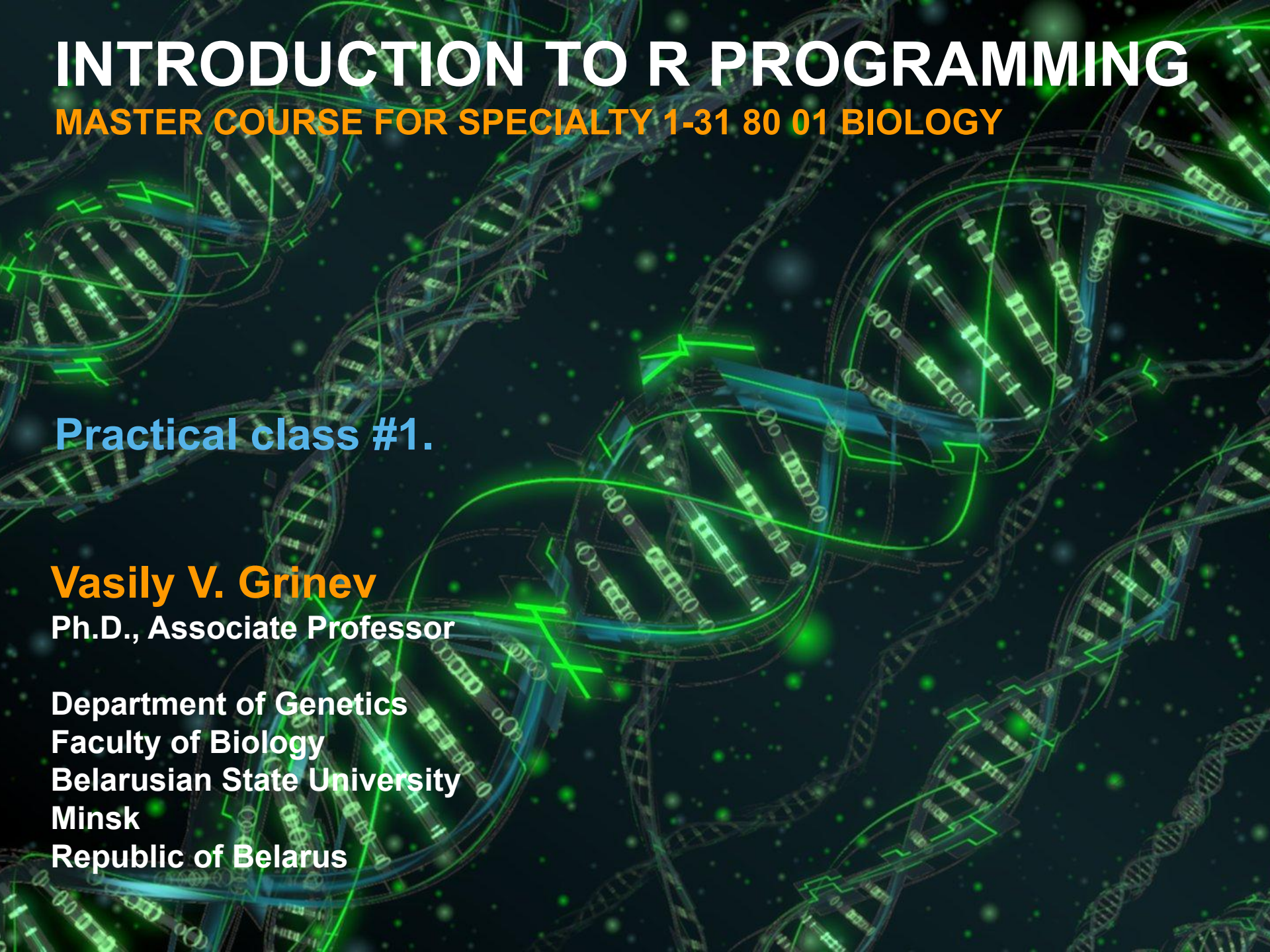
INTRODUCTION TO R PROGRAMMING

MASTER COURSE FOR SPECIALTY 1-31 80 01 BIOLOGY



Practical class #1.

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Faculty of Biology
Belarusian State University
Minsk
Republic of Belarus

LIST OF PRACTICAL TASKS

Task by task.

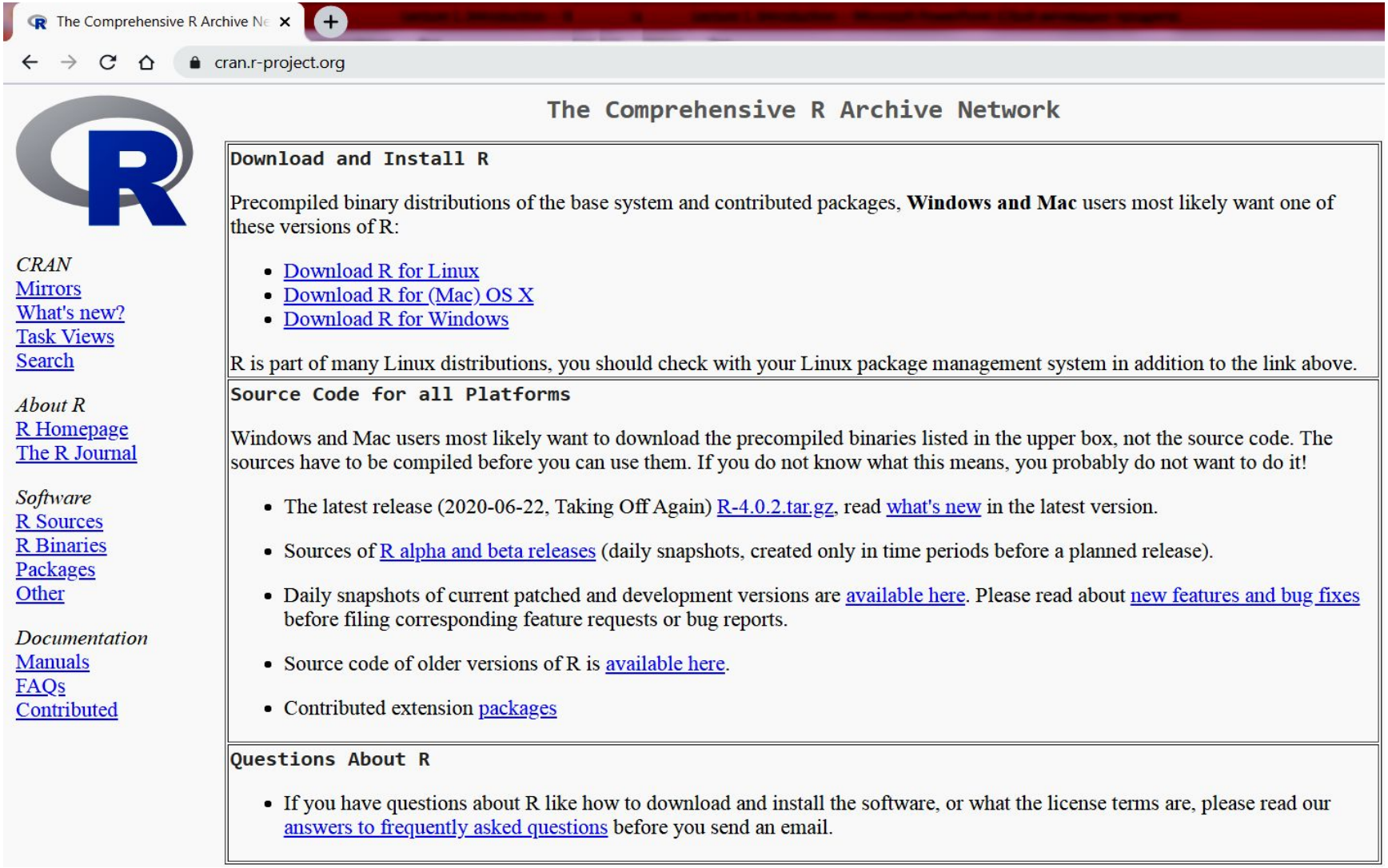
- Task #1: Installation of R on Windows.
- Task #2: Basic administration of R.
- Task #3: Handling with R workspace.
- Task #4: Life cycle of native R files.
- Task #5: Getting help on R issues.

