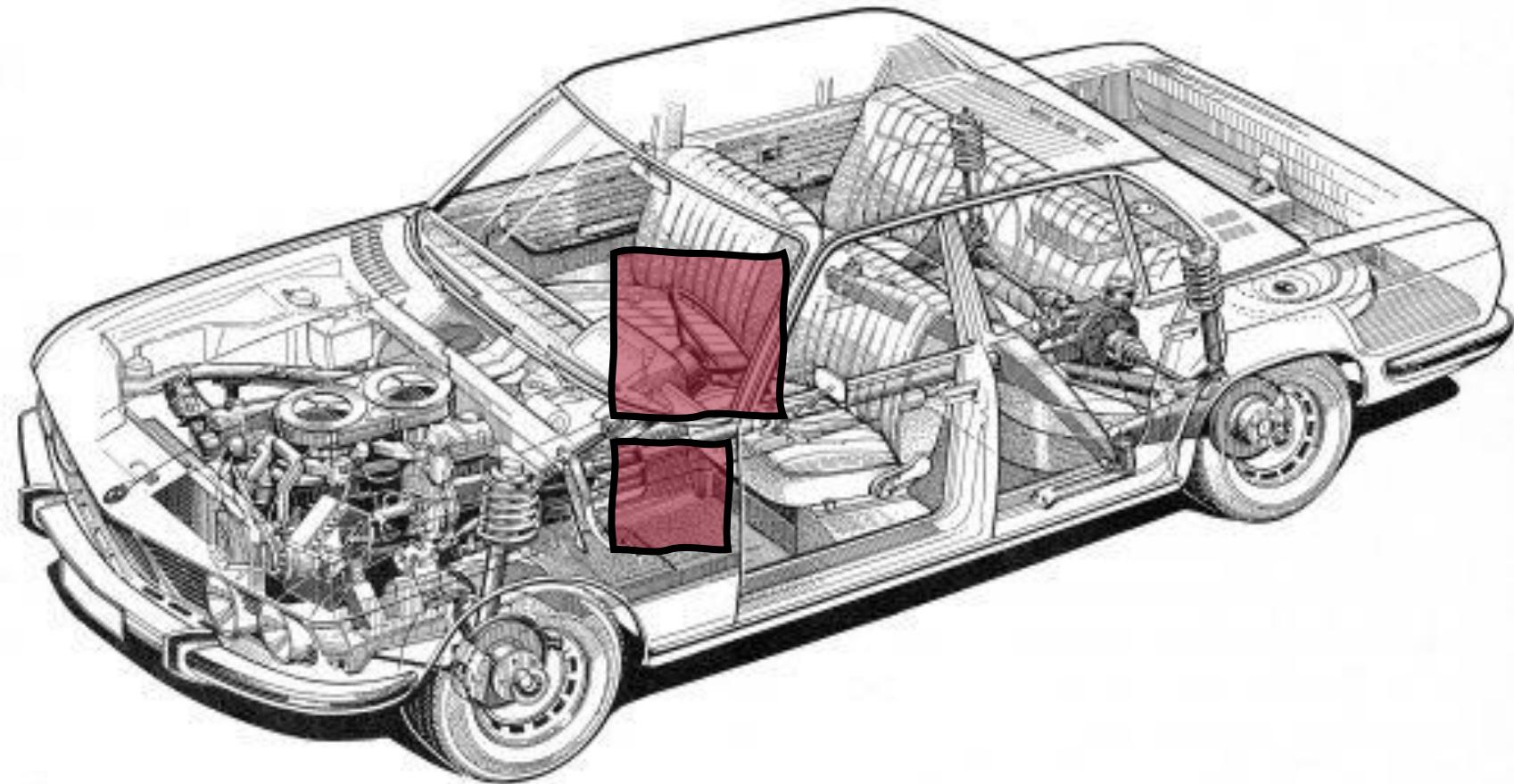
Principles of R: Extensions



Principles of R: Extensions



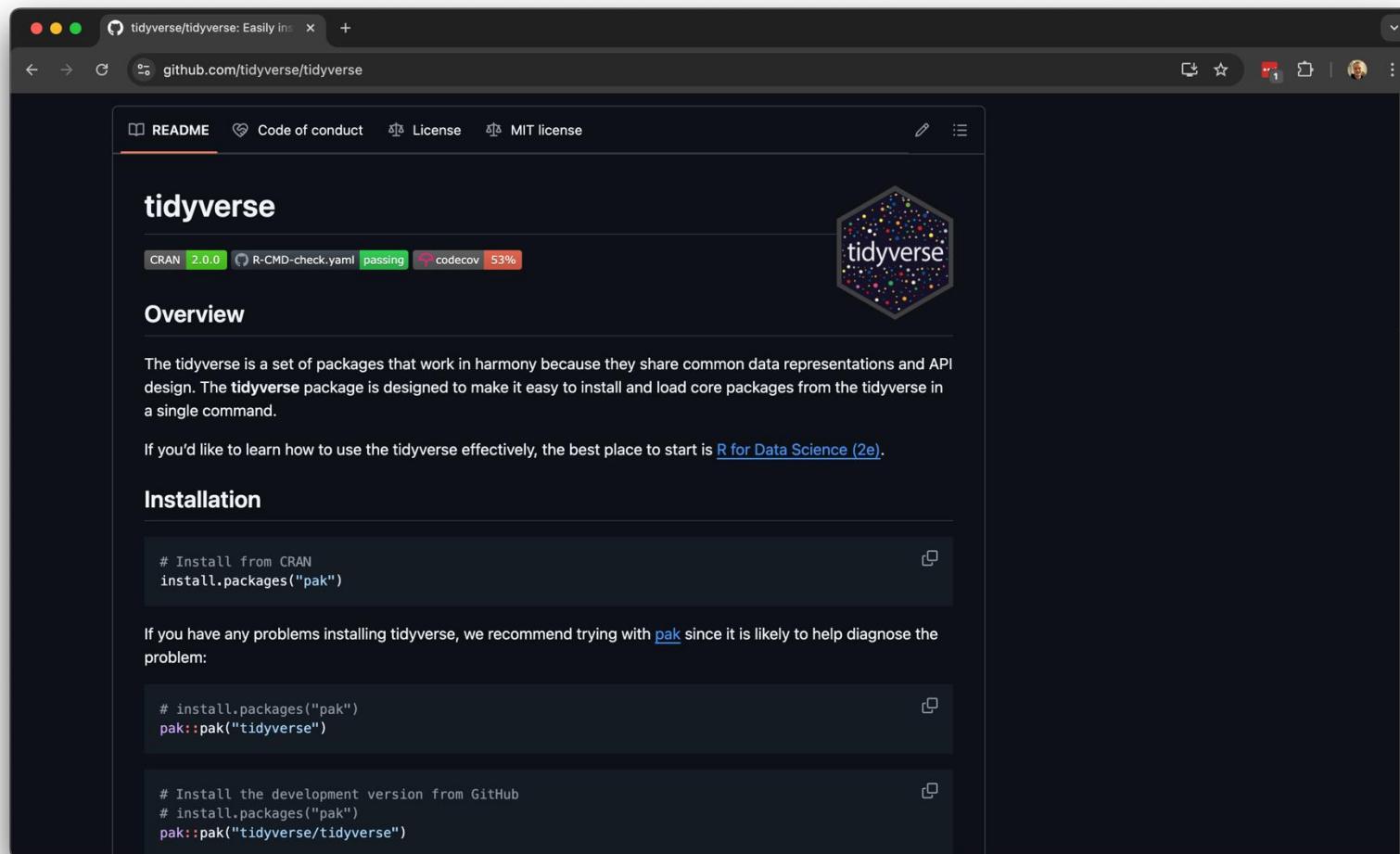
Principles of R: Extensions



Principles of R: Extensions

- Available on The Comprehensive R Archive Network: [CRAN](#)
- CRAN is a repository for R packages and software.
- Currently CRAN features over 21,574 available packages (25/10/2024).
- Allows developers to submit and maintain their own R packages.

tidyverse



A screenshot of a web browser displaying the GitHub repository for the tidyverse package. The page has a dark theme. At the top, there are navigation links for README, Code of conduct, License, and MIT license. Below these, the repository name "tidyverse" is displayed in large white text, with a small icon of a person next to it. There are also links for CRAN 2.0.0, R-CMD-check.yaml passing, and codecov 53%. A large hexagonal logo for tidyverse, consisting of many small colored dots, is centered on the page. The main content area starts with a section titled "Overview" which contains a brief description of what the tidyverse is and a link to "R for Data Science (2e)". Below this is a "Installation" section with three code snippets for installing the package from CRAN, using pak, and from GitHub.

tidyverse

CRAN 2.0.0 R-CMD-check.yaml passing codecov 53%

Overview

The tidyverse is a set of packages that work in harmony because they share common data representations and API design. The `tidyverse` package is designed to make it easy to install and load core packages from the tidyverse in a single command.

