

Software required to compute accessibility metrics using your own computer.

You will need R and RStudio.

If you don't have them installed in your computer, follow the instructions below.

Otherwise, you can skip to section '3 – Installing r5r'.

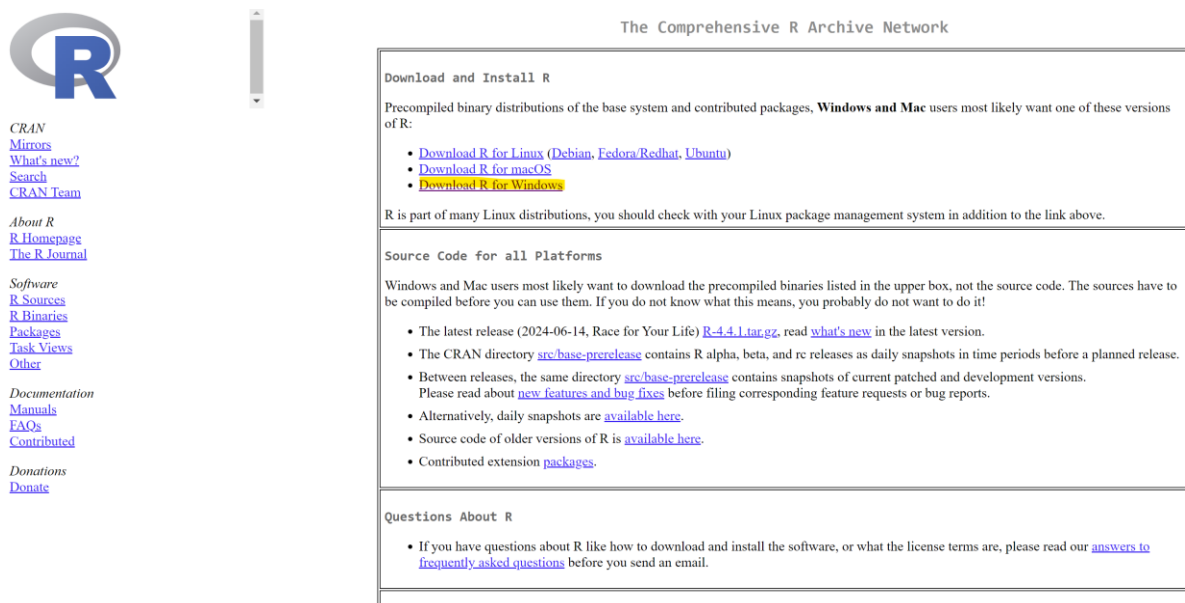
You will need:

- R
- RStudio
- r5r package - <https://github.com/ipeaGIT/r5r/>
- JDK 21

Step 1 - Install R

Download and install the latest R version from <https://cran.rstudio.com/>, or any other mirror from this list: <https://cran.rstudio.com/mirrors.html>

Click on Download R for Windows. If your computer is a mac, then click on the Download R for macOS. Note these instructions have been designed for PCs so please adapt them as necessary if your computer is not a PC.



The screenshot shows the CRAN (Comprehensive R Archive Network) website. On the left is a sidebar with navigation links. The main content area is titled 'The Comprehensive R Archive Network' and contains sections for downloading and installing R, source code for all platforms, and frequently asked questions. The 'Download and Install R' section lists three options: 'Download R for Linux (Debian, Fedora/Redhat, Ubuntu)', 'Download R for macOS', and 'Download R for Windows'. The 'Download R for Windows' link is highlighted in yellow. Below this, it states that R is part of many Linux distributions and advises checking with the Linux package management system. The 'Source Code for all Platforms' section explains that Windows and Mac users should download precompiled binaries, while Linux users can use source code. It provides links to the latest release, the CRAN directory for pre-releases, and source code of older versions. The 'Questions About R' section provides a link to frequently asked questions.

CRAN
Mirrors
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The Comprehensive R Archive Network

Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux \(Debian, Fedora/Redhat, Ubuntu\)](#)
- [Download R for macOS](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

Source Code for all Platforms


Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (2024-06-14, Race for Your Life) [R-4.4.1.tar.gz](#), read [what's new](#) in the latest version.
- The CRAN directory [src/base-prerelease](#) contains R alpha, beta, and rc releases as daily snapshots in time periods before a planned release. Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Alternatively, daily snapshots are [available here](#).
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#).

Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

Click on Install R for the first time (highlighted below):



[CRAN](#)
[Mirrors](#)
[What's new?](#)
[Search](#)
[CRAN Team](#)

[About R](#)
[R Homepage](#)
[The R Journal](#)

[Software](#)
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R for Windows

Subdirectories:

[base](#)
[contrib](#)
[old contrib](#)
[Rtools](#)

Binaries for base distribution. This is what you want to **install R for the first time.**

Binaries of contributed CRAN packages (for R >= 4.0.x).

Binaries of contributed CRAN packages for outdated versions of R (for R < 4.0.x).


Tools to build R and R packages. This is what you want to build your own packages on Windows, or to build R itself.

Please do not submit binaries to CRAN. Package developers might want to contact Uwe Ligges directly in case of questions / suggestions related to Windows binaries.

You may also want to read the [R FAQ](#) and [R for Windows FAQ](#).

Note: CRAN does some checks on these binaries for viruses, but cannot give guarantees. Use the normal precautions with downloaded executables.

Click on Download R-4.4.1 for Windows (highlighted below):



[CRAN](#)
[Mirrors](#)
[What's new?](#)
[Search](#)
[CRAN Team](#)

[About R](#)
[R Homepage](#)
[The R Journal](#)

[Software](#)
[R Sources](#)
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R-4.4.1 for Windows

[Download R-4.4.1 for Windows](#) (82 megabytes, 64 bit)
[README on the Windows binary distribution](#)
[New features in this version](#)

This build requires UCRT, which is part of Windows since Windows 10 and Windows Server 2016. On older systems, UCRT has to be installed manually from [here](#).

If you want to double-check that the package you have downloaded matches the package distributed by CRAN, you can compare the [md5sum](#) of the .exe to the [fingerprint](#) on the master server.

Frequently asked questions

- [Does R run under my version of Windows?](#)
- [How do I update packages in my previous version of R?](#)

Please see the [R FAQ](#) for general information about R and the [R Windows FAQ](#) for Windows-specific information.


Other builds

- Patches to this release are incorporated in the [r-patched snapshot build](#).
- A build of the development version (which will eventually become the next major release of R) is available in the [r-devel snapshot build](#).
- [Previous releases](#)

Note to webmasters: A stable link which will redirect to the current Windows binary release is [CRAN MIRROR>bin/windows/base/release.html](#).

Last change: 2024-06-15

A .exe file will download onto your computer:

 R-4.4.1-win	29/08/2024 14:46	Application	83,888 KB
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Click on the file and follow the instructions. Accept all default options.

Step 2 - Installing RStudio Desktop

Go to the RStudio Desktop Download web page: <https://posit.co/download/rstudio-desktop/>

Click on the download button (highlighted below)

RStudio Desktop

Used by millions of people weekly, the RStudio integrated development environment (IDE) is a set of tools built to help you be more productive with R and Python.

Don't want to download or install anything? Get started with RStudio on [Posit Cloud for free](#). If you're a professional data scientist looking to download RStudio and also need common enterprise features, don't hesitate to [book a call with us](#).

Want to learn about core or advanced workflows in RStudio? Explore the [RStudio User Guide](#) or the [Getting Started](#) section.

1: Install R

RStudio requires R 3.6.0+. Choose a version of R that matches your computer's operating system.

R is not a Posit product. By clicking on the link below to download and install R, you are leaving the Posit website. Posit disclaims any obligations and all liability with respect to R and the R website.

DOWNLOAD AND INSTALL R

2: Install RStudio

DOWNLOAD RSTUDIO DESKTOP FOR WINDOWS

Size: 262.79 MB | SHA-256: 09E1E38A | Version: 2024.04.2+764 | Released: 2024-06-10

The following file will be downloaded to your computer. Click on the file and follow the instructions.

 RStudio-2024.04.2-764	29/08/2024 14:50	Application	256,630 KB
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Install RTools

<https://cran.r-project.org/bin/windows/Rtools/>

Select the RTools 4.4 version that is compatible with the R version you have just installed:

RTools: Toolchains for building R and R packages from source on Windows

Choose your version of Rtools:

RTools 4.4	for R versions from 4.4.0 (R-release and R-devel)
RTools 4.3	for R versions 4.3.x (R-oldrelease)
RTools 4.2	for R versions 4.2.x
RTools 4.0	for R from version 4.0.0 to 4.1.3
old versions of RTools	for R versions prior to 4.0.0

This will take you to the following page. Click on RTools42 installer link (highlighted):

Rtools44 for Windows

Rtools is a toolchain bundle used for building R packages from source (those that need compilation of C/C++ or Fortran code) and for building R itself. Rtools44 is currently used for R 4.4 and R-devel, the development version of R, to become R 4.5.0.