Duration.

Eighty minutes (in total) per group of students.

PRACTICAL TASK #1: Installation of R on Windows

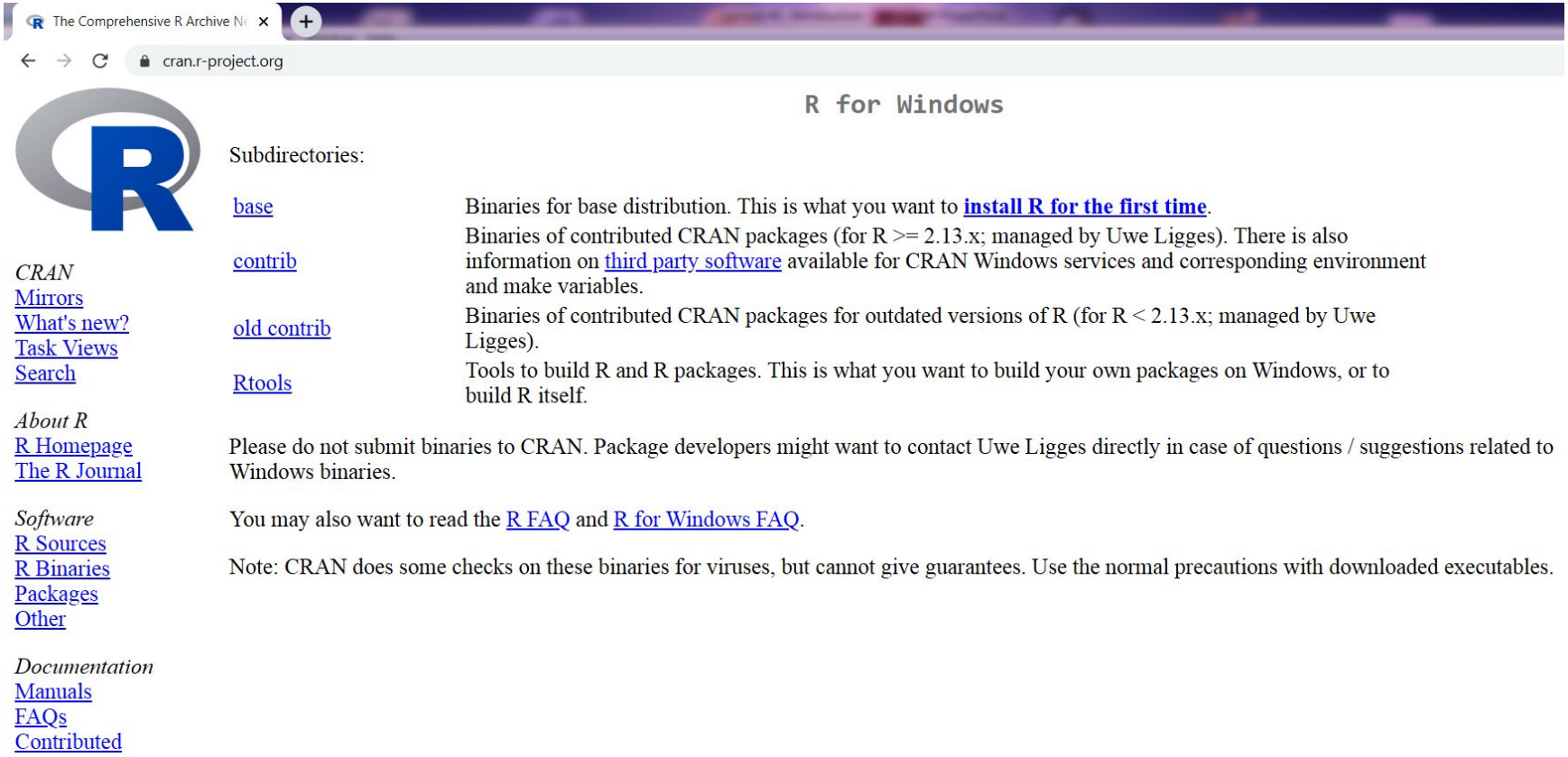
Start page of CRAN



https://cran.r-project.org/

PRACTICAL TASK #1: Installation of R on Windows

R for Windows



PRACTICAL TASK #1: Installation of R on Windows

R for Windows

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R-4.1.1 for Windows (32/64 bit)

Download R 4.1.1 for Windows

Installation and other instructions
New features in this version

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. You will need a version of md5sum for windows: both graphical and command line versions are available.

Frequently asked questions

- Does R run under my version of Windows?
- How do I update packages in my previous version of R?
- Should I run 32-bit or 64-bit R?

Please see the R FAQ for general information about R and the R Windows FAQ for Windows-specific information.

Other builds

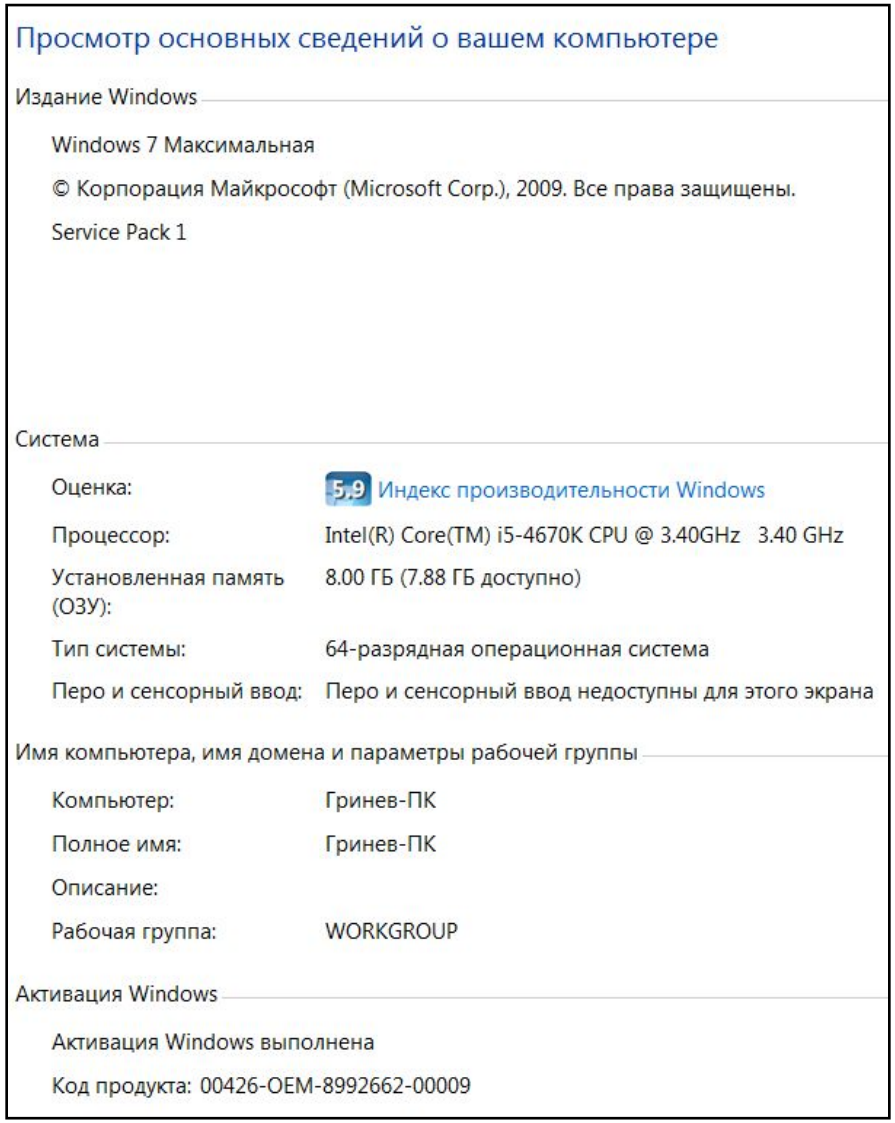
- Patches to this release are incorporated in the r-patched snapshot build.
- A build of the development version (which will eventually become the next major release of R) is available in the r-devel snapshot build.
- Previous releases