If you'd like to learn how to use the tidyverse effectively, the best place to start is [R for Data Science \(2e\)](#).

Installation

```
# Install from CRAN  
install.packages("pak")
```

```
# install.packages("pak")  
pak::pak("tidyverse")
```

```
# Install the development version from GitHub  
# install.packages("pak")  
pak::pak("tidyverse/tidyverse")
```

tidyverse

R for Data Science (2e)  

Welcome

- Preface to the second edition
- Introduction
- Whole game
 - 1 Data visualization
 - 2 Workflow: basics
 - 3 Data transformation
 - 4 Workflow: code style
 - 5 Data tidying
 - 6 Workflow: scripts and projects
 - 7 Data import
 - 8 Workflow: getting help
- Visualize
 - 9 Layers
 - 10 Exploratory data analysis
 - 11 Communication
- Transform
 - 12 Logical vectors
 - 13 Numbers
 - 14 Strings
 - 15 Regular expressions
 - 16 Factors

R for Data Science (2e)

Welcome

This is the website for the 2nd edition of “**R for Data Science**”. This book will teach you how to do data science with R: You’ll learn how to get your data into R, get it into the most useful structure, transform it and visualize.

In this book, you will find a practicum of skills for data science. Just as a chemist learns how to clean test tubes and stock a lab, you’ll learn how to clean data and draw plots—and many other things besides. These are the skills that allow data science to happen, and here you will find the best practices for doing each of these things with R. You’ll learn how to use the grammar of graphics, literate programming, and reproducible research to save time. You’ll also learn how to manage cognitive resources to facilitate discoveries when wrangling, visualizing, and exploring data.

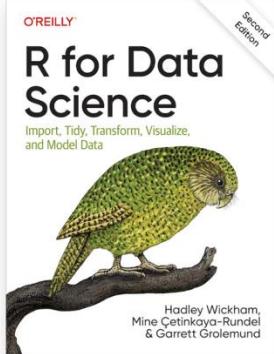
This website is and will always be free, licensed under the [CC BY-NC-ND 3.0 License](#). If you’d like a physical copy of the book, you can order it on [Amazon](#). If you appreciate reading the book for free and would like to give back, please make a donation to [Kākāpō Recovery](#): the kākāpō (which appears on the cover of R4DS) is a critically endangered parrot native to New Zealand; there are only 248 left.

If you speak another language, you might be interested in the freely available translations of the 1st edition:

Table of contents

- Welcome**
- Acknowledgements

 [Edit this page](#)
 [Report an issue](#)



Simple Features

A screenshot of a web browser window showing the GitHub README page for the `r-spatial/sf` repository. The page has a dark theme.

The top navigation bar shows the URL `github.com/r-spatial/sf`. Below the header, there are tabs for `README` and `License`, with `README` being active. A horizontal line separates the header from the main content.

Below the line, there are several green status badges: `R-CMD-check passing`, `tic-db passing`, `coverage 78%`, `license GPL (>= 2)`, `CRAN 1.0-18`, `CRAN NOTE`, and `downloads 298K/month`. There is also a badge for `dependencies 6/9`.

Simple Features for R

A package that provides [simple features access](#) for R.

