

# **A guide to writing a scientific paper using R**

**Research Methodologies 2024**

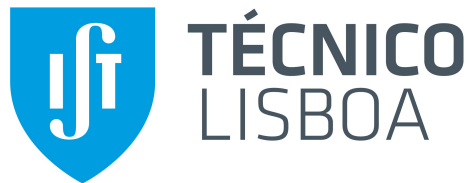
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# 1 Use R to write a paper

Materials for the practical module **A guide to writing a scientific paper using R**, of the [Research Methodologies in Natural and Social Sciences](#) course of the PhD in Transport Systems at IST-ULisboa.



## **i** Note

This website was totally written in R using [Quarto](#).

## 2 Software

In this chapter we will guide you through the installation of R, RStudio and the packages you will need for this course.

**R** and **RStudio**<sup>1</sup> are separate downloads.

### 2.1 R

**R** or **R stats** (how it is also known) is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.

The download links live at [The Comprehensive R Archive Network](#) (aka CRAN). The most recent version is 4.4.1, but you can use `>= 4.1.x` if you already have it installed.

#### 2.1.1 Windows

[Download R-4.4.2 for Windows](#) and run the executable file.

##### Important

You will also need to install [Rtools](#), which is a collection of tools necessary to build R packages in Windows.  
Select the second link if you use an ARM processor (more recent), and the first link otherwise.

#### 2.1.2 Mac

[Download R-4.4.2 for MacOX](#). You will have to choose between the arm64 or the x86-64 version.

Download the `.pkg` file and install it as usual.

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<sup>1</sup>We will use RStudio, although if you already use other studio such as VScode, that's also fine.

### 2.1.3 Ubuntu

These are instructions for Ubuntu. If you use other linux distribution, please follow the instructions on [The Comprehensive R Archive Network - CRAN](#).

You can look for R in the Ubuntu **Software Center** or install it via the terminal:

```
# sudo apt update && sudo apt upgrade -y
sudo apt install r-base
```

Or, if you prefer, you can install the latest version of R from CRAN:

```
# update indices
sudo apt update -qq
# install two helper packages we need
sudo apt install --no-install-recommends software-properties-common dirmngr
# add the signing key (by Michael Rutter) for these repos
wget -qO- https://cloud.r-project.org/bin/linux/ubuntu/marutter_pubkey.asc | sudo tee -a /etc/apt/trusted.gpg
# add the R 4.0 repo from CRAN -- adjust 'focal' to 'groovy' or 'bionic' as needed
sudo add-apt-repository "deb https://cloud.r-project.org/bin/linux/ubuntu $(lsb_release -cs)-r-base"
sudo apt update
```

Then run:

```
sudo apt install r-base r-base-core r-recommended r-base-dev
```

[Optional] To keep up-to-date r version and packages, you can follow the instructions at [r2u](#)

After this installation, you don't need to open R base. Please proceed to install RStudio.

## 2.2 RStudio

RStudio Desktop is an integrated development environment (IDE) for R. It includes a console, syntax-highlighting editor that supports direct code execution, as well as tools for plotting, history, debugging and workspace management.

RStudio is available for free download from [Posit RStudio](#).

### 2.2.1 Windows 10/11

[Download RStudio 2024.09](#) and run the executable file.

## 2.2.2 MacOS

Download [RStudio 2024.09](#) and install it as usual.

## 2.2.3 Ubuntu

These are instructions for Ubuntu **24** / Debian 12. If you use other linux distribution, please follow the instructions on [Posit RStudio](#).