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: 2021-08-10

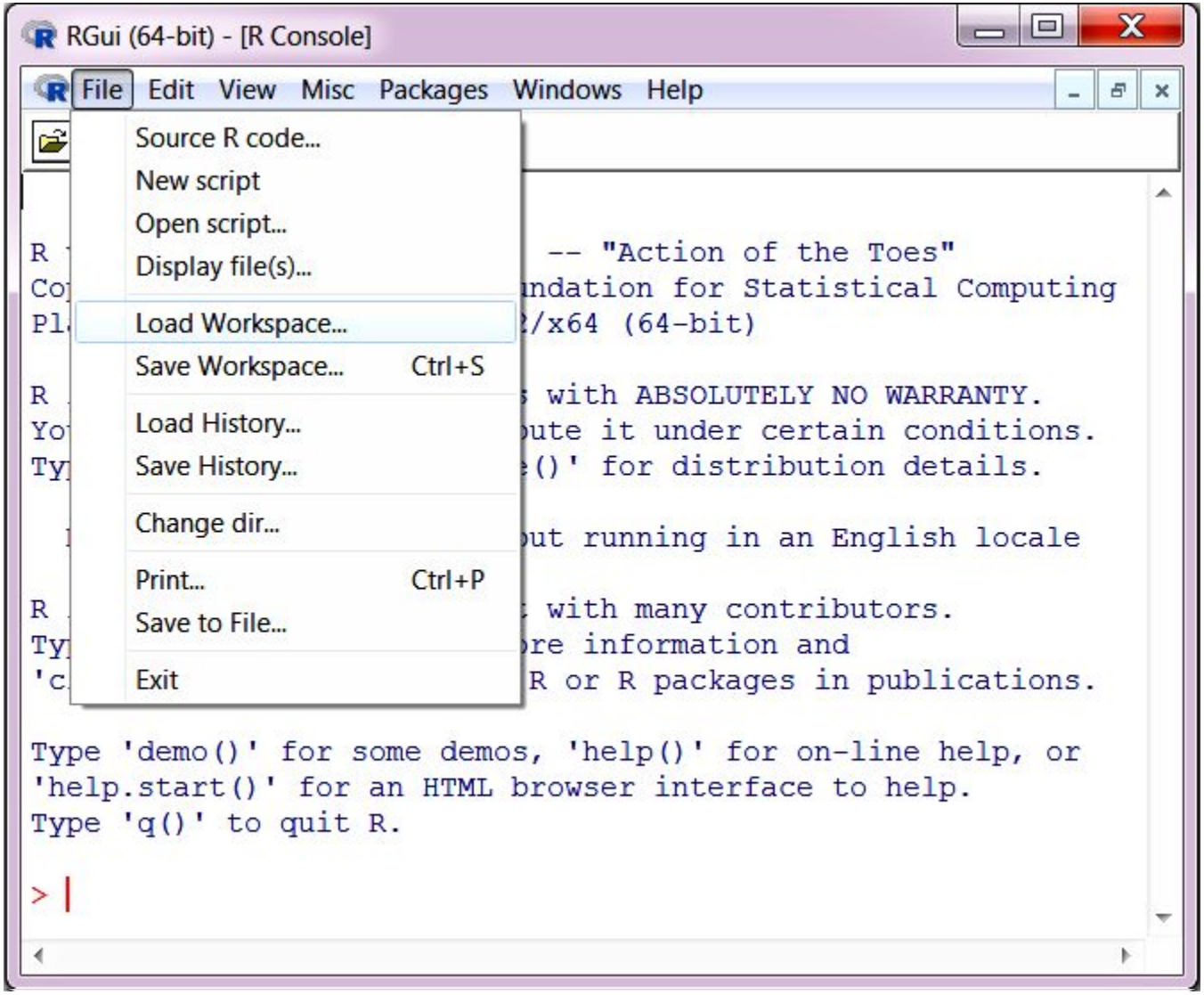
PRACTICAL TASK #1: Installation of R on Windows

R for Windows



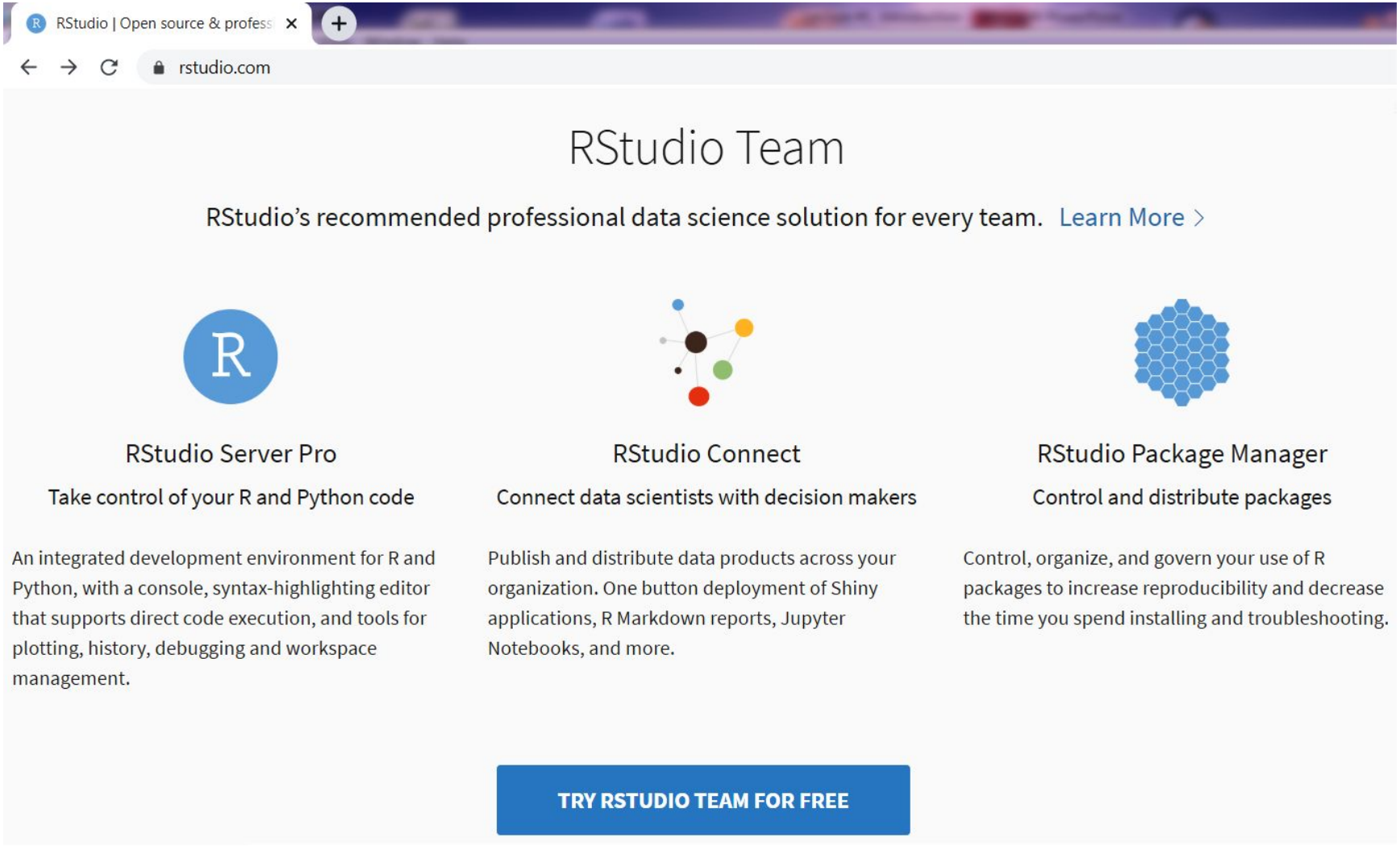
PRACTICAL TASK #2: Basic administration of R