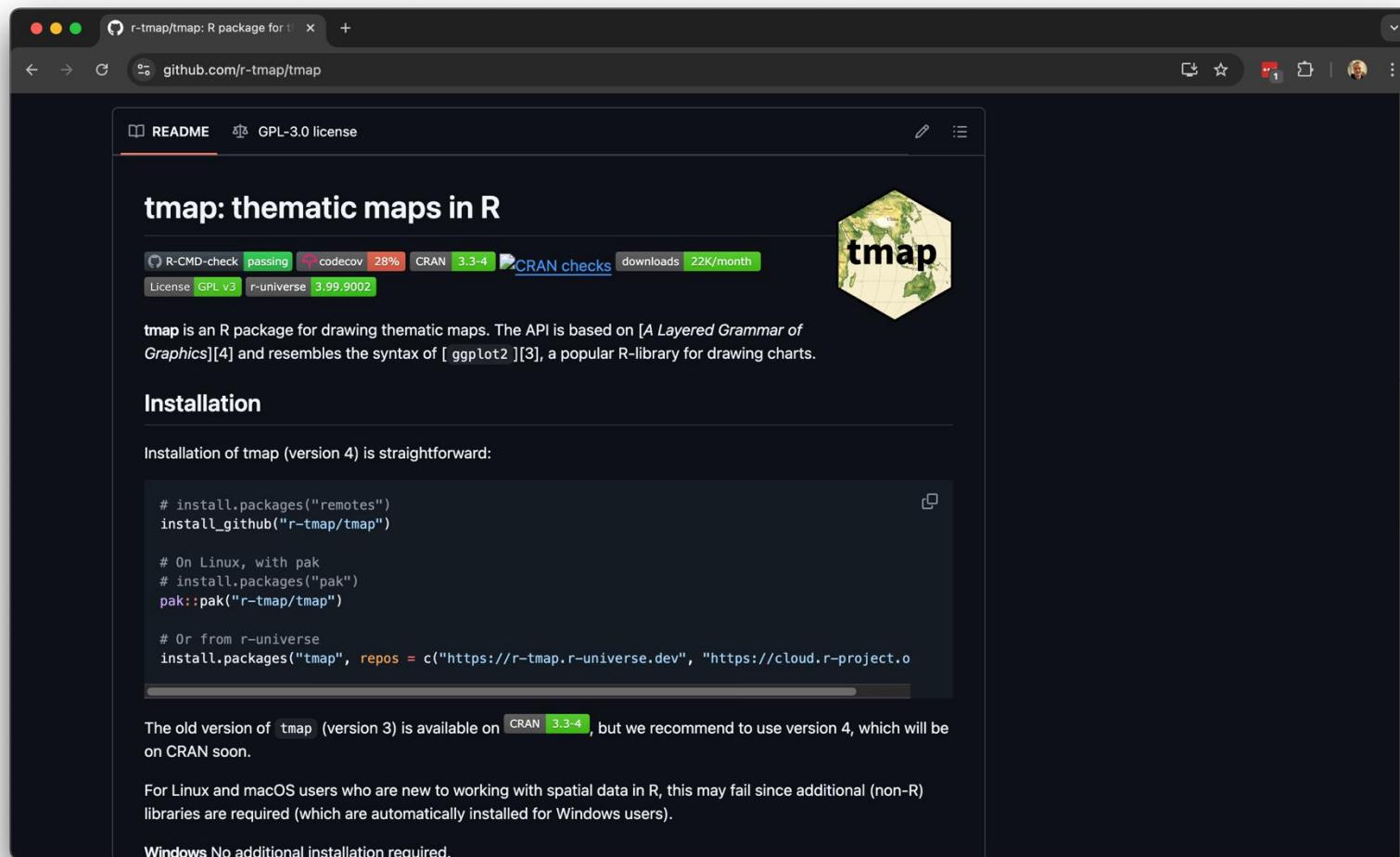
[Blogs, links](#) • [Cheatsheet](#) • [Installing](#) • [Contributing](#) • [Acknowledgment](#) • [How to cite](#)

Package sf:

- represents simple features as records in a `data.frame` or `tibble` with a `geometry` list-column
- represents natively in R all 17 simple feature types for all dimensions (XY, XYZ, XYM, XYZM)
- interfaces to [GEOS](#) for geometrical operations on projected coordinates, and (through R package [s2](#)) to [s2geometry](#) for geometrical operations on ellipsoidal coordinates
- interfaces to [GDAL](#), supporting all driver options, `Date` and `POSIXct` and list-columns
- interfaces to [PROJ](#) for coordinate reference system conversion and transformation
- uses [well-known-binary](#) serialisations written in C++/Rcpp for fast I/O with GDAL and GEOS
- reads from and writes to spatial databases such as [PostGIS](#) using [DBI](#)
- is extended by
 - [lwgeom](#) for selected liblwgeom/PostGIS functions
 - [stars](#) for raster data, and raster or vector data cubes (spatial time series)
 - [sfnetworks](#) for geospatial network data



tmap

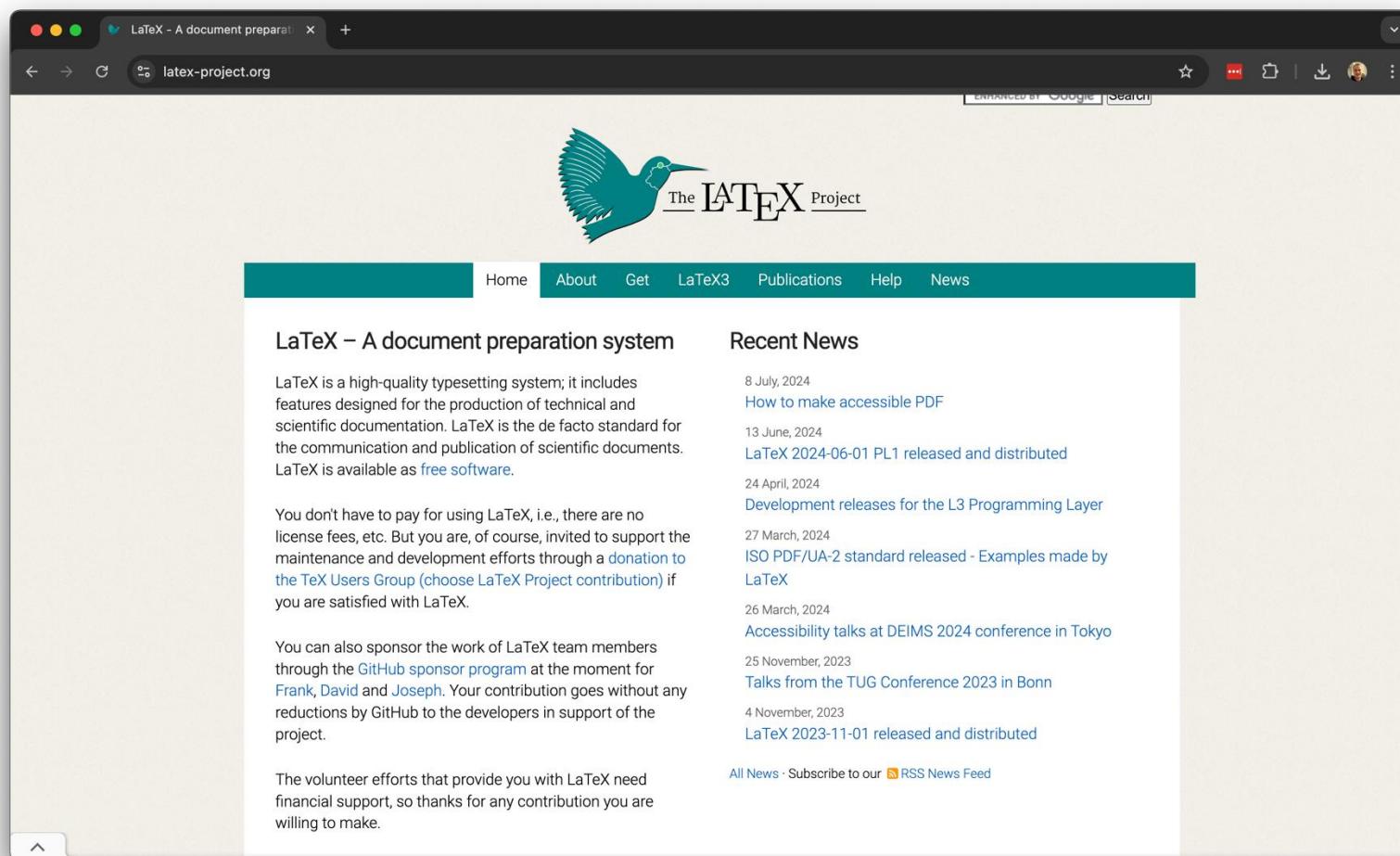


The screenshot shows the GitHub README page for the `tmap` R package. The page has a dark theme. At the top, there are navigation links for `README` and `GPL-3.0 license`. Below this is a header section with the title `tmap: thematic maps in R`, a green hexagonal logo containing the word `tmap`, and a brief description: "tmap is an R package for drawing thematic maps. The API is based on [A Layered Grammar of Graphics][4] and resembles the syntax of [ggplot2][3], a popular R-library for drawing charts." Below the header, there is a "Installation" section with the heading "Installation". It contains instructions for installing version 4 of the package, including code snippets for remote installation via GitHub, Linux users using `pak`, and users from the `r-universe` repository. A note at the bottom of this section states: "The old version of `tmap` (version 3) is available on CRAN 3.3-4, but we recommend to use version 4, which will be on CRAN soon." At the bottom of the page, there is a note for Windows users stating: "Windows No additional installation required."

Reproducibility with R Markdown

- Markdown is a lightweight **markup language** designed for creating formatted text using a plain-text editor. It allows you to write in a simple, readable format that can be easily converted to HTML, PDF, or other formats.
- R Markdown extends Markdown by integrating R code with the text. This allows you to: embed code, execute code, create dynamic reports, format and typeset your content.

Reproducibility with R Markdown