Rtools44 consists of Msys2 build tools, GCC 13/MinGW-w64 compiler toolchain, libraries built using the toolchain, and QPDF. Rtools44 supports 64-bit Windows and UCRT as the C runtime.

Compared to Rtools43, Rtools44 for 64-bit Intel machines has newer versions of three core components: GCC, MinGW-w64, and binutils. It is therefore recommended to re-compile all code with the new toolchain to avoid problems. The code compiled by Rtools older than Rtools42 is incompatible due to use of MSVCRT and has to be recompiled with Rtools44 for use in R packages.

Rtools44 is also available for 64-bit ARM machines (aarch64); it includes Msys2 build tools (64-bit Intel builds running via emulation) and aarch64 builds of LLVM 17/MinGW-w64 compiler toolchain, libraries built using the toolchain, and again QPDF. The 64-bit ARM version of Rtools44 is experimental: a number of CRAN packages don't work with it and the Fortran compiler (flang-new) is not yet able to compile Fortran code of all CRAN packages. A number of CRAN packages doesn't work because they require not-yet-available 64-bit ARM versions of external software.

Installing Rtools44

Rtools is only needed for installation of R packages from source (those that need compilation of C/C++ or Fortran code) or building R from source. R can be installed from the R binary installer and by default will install binary versions of CRAN packages, which does not require Rtools44.

Moreover, online build services are available to check and build R packages for Windows, for which again one does not need to install Rtools44 locally. The [Winbuilder](#) check service uses identical setup as the CRAN incoming packages checks and has already all CRAN and Bioconductor packages pre-installed.

Rtools44 may be installed from the [Rtools44 installer](#) or [64-bit ARM Rtools44 installer](#). It is recommended to use the defaults, including the default installation location of C:\rtools44.

When using R installed by the installer, no further setup is necessary after installing Rtools44 to build R packages from source. When using the default installation location, R and Rtools44 may be installed in any order and Rtools44 may be installed when R is already running.

On ARM, binary versions of packages are currently not available from CRAN, so Rtools44 is required to install any package that needs compilation.

Additional information

A detailed tutorial on how to build R and packages using Rtools44 for R package authors and R developers is available for [R 4.4.x](#) and [R-devel](#).


From the user perspective, Rtools44 is the same as Rtools43 (and Rtools42). However, it uses newer versions of the compiler toolchain and libraries, and hence some package authors will have to extend their make files to link additional libraries. Maintainers of CRAN and Bioconductor packages may use [these patches](#) for reference or re-use them in their code.

A change log for Rtools44 vs Rtools43 and of individual revisions of Rtools44 is available [here](#).

Rtools44 is also available in base and full toolchain tarballs suitable for users who have their own installation of Msys2. The base toolchain tarball is smaller and includes only what is needed to build R and the recommended packages. All Rtools files are available [here](#).

Sources are available for the [toolchain tarballs](#) and the [Rtools44 installer](#).

The following file will be downloaded to your computer:

 rtools44-6104-6039	29/08/2024 15:06	Application	438,504 KB
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Click and follow the instructions to install, accepting all default options.

Step 3 - Installing r5r

We will use a package called **r5r: Rapid Realistic Routing with R5 in R**

Go to <https://github.com/ipeaGIT/r5r> to read more about it.

r5r: Rapid Realistic Routing with R5 in R

CRAN 2.0 downloads 916K R-CMD-check passing codecov 93% lifecycle maturing
DOI 10.32866/001c.21262

r5r is an R package for rapid realistic routing on multimodal transport networks (walk, bike, public transport and car). It provides a simple and friendly interface to R⁵, the [Rapid Realistic Routing on Real-world and Reimagined networks](#), the routing engine developed independently by [Conveyal](#).

r5r is a simple way to run R⁵ locally, allowing R users to generate detailed routing analysis or calculate travel time matrices and accessibility using seamless parallel computing. See a detailed demonstration of r5r in the [intro Vignette](#). More details about r5r can be found on the [package webpage](#) or on this [paper](#). Over time, r5r might be expanded to incorporate other functionality from R⁵.