R Console



PRACTICAL TASK #2: Basic administration of R

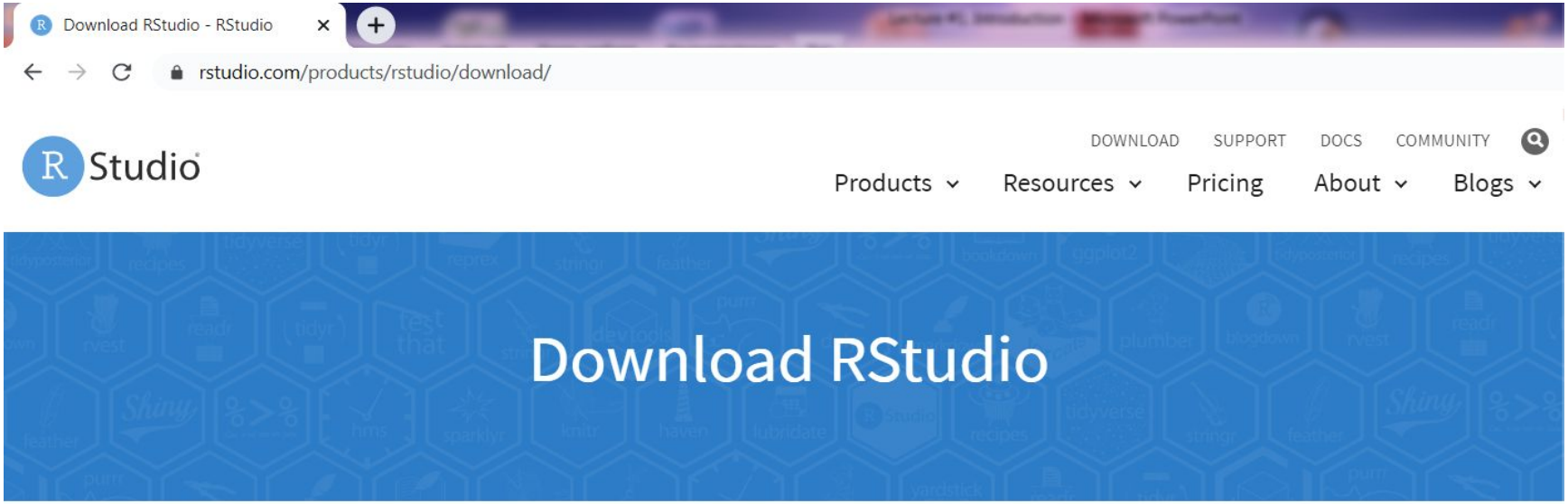
RStudio



https://rstudio.com/

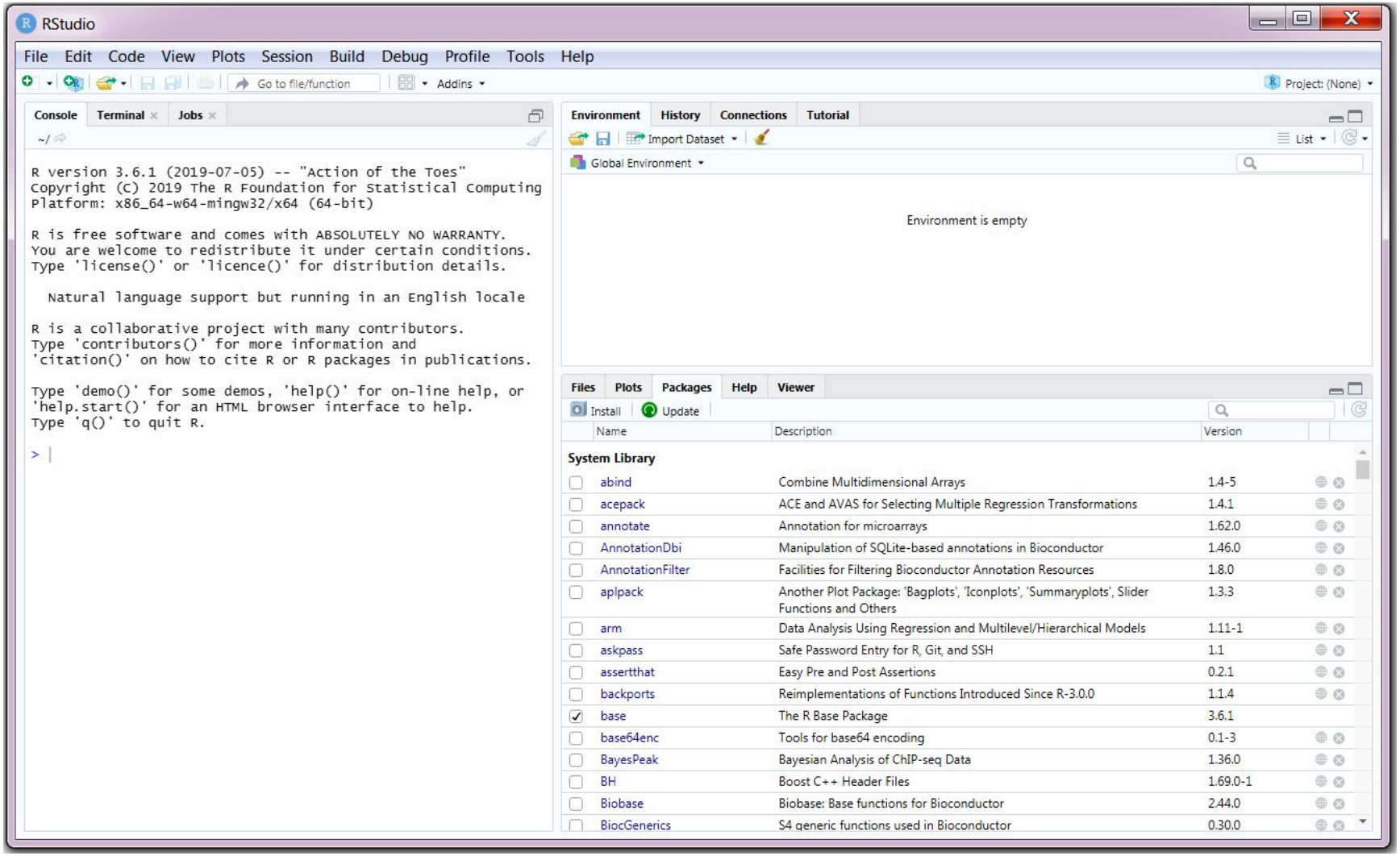
PRACTICAL TASK #2: Basic administration of R