The screenshot shows a web browser window displaying the LaTeX Project homepage at [latex-project.org](https://www.latex-project.org). The page features a large teal bird logo above the text "The LATEX Project". A navigation bar at the top includes links for Home, About, Get, LaTeX3, Publications, Help, and News. The main content area has two columns. The left column contains text about LaTeX being a high-quality typesetting system for technical documentation, a note that it's free software, information about sponsorship through GitHub, and a message of thanks for volunteer contributions. The right column is titled "Recent News" and lists several items with dates and titles, such as "How to make accessible PDF" (8 July, 2024) and "LaTeX 2024-06-01 PL1 released and distributed" (13 June, 2024). At the bottom of the news section, there are links for "All News" and "Subscribe to our RSS News Feed".

LaTeX – A document preparation system

LaTeX is a high-quality typesetting system; it includes features designed for the production of technical and scientific documentation. LaTeX is the de facto standard for the communication and publication of scientific documents. LaTeX is available as [free software](#).

You don't have to pay for using LaTeX, i.e., there are no license fees, etc. But you are, of course, invited to support the maintenance and development efforts through a [donation to the TeX Users Group \(choose LaTeX Project contribution\)](#) if you are satisfied with LaTeX.

You can also sponsor the work of LaTeX team members through the [GitHub sponsor program](#) at the moment for [Frank](#), [David](#) and [Joseph](#). Your contribution goes without any reductions by GitHub to the developers in support of the project.

The volunteer efforts that provide you with LaTeX need financial support, so thanks for any contribution you are willing to make.

Recent News

8 July, 2024
[How to make accessible PDF](#)

13 June, 2024
[LaTeX 2024-06-01 PL1 released and distributed](#)

24 April, 2024
[Development releases for the L3 Programming Layer](#)

27 March, 2024
[ISO PDF/UA-2 standard released - Examples made by LaTeX](#)

26 March, 2024
[Accessibility talks at DEIMS 2024 conference in Tokyo](#)

25 November, 2023
[Talks from the TUG Conference 2023 in Bonn](#)

4 November, 2023
[LaTeX 2023-11-01 released and distributed](#)

[All News](#) · [Subscribe to our RSS News Feed](#)

Reproducibility with R Markdown

This is the basic model for Quarto publishing—take a source document and render it to a variety of output

The screenshot shows the Quarto RStudio extension interface. On the left, the RStudio sidebar displays navigation links: 'Get Started', 'Tutorial: Hello, Quarto', 'Tutorial: Computations', and 'Tutorial: Authoring'. The main workspace is split into two panes. The left pane shows the R Markdown source code for a file named 'hello.qmd':---

```
{r}<#| label: load-packages#| include: false}  
library(tidyverse)  
library(palmerpenguins)
```

Meet Quarto

Quarto enables you to weave together content and executable code into a finished document. To learn more about Quarto see <https://quarto.org>.