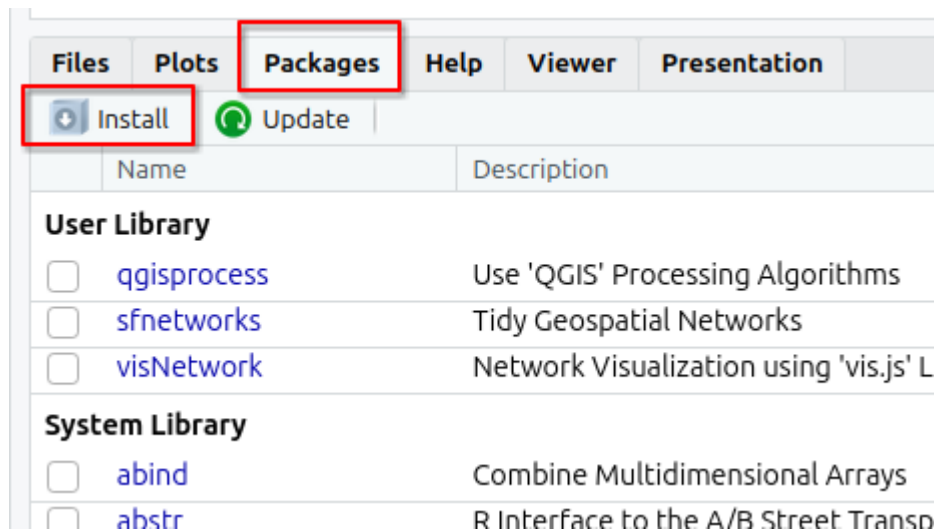
Install it via the terminal:

```
sudo apt install libssl-dev libclang-dev
wget https://download1.rstudio.org/electron/jammy/amd64/rstudio-2024.09.1-394-amd64.deb
sudo dpkg -i rstudio*
rm -v rstudio*
```

## 2.3 R packages

You will need to install some packages to work with the data and scripts in this course.

You can install them in RStudio by searching for them in the **Packages** tab:



or by running the following code in the console:

```
install.packages("rticles")

install.packages("tidyverse")
install.packages("readxl")

install.packages(c("remotes", "devtools", "usethis"))
```

## 2.4 rticles

You can install and use **rticles** from CRAN as follows:

```
install.packages("rticles")
```

See [chapter 3](#) to setup an rticle template.

## 2.5 tinytex

To be able to **export** your Rmarkdown document to a pdf file, you will need a LaTeX processor. **tinytex** is a low weight R package with the most used features of LaTeX that you can use with R.

```
# you need to run both lines
install.packages("tinytex")
tinytex::install_tinytex()
```

To use some LaTeX packages, you also need to install some **tlmgr** packages. Here is a list of the most common ones.

```
tinytex::tlmgr_install(c("algorithmicx", "algorithms", "amscs", "amsfonts", "amsmath", "apa")
tinytex::tlmgr_update() # updates all latex pkgs
```

### **i** Note

This may take a bit longer for the first time.

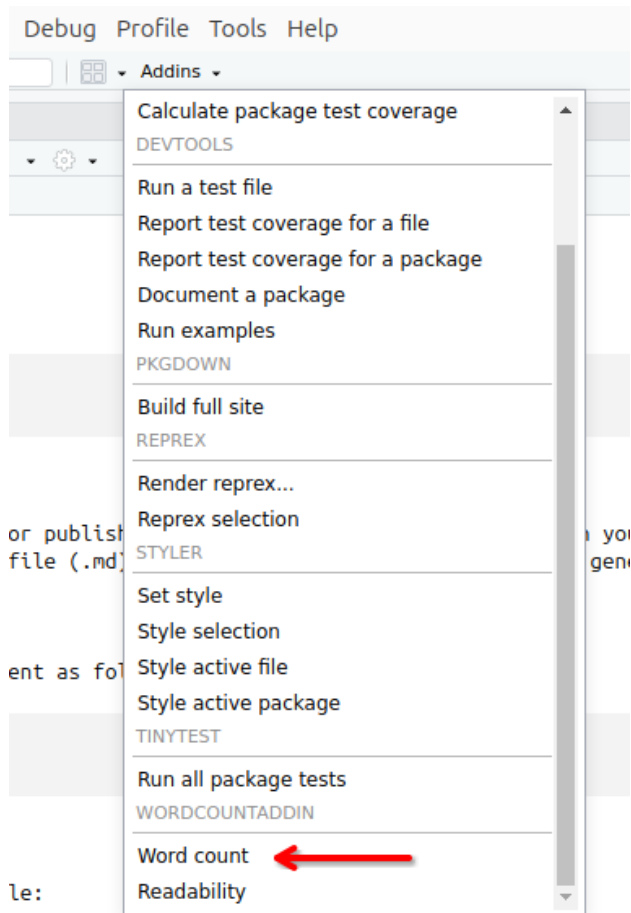
## 2.6 Word count addin

This [R package](#) is an [RStudio addin](#) to count words and characters in text in an [R markdown](#) document. It also has a function to compute readability statistics so you can get an indication of how easy or difficult your document is to read.