RStudio



PRACTICAL TASK #2: Basic administration of R

RStudio



PRACTICAL TASK #2: Basic administration of R

.Renviron

```
> Sys.getenv()
…
APPDATA     C:\Users\Гринев\AppData\Roaming
...
COMPUTERNAME     ГРИНЕВ-ПК
...
HOME    C:\Users\Гринев\Documents
HOMEDRIVE       C:
HOMEPATH  \Users\Гринев
LOCALAPPDATA C:\Users\Гринев\AppData\Local
...
R_HOME      D:/Software/R-4.1.1
R_LIBS_USER     C:\Users\Гринев\Documents/R/win-library/4.1
...
TEMP    C:\Users\6416~1\AppData\Local\Temp
TMP     C:\Users\6416~1\AppData\Local\Temp
...
USERNAME Гринев
```

PRACTICAL TASK #2: Basic administration of R

.Renviron

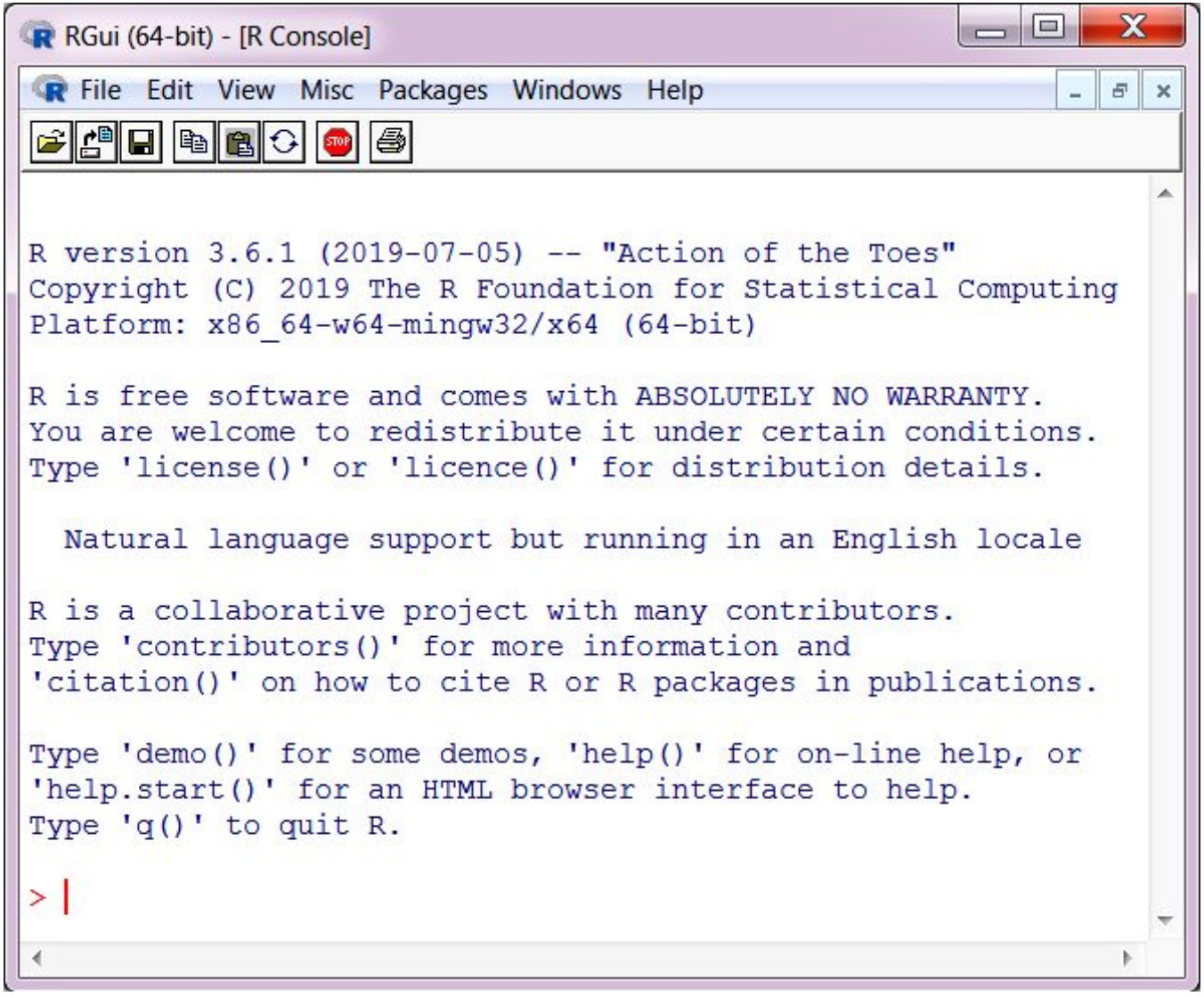
C:\Users\user_name\Documents

TMP = 'D:\Software\R-4.1.1\Temp'
APPDATA = 'D:\Software\R-4.1.1\AppData'
LOCALAPPDATA = 'D:\Software\R-4.1.1\AppData\Local'
TEMP = 'D:\Software\R-4.1.1\AppData\Local\Temp'
HOME = 'D:\Software\R-4.1.1\Documents'
R_LIBS_USER = 'D:\Software\R-4.1.1\library\user‘

```
> Sys.getenv("TEMP")
[1] "C:\\Users\\6416~1\\AppData\\Local\\Temp"
> Sys.getenv("TEMP")
[1] "D:\\Software\\R-4.1.1\\AppData\\Local\\Temp"
```

PRACTICAL TASK #2: Basic administration of R

R version



PRACTICAL TASK #2: Basic administration of R

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Last change: 2021-08-10

PRACTICAL TASK #2: Basic administration of R

R version

Calling of current R version from command console.

```
> R.Version()$version.string
[1] "R version 4.1.1 (2021-08-10)"
```

Updating R from command console using the package *installr*. The main work horse of this package is function updateR(). This function performs the following: finding the latest R version, downloading it, running the installer, deleting the installation file, copy and updating old packages to the new R installation.

```
### Installing the package
> install.packages(pkgs="installr")
### Loading the package
> suppressMessages(expr=library(package=installr))
### Using the package
> updateR()
```

CRAN cran.r-project.org/web/packages/installr/index.html
Tutorial r-statistics.com/2013/03/updating-r-from-r-on-windows-using-the-installr-package

PRACTICAL TASK #2: Basic administration of R

R version

Old versions of R at https://cran.r-project.org/bin/windows/base/old

Previous Releases of R for Windows

This directory contains previous binary releases of R for Windows.