Meet the penguins

The `penguins` data from the `palmerpenguins` package contains size measurements for `nrow(penguins)` penguins from three species observed on three islands in the Palmer Archipelago, Antarctica.

The plot below shows the relationship between flipper and bill lengths of these penguins.

```
{r}<#| label: plot-penguins#| include: false}(Top Level) :  
Console
```

The right pane shows the rendered HTML output. It includes a header with a navigation bar for 'Environment', 'History', 'Connections', 'Build', 'Git', and 'Tutorial'. Below the header is a section titled 'Hello, Quarto' with the sub-section 'Meet Quarto'. It contains the explanatory text and a link to the Quarto website. A section titled 'Meet the penguins' follows, featuring a colorful illustration of three penguins labeled 'CHINSTRAP', 'GENTOO', and 'ADELIE'. Below the illustration is a scatter plot titled 'Flipper and bill length Dimensions for penguins at Palmer Station LTER'. The plot shows the relationship between flipper length (mm) on the x-axis and bill depth (mm) on the y-axis, with data points colored by species: Adelie (orange), Gentoo (teal), and Chinstrap (purple). A legend indicates the color coding for the species.

Reproducibility with R Markdown

A screenshot of a GitHub repository page for 'GEOG0018' (jtvdijk/GEOG0018). The repository is public and contains 1 branch ('master') and 0 tags. The 'Code' tab is selected. The commit history shows 41 commits from 'jtvdijk' with the message 'tweaks'. The commits are dated 19 hours ago. The repository page also includes sections for 'About', 'Readme', 'CC-BY-SA-4.0 license', 'Activity', '0 stars', '1 watching', '0 forks', 'Releases' (no releases), 'Packages' (no packages), and 'Deployments' (40).

This GitHub repository generates the GEOG0018 handbook for the 2024-2025 academic year which can be found at: <https://jtvdijk.github.io/GEOG0018/>

Code

jtvdijk / GEOG0018

GEOG0018 Public

master 1 Branch Tags

Go to file Add file Code About

Commits

Author	Message	Date
jtvdijk	tweaks	352d16f · 19 hours ago
jtvdijk	tweaks	19 hours ago
jtvdijk	tweaks	19 hours ago
jtvdijk	tweaks	19 hours ago
jtvdijk	tweaks	19 hours ago
jtvdijk	tweaks	19 hours ago
jtvdijk	missing library fix	2 weeks ago
jtvdijk	tweaks	19 hours ago
jtvdijk	tweaks	19 hours ago
jtvdijk	remove sidebar hover colour	2 weeks ago
jtvdijk	minor tweaks w08	2 weeks ago
jtvdijk	tweaks	19 hours ago

About

This GitHub repository generates the GEOG0018 handbook for the 2024-2025 academic year which can be found at: <https://jtvdijk.github.io/GEOG0018/>

Readme

CC-BY-SA-4.0 license

Activity

0 stars

1 watching

0 forks

Releases

No releases published

[Create a new release](#)

Packages

No packages published

[Publish your first package](#)

Deployments 40

Reproducibility with R Markdown

The screenshot shows a web browser window with the title bar "GEOG0018". The URL in the address bar is "jtvdijk.github.io/GEOG0018/00-index.html". The page content is as follows:

**GEOG
0018**

Module overview

- Welcome
- Getting Started

Statistical Analysis

- 1 R for Data Analysis
- 2 Statistical Analysis I
- 3 Statistical Analysis II

Spatial Analysis

- 4 Spatial Analysis I
- 5 Spatial Analysis II

Methods in Human Geography

Welcome

Welcome to the second half of **Methods in Human Geography**. In this part of the module, you will delve into essential statistical analysis techniques and gain a basic foundation in creating thematic maps. We will be using R and the RStudio environment for statistical analysis, and the open-source programme QGIS for handling spatial data.