Install with:

```
devtools::install_github("benmarwick/wordcountaddin",  
                          type = "source", dependencies = TRUE)
```

Close and reopen RStudio so the WordCountAddin should be available under Addins.



## 2.7 Zotero

Zotero is a free reference and bibliography manager, just like *Mendley* and others.



You can use Zotero to organize your papers, and to create automatic in-line citations and references.

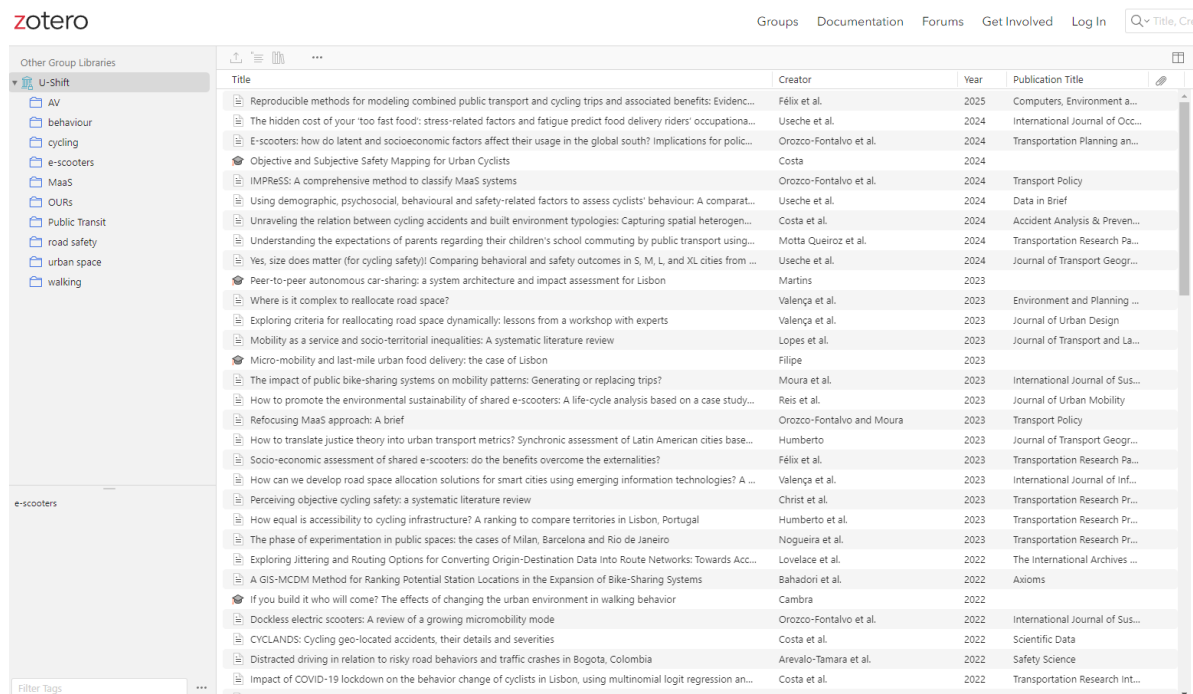
To **download**, please visit <https://www.zotero.org/download/> and select your operating system.

You may need to register for a free account at <https://www.zotero.org/user/register>

## 2.7.1 Shared libraries

An interesting thing in Zotero is that you can share a bibliography collection with others, for instance your research group or lab, and even those collections can be divided in sub-folders. And in that case, you can benefit from the readings of your colleagues.