This repository contains the R code (r-package folder) and the Java code (java-api folder) that provides the interface to R⁵.

Their readme page also provides information on how to install the r5r package and the Java Development Kit (JDK) required for the interface.



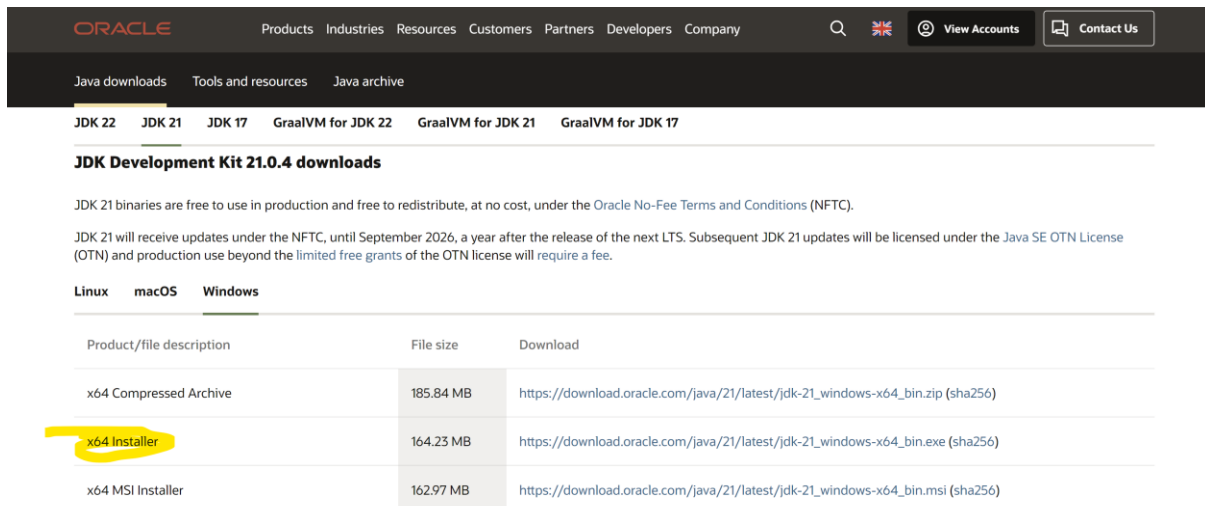
However, we will do this in alternative ways because we will need to install other packages as well.

Install JDK 21

Download and install Java SE Development Kit 21

<https://www.oracle.com/uk/java/technologies/downloads/#jdk21-windows>


Click on the Windows tab and then on the x64 Installer link highlighted below:



The screenshot shows the Oracle website's download page for JDK 21.0.4. The 'Windows' tab is selected, and the 'x64 Installer' link is highlighted with a yellow circle. The table below lists the available download options.

Product/file description	File size	Download
x64 Compressed Archive	185.84 MB	https://download.oracle.com/java/21/latest/jdk-21_windows-x64_bin.zip (sha256)
x64 Installer	164.23 MB	https://download.oracle.com/java/21/latest/jdk-21_windows-x64_bin.exe (sha256)
x64 MSI Installer	162.97 MB	https://download.oracle.com/java/21/latest/jdk-21_windows-x64_bin.msi (sha256)

The following file will be downloaded to your computer. Click on it and follow the instructions to install.

 jdk-21_windows-x64_... 29/08/2024 16:56 Application 168,168 KB

Once the installation has been completed, you must do one more step before starting the analysis, which is to install the required packages, including r5r.

Alternatively, you can install JDK 21 via code, following the instructions on the r5r GitHub page.