The current release, and links to development snapshots, are available here. Source code for these releases and others is available through the main CRAN page.

In this directory:

R 4.1.1 (August, 2021)
R 4.1.0 (May, 2021)
R 4.0.5 (March, 2021)
R 4.0.4 (February, 2021)
R 4.0.3 (October, 2020)
R 4.0.2 (June, 2020)
R 4.0.1 (June, 2020)
R 4.0.0 (April, 2020)
R 3.6.3 (February, 2020)
R 3.6.2 (December, 2019)
R 3.6.1 (July, 2019)
R 3.6.0 (April, 2019)
R 3.5.3 (March, 2019)
R 3.5.2 (December, 2018)
R 3.5.1 (July, 2018)
R 3.5.0 (April, 2018)
R 3.4.4 (March, 2018)
R 3.4.3 (November, 2017)
R 3.4.2 (September, 2017)
R 3.4.1 (June, 2017)
R 3.4.0 (April, 2017)
R 3.3.3 (March, 2017)

PRACTICAL TASK #3: Handling with R workspace

Basic definitions

The **workspace** is current R working environment. It includes any **user-defined objects** (vectors, matrices, data frames, lists, functions). At the end of an R session, the user can save an image of the current workspace that is automatically reloaded the next time R is started.

Some standard commands for managing R workspace:

```
### Get work directory
> getwd()
[1] "C:/Users/Гринев/Documents"
### Set custom work directory
> setwd(dir="D:/Vasily Grinev")
> getwd()
[1] "D:/Vasily Grinev“
### List the objects in the current workspace
> ls()
character(0)
```

PRACTICAL TASK #3: Handling with R workspace

Session info

```
> sessionInfo()
R version 4.1.1 (2021-08-10)
Platform: x86_64-w64-mingw32/x64 (64-bit)
Running under: Windows 7 x64 (build 7601) Service Pack 1

Matrix products: default

locale:
[1] LC_COLLATE=English_United States.1252
[2] LC_CTYPE=English_United States.1252
[3] LC_MONETARY=English_United States.1252
[4] LC_NUMERIC=C
[5] LC_TIME=English_United States.1252
system code page: 1251

attached base packages:
[1] stats     graphics  grDevices utils     datasets  methods   base

loaded via a namespace (and not attached):
[1] compiler_3.6.1
```

PRACTICAL TASK #3: Handling with R workspace

Options

Options are **global parameters** that affect the way in which R computes and displays its results. Just one example:

```
> options("digits")
$digits
[1] 7
> 3/4.5
[1] 0.6666667

### The names of the options
> names(x=options())
  [1] "add.smooth"      "askYesNo"
  [3] "browserNLdisabled"   "CBoundsCheck"
  [5] "check.bounds"    "citation.bibtex.max"
  [7] "continue"    "contrasts"
  [9] "defaultPackages"     "demo.ask"
[11] "deparse.cutoff"   "device"
[13] "device.ask.default"     "digits"
[15] "echo"   "editor"
[17] "encoding"    "example.ask“
…
```

PRACTICAL TASK #3: Handling with R workspace

Options

```
### View current (default) options settings
>options()
$add.smooth
[1] TRUE

$askYesNo
function (msg, ...)
{
    flush.console()
    ans <- winDialog("yesnocancel", msg)
    switch(ans, YES = TRUE, NO = FALSE, NA)
}
<bytecode: 0x00000000097acd40>
<environment: namespace:utils>

$browserNLdisabled
[1] FALSE
…
```

PRACTICAL TASK #3: Handling with R workspace

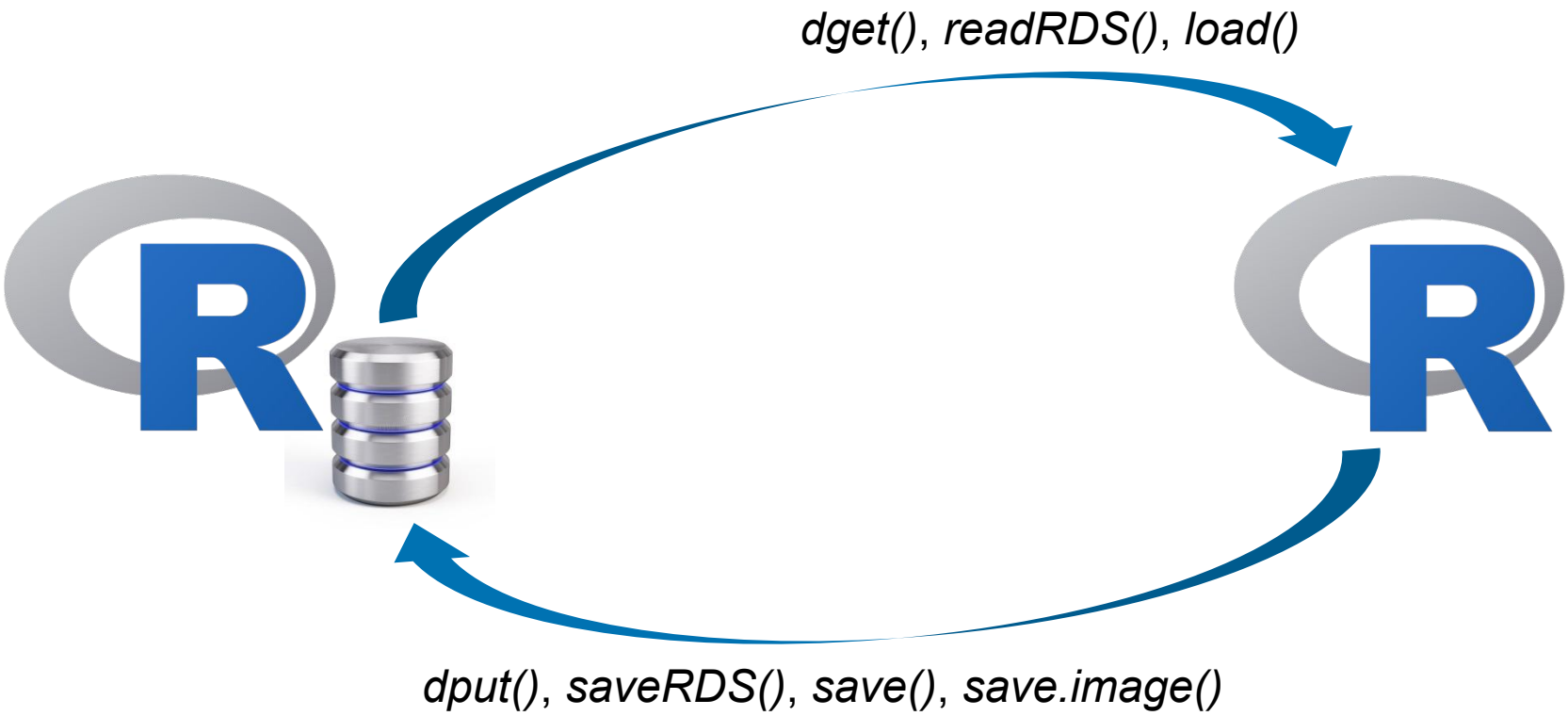
Options

```
> options("digits")
$digits
[1] 7
> getOption(x="digits")
[1] 7

### Re-settings of option value
> options(digits=4)
> 3/4.5
[1] 0.6667
> options(digits=20)
> 3/4.5
[1] 0.66666666666666663
```