See the [U-Shift Zotero collection](#), for instance.:



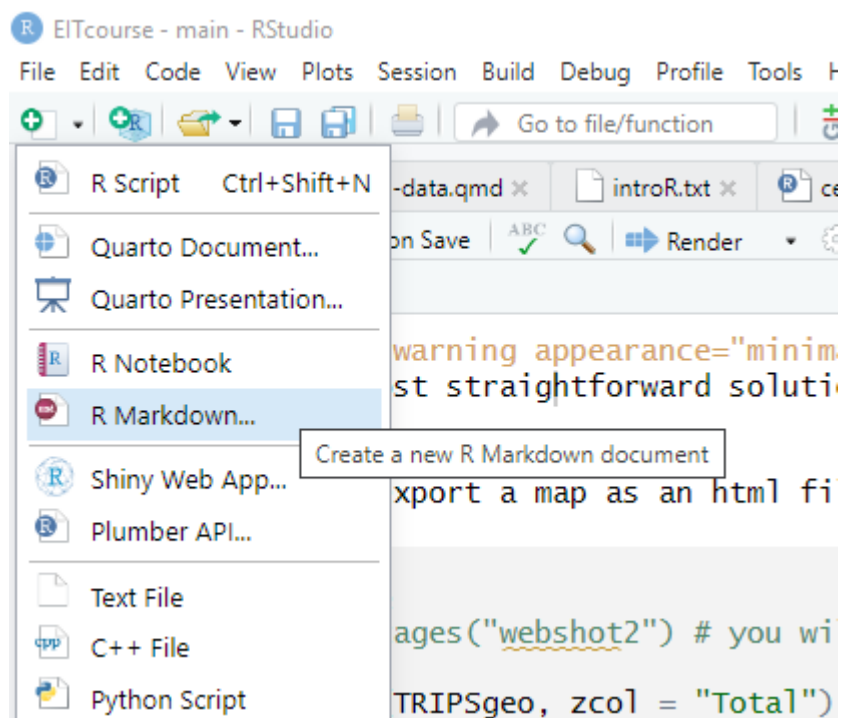
The screenshot displays the Zotero web interface. On the left, a sidebar shows a folder structure under 'Other Group Libraries', with 'U-Shift' selected and expanded. The main area shows a table of items within this collection. The table has columns for Title, Creator, Year, and Publication Title. The items listed are primarily research papers and reports related to urban mobility, cycling, and public transit, with years ranging from 2022 to 2025.