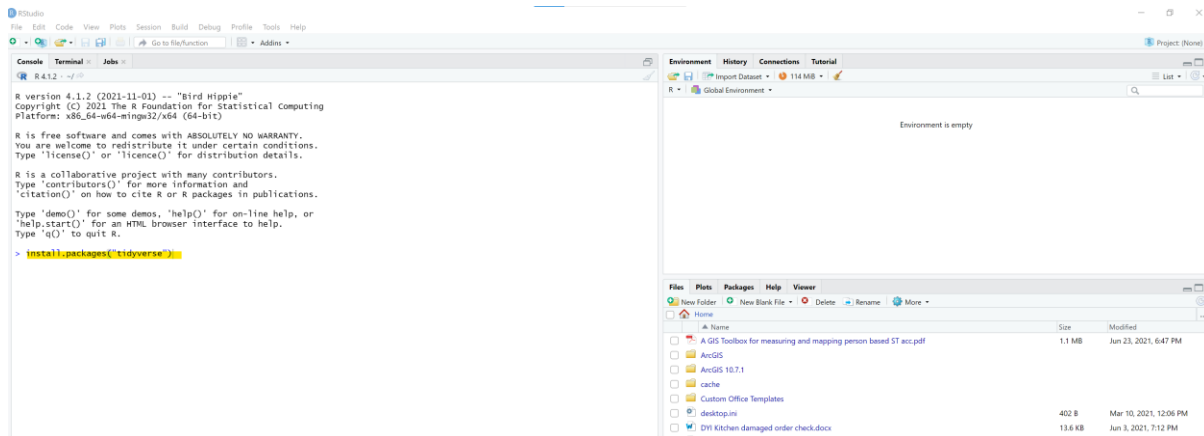
Install R packages

Open RStudio and run the following commands in a new script to install required packages:

```
install.packages("r5r")
install.packages("tidyverse")
install.packages("data.table")
install.packages("rgdal")
install.packages("rgeos")
install.packages("sf")
```

```
install.packages("mapview")
install.packages("leaflet")
install.packages("piggyback")
install.packages("devtools")
install.packages("oapdata")
install.packages("quantreg")
install.packages('geobr')
```

You can simply copy and paste each of the above lines as below:



Once you click enter, the packages will install. See example below:

```
Console Terminal Jobs
R 4.1.2 ~ -/

R version 4.1.2 (2021-11-01) -- "Bird Hippie"
Copyright (C) 2021 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

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.

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.

> install.packages("tidyverse")
also installing the dependencies 'colorspace', 'sys', 'bit', 'ps', 'base64enc', 'fastmap', 'rappdirs', 'rematch', 'farver',
' labeling', 'munsell', 'RColorBrewer', 'viridisLite', 'askpass', 'bit64', 'prettyunits', 'processx', 'evaluate', 'highr',
' yam', 'xfun', 'htmltools', 'tinytex', 'jquerylib', 'backports', 'ellipsis', 'generics', 'glue', 'assertthat', 'blob', 'DB
I', 'lifecycle', 'R6', 'tidyselect', 'vctrs', 'withr', 'data.table', 'gargle', 'uuid', 'cellranger', 'curl', 'ids', 'rematch
2', 'digest', 'gtable', 'isoband', 'scales', 'cpl1', 'pkgconfig', 'mime', 'openssl', 'fansl', 'utf8', 'clipr', 'vroom', 'tz
db', 'Rcpp', 'progress', 'callr', 'fs', 'knitr', 'rmarkdown', 'selectr', 'stringi', 'broom', 'cli', 'crayon', 'dbplyr', 'dpl
yr', 'dtplyr', 'forcats', 'googledrive', 'googlesheets4', 'ggplot2', 'haven', 'hms', 'httr', 'jsonlite', 'lubridate', 'magri
ttr', 'modelr', 'pillar', 'purrr', 'readr', 'readxl', 'reprex', 'rlang', 'rstudioapi', 'rvest', 'stringr', 'tibble', 'tidy
r', 'xml2'

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/colorspace_2.0-3.zip'
Content type 'application/zip' length 2651382 bytes (2.5 MB)
downloaded 2.5 MB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/sys_3.4.zip'
Content type 'application/zip' length 59904 bytes (58 KB)
downloaded 58 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/bit_4.0.4.zip'
Content type 'application/zip' length 640839 bytes (625 KB)
downloaded 625 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/ps_1.6.0.zip'
Content type 'application/zip' length 775901 bytes (757 KB)
downloaded 757 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/base64enc_0.1-3.zip'
Content type 'application/zip' length 43156 bytes (42 KB)
downloaded 42 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/fastmap_1.1.0.zip'
Content type 'application/zip' length 215489 bytes (210 KB)
downloaded 210 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.1/rappdirs_0.3.3.zip'
```

You can repeat this for each line or copy all lines together and press enter.

If you copy all lines together, be patient while RStudio installs them all. The installation will be completed when the prompt line shows again.

If a window pops up asking if you to confirm the installation of items that need compiling, click YES.

Congratulations!

You are now ready to run the accessibility analysis.