Moodle

[Moodle](#) is the central point of contact for GEOG0018 and it is where all important information will be communicated such as key module and assessment information. This workbook provides links to all

On this page

- Methods in Human Geography
- Welcome
- Moodle
- Module overview
- Major updates
- Acknowledgements

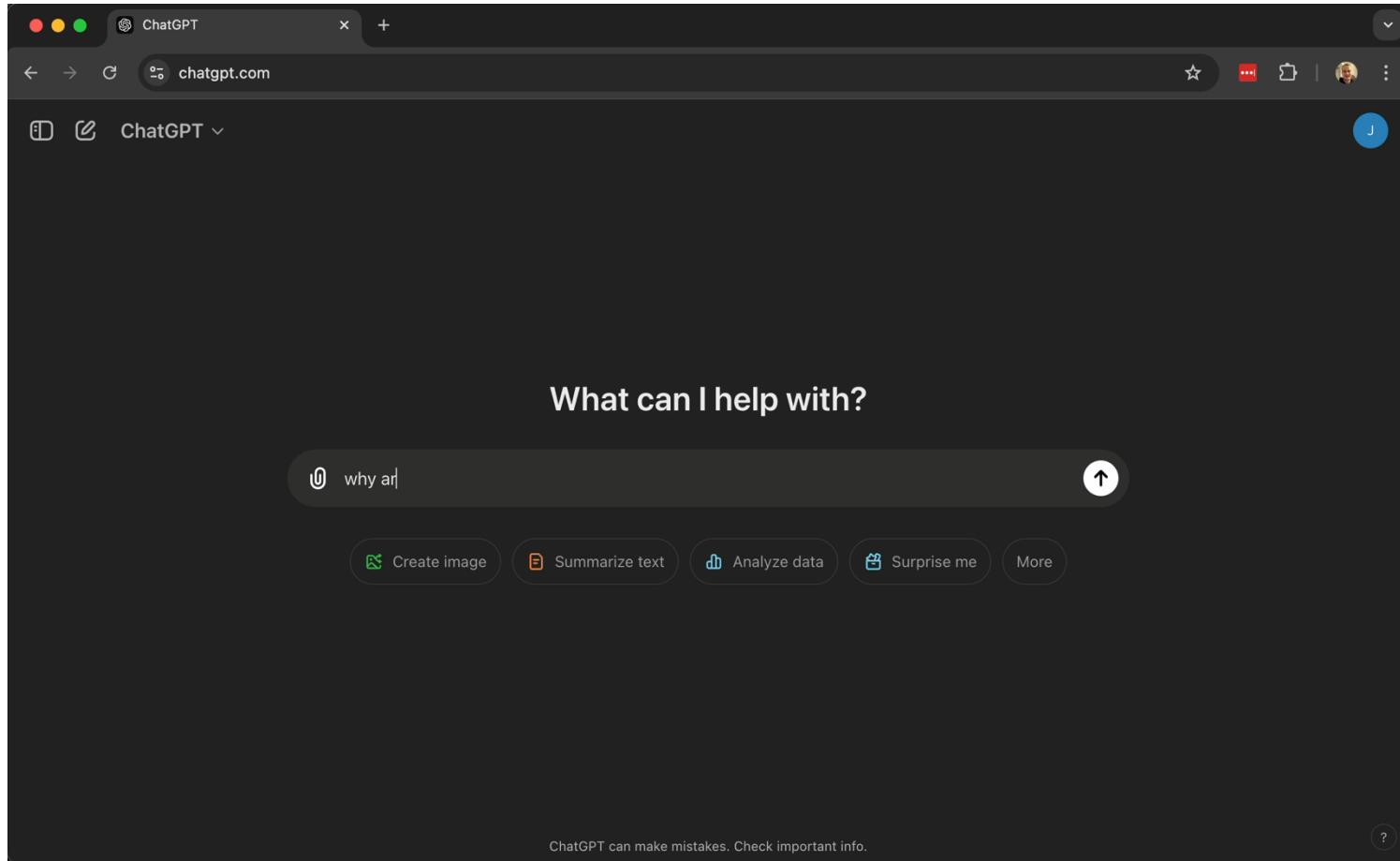
Report an issue

Summary

Summary

- Quantitative methods focus on the collection and analysis of numerical data to identify patterns, test hypotheses, and make predictions.
- When designing research questions, consider how they align with the data you will collect and the statistical methods you will use.
- Understanding variable types (nominal, ordinal, interval, ratio) and their distributions is essential for selecting appropriate analysis techniques.
- R is a powerful tool for conducting, visualising, and ensuring the reproducibility of quantitative research.

Quantitative methods



Questions

Justin van Dijk

j.t.vandijk@ucl.ac.uk