Title	Creator	Year	Publication Title
Reproducible methods for modeling combined public transport and cycling trips and associated benefits: Evidenc...	Félix et al.	2025	Computers, Environment a...
The hidden cost of your 'too fast food': stress-related factors and fatigue predict food delivery riders' occupationa...	Useche et al.	2024	International Journal of Occ...
E-scooters: how do latent and socioeconomic factors affect their usage in the global south? Implications for polic...	Orozco-Fontalvo et al.	2024	Transportation Planning an...
Objective and Subjective Safety Mapping for Urban Cyclists	Costa	2024	
IMPRéSS: A comprehensive method to classify MaaS systems	Orozco-Fontalvo et al.	2024	Transport Policy
Using demographic, psychosocial, behavioural and safety-related factors to assess cyclists' behaviour: A comparat...	Useche et al.	2024	Data in Brief
Unraveling the relation between cycling accidents and built environment typologies: Capturing spatial heterogen...	Costa et al.	2024	Accident Analysis & Preven...
Understanding the expectations of parents regarding their children's school commuting by public transport using...	Motta Queiroz et al.	2024	Transportation Research Pa...
Yes, size does matter (for cycling safety!): Comparing behavioral and safety outcomes in S, M, L, and XL cities from ...	Useche et al.	2024	Journal of Transport Geogr...
Peer-to-peer autonomous car-sharing: a system architecture and impact assessment for Lisbon	Martins	2023	
Where is it complex to reallocate road space?	Valença et al.	2023	Environment and Planning ...
Exploring criteria for reallocating road space dynamically: lessons from a workshop with experts	Valença et al.	2023	Journal of Urban Design
Mobility as a service and socio-territorial inequalities: A systematic literature review	Lopes et al.	2023	Journal of Transport and La...
Micro-mobility and last-mile urban food delivery: the case of Lisbon	Filipe	2023	
The impact of public bike-sharing systems on mobility patterns: Generating or replacing trips?	Moura et al.	2023	International Journal of Sus...
How to promote the environmental sustainability of shared e-scooters: A life-cycle analysis based on a case study...	Reis et al.	2023	Journal of Urban Mobility
Refocusing MaaS approach: A brief	Orozco-Fontalvo and Moura	2023	Transport Policy
How to translate justice theory into urban transport metrics? Synchronic assessment of Latin American cities base...	Humberto	2023	Journal of Transport Geogr...
Socio-economic assessment of shared e-scooters: do the benefits overcome the externalities?	Félix et al.	2023	Transportation Research Pa...
How can we develop road space allocation solutions for smart cities using emerging information technologies? A ...	Valença et al.	2023	International Journal of Inf...
Perceiving objective cycling safety: a systematic literature review	Christ et al.	2023	Transportation Research Pr...
How equal is accessibility to cycling infrastructure? A ranking to compare territories in Lisbon, Portugal	Humberto et al.	2023	Transportation Research Pr...
The phase of experimentation in public spaces: the cases of Milan, Barcelona and Rio de Janeiro	Nogueira et al.	2023	Transportation Research Pr...
Exploring Jittering and Routing Options for Converting Origin-Destination Data into Route Networks: Towards Acc...	Lovelace et al.	2022	The International Archives ...
A GIS-MCDM Method for Ranking Potential Station Locations in the Expansion of Bike-Sharing Systems	Bahadori et al.	2022	Axioms
If you build it who will come? The Effects of changing the urban environment in walking behavior	Cambra	2022	
Dockless electric scooters: A review of a growing micromobility mode	Orozco-Fontalvo et al.	2022	International Journal of Sus...
CYCLANDS: Cycling geo-located accidents, their details and severities	Costa et al.	2022	Scientific Data
Distracted driving in relation to risky road behaviors and traffic crashes in Bogotá, Colombia	Arevalo-Tamara et al.	2022	Safety Science
Impact of COVID-19 lockdown on the behavior change of cyclists in Lisbon, using multinomial logit regression an...	Costa et al.	2022	Transportation Research Int...

**i** Keep in mind that automatic fields of references **may need some adjustments**. Always double check if the fields seem to be correct.

### 3 Using Rmarkdown

ewew



## 4 Setup a paper with styles

We can write an academic paper using R Studio.

You don't need to know everything by heart. Starting with a pre-defined template is usually the best way to go.

See the examples of journal's templates at <https://pkgs.rstudio.com/rarticles/articles/examples.html>

To use **rarticles** from RStudio, you can access the templates through **File -> New File -> R Markdown**. This will open the dialog box where you can select from one of the available templates:

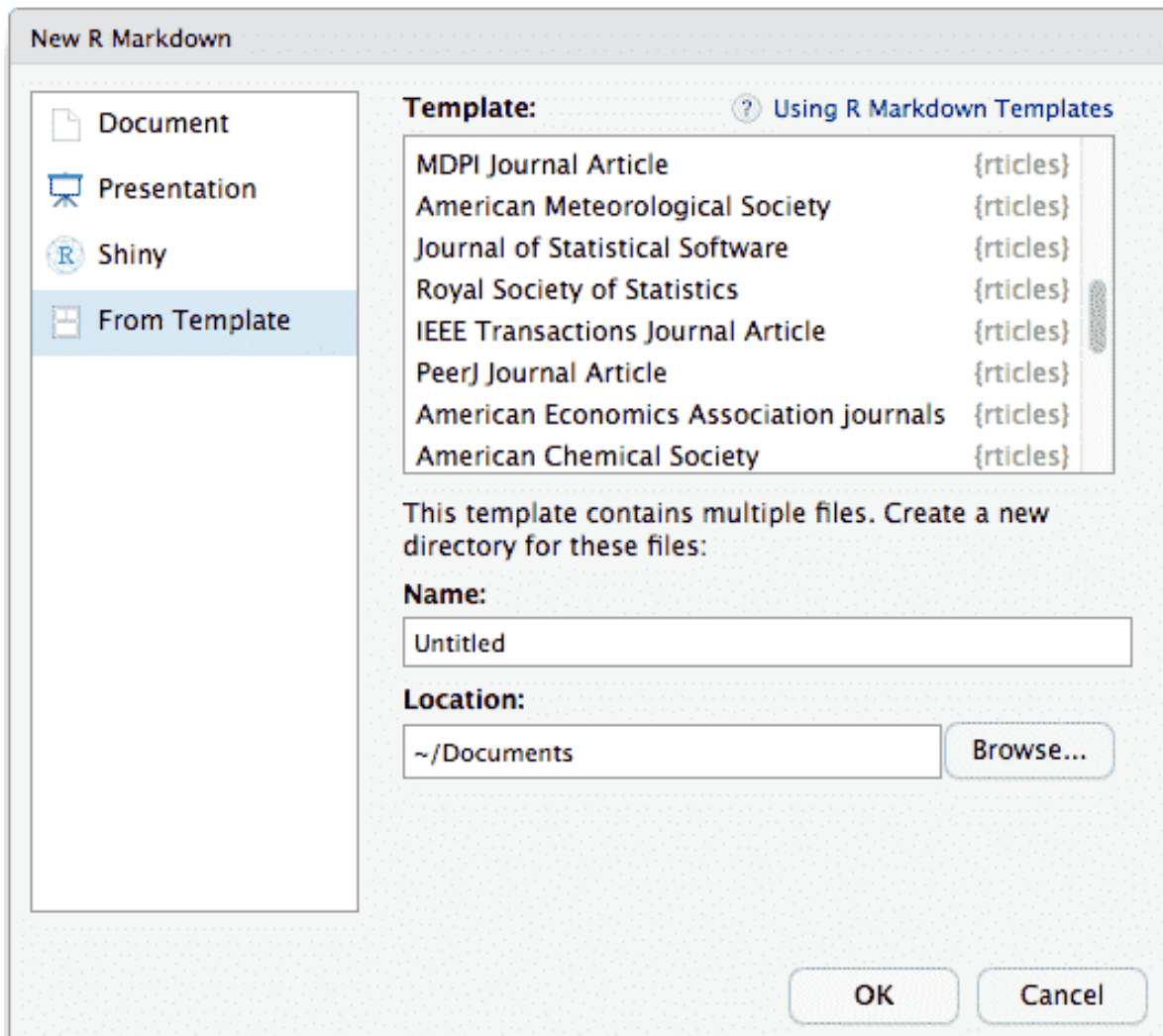


Figure 4.1: New R Markdown

Let's start by choosing the Elsevier template, and provide a name to your paper (this will also be the name of the folder).

# About

## Rosa Félix

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### Short bio

Rosa Félix is a senior post-doctoral researcher at the Instituto Superior Técnico – University of Lisbon and member of the [U-Shift lab](#), in the Transportation Research Group of [CERIS](#). Having a background of Urban Planning Engineering, she completed her Ph.D. in Transport Systems in 2019 at Instituto Superior Técnico (MIT Portugal program), and was a Visiting Scholar at Portland State University in 2017/18.

Rosa is an active mobility researcher, and excels in R and GIS. She is an open source and reproducible research enthusiast. Her publications include articles on cycling and behavior change, and open source code solutions to specific GIS and mobility problems. Every year, Rosa lectures a course for cycling infrastructure planning and design for practitioners, and also teaches GIS for transportation and introduction to programming for MSc course of Transportation Systems.

Rosa has worked in multiple R&D and consultancy projects with both municipalities and industry, such as the Municipality of Lisbon (2019-2022) and the Department for Transportation of Lisbon Metro (2023), in which she developed a digital tool - [biclaR](#) - to support the planning of the metropolitan cycling network, in collaboration with Institute for Transport Studies of the University of Leeds.