PRACTICAL TASK #4: Life cycle of native R files

Native R files




```
> saveRDS(object=my_R_object,     # R object to serialize
                  file="my_R_object.rds")# the name of the file where the
      # R object is saved to
> readRDS(file="my_R_object.rds") # the name of the file where the
      # R object is read from
```

PRACTICAL TASK #4: Life cycle of native R files

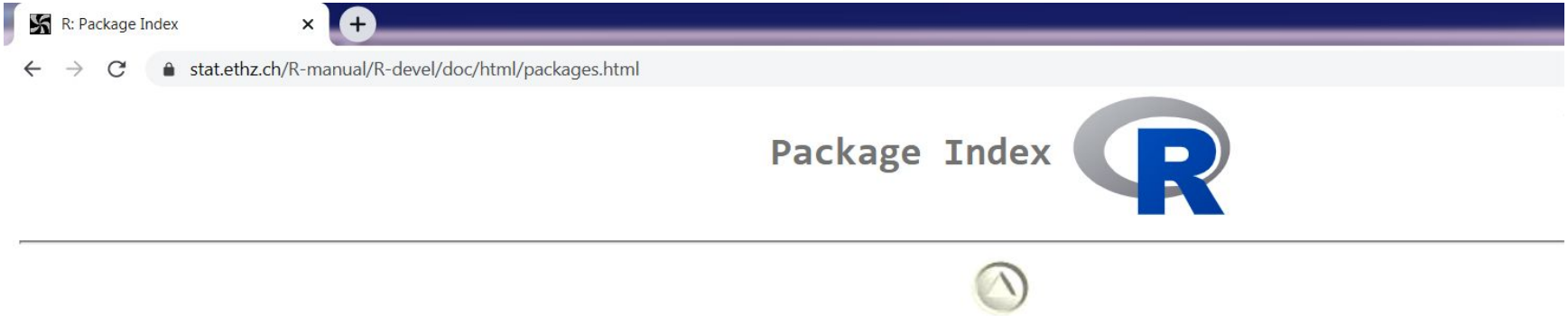
Built-in functions

- *dget()* – reads in active memory of single R object from the R text file;
- *load()* – reads the R environment objects;
- *readRDS()* – reads a single R object from *.RDS file.

- *dput()* – write an R object to a text file or connection;
- *dump()* – write R objects into a text file;
- *save()* – write an object of the R environment into a text file;
- *save.image()* – write a current R workspace in .rdata file;
- *saveRDS()* – write a single R object to a file.

PRACTICAL TASK #5: Getting help on R issues

Packages in the standard R library



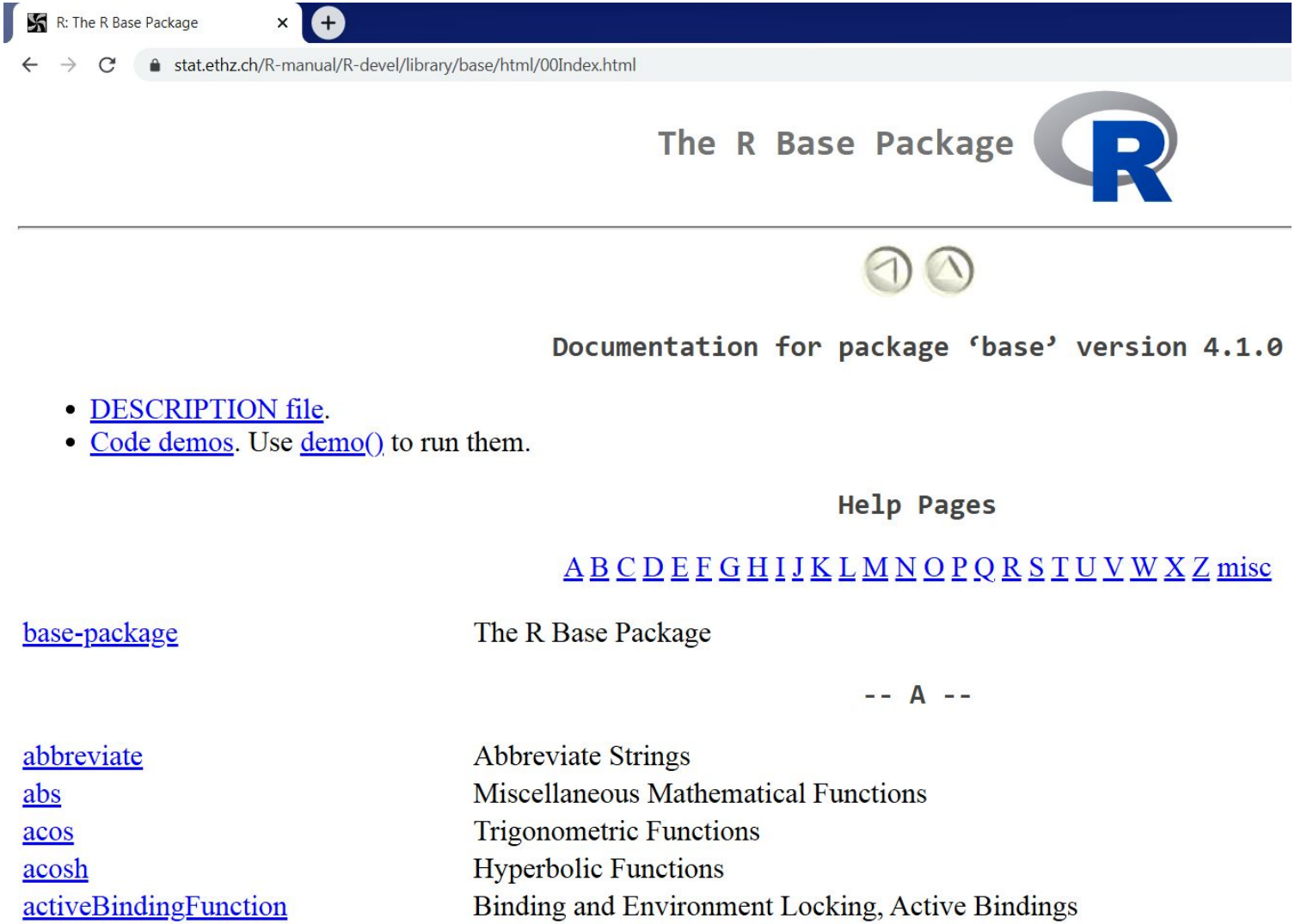
Packages in the standard library

base	The R Base Package
boot	Bootstrap Functions (Originally by Angelo Canty for S)
class	Functions for Classification
cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.
codetools	Code Analysis Tools for R
compiler	The R Compiler Package
datasets	The R Datasets Package
foreign	Read Data Stored by 'Minitab', 'S', 'SAS', 'SPSS', 'Stata', 'Systat', 'Weka', 'dBase', ...
graphics	The R Graphics Package
grDevices	The R Graphics Devices and Support for Colours and Fonts
grid	The Grid Graphics Package
KernSmooth	Functions for Kernel Smoothing Supporting Wand & Jones (1995)
lattice	Trellis Graphics for R
MASS	Support Functions and Datasets for Venables and Ripley's MASS

stat.ethz.ch/R-manual/R-devel/doc/html/packages.html

PRACTICAL TASK #5: Getting help on R issues

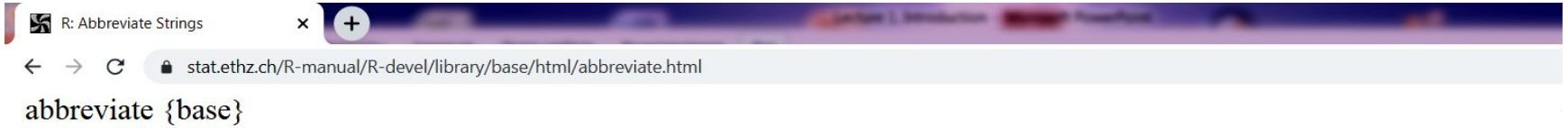
Package description page



https://stat.ethz.ch/R-manual/R-devel/library/base/html/00Index.html

PRACTICAL TASK #5: Getting help on R issues

Function description page



abbreviate {base}

Abbreviate Strings

Description

Abbreviate strings to at least `minlength` characters, such that they remain *unique* (if they were), unless `strict = TRUE`.

Usage

```
abbreviate(names.arg, minlength = 4, use.classes = TRUE,
           dot = FALSE, strict = FALSE,
           method = c("left.kept", "both.sides"), named = TRUE)
```

Arguments

`names.arg`
: a character vector of names to be abbreviated, or an object to be coerced to a character vector by `as.character`.

`minlength`
: the minimum length of the abbreviations.

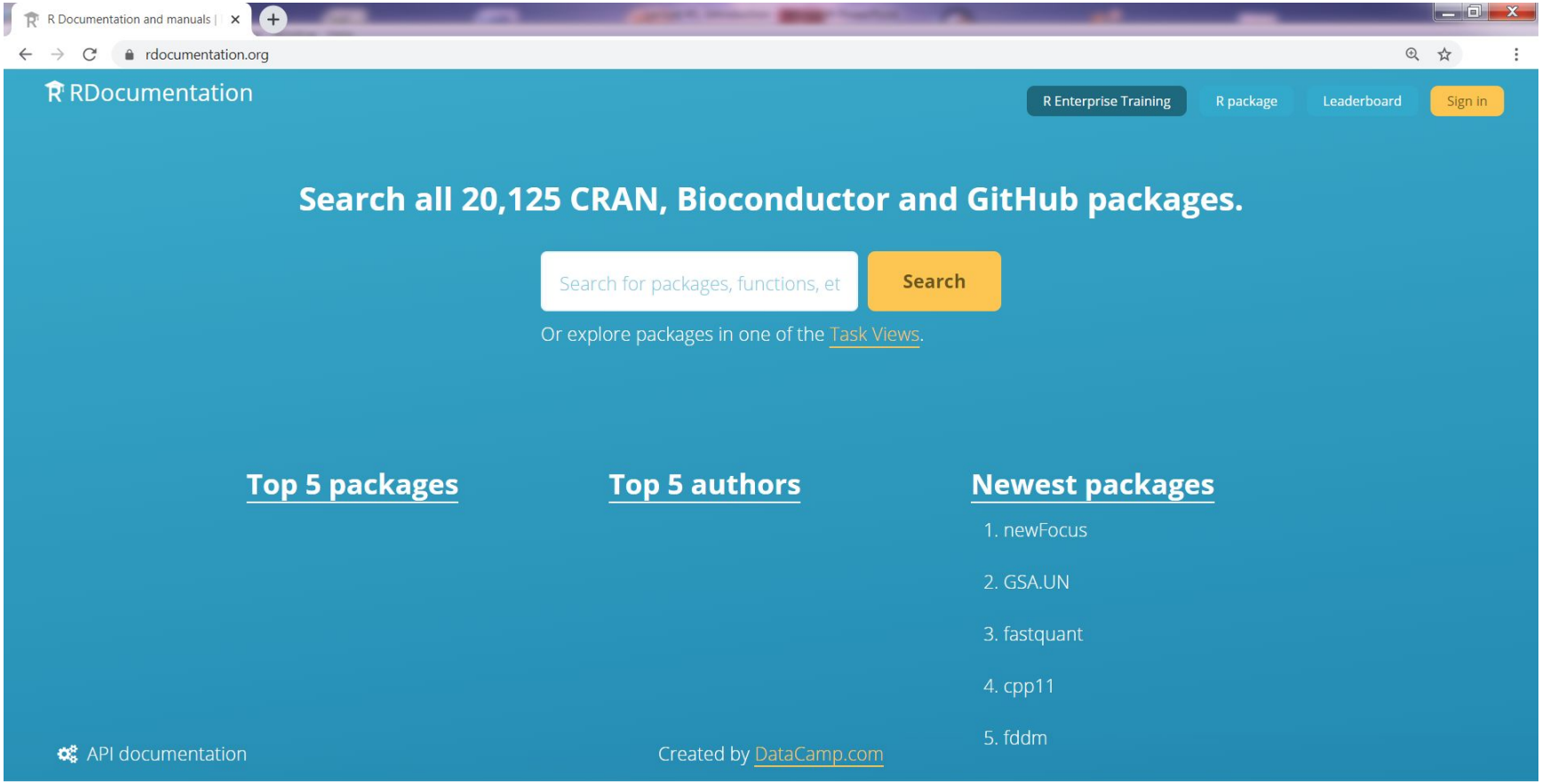
`use.classes`
: logical: should lowercase characters be removed first?

`dot`
: logical: should a dot (".") be appended?

https://stat.ethz.ch/R-manual/R-devel/library/base/html/abbreviate.html

PRACTICAL TASK #5: Getting help on R issues

R documentation



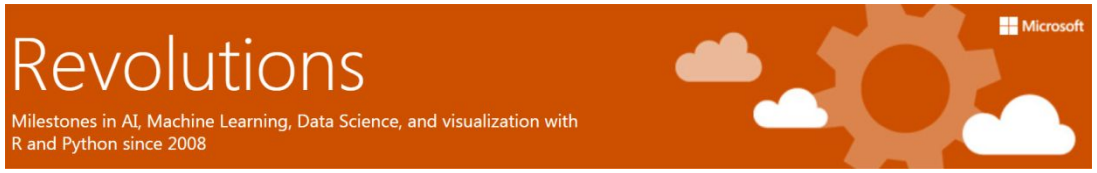
https://www.rdocumentation.org/

PRACTICAL TASK #5: Getting help on R issues

R community: blogs and blog aggregators

R-bloggers (https://www.r-bloggers.com)
R-Bloggers is a blog aggregator of content contributed by bloggers who write about R.

R Studio® Community (https://community.rstudio.com)
RStudio Community is a blog aggregator for all things R and RStudio.



(https://blog.revolutionanalytics.com/about.html)
Revolutions is a blog dedicated to news and information of interest to members of the R community

R exercises (https://www.r-exercises.com/)
R-exercises aims to help people develop and improve their R programming skills

R АНАЛИЗ И ВИЗУАЛИЗАЦИЯ ДАННЫХ

(https://r-analytics.blogspot.com/)
Этот блог посвящен языку программирования и системе статистических вычислений R.

PRACTICAL TASK #5: Getting help on R issues

Internal R documentation

```
### List of installed packages
> attr(installed.packages()[, 1], "names")

### Get help on a package
> ?base
> library(help="base")

### Get help on a function
> ls(pos="package:base")
> ?sqrt
> ??abs

### Get help on an operator
> ?"+"
> ??"+"
```

THANKS FOR YOUR ATTENTION!

https://www.sr-sv.com/the-power-of-r-for-trading-part-1/