



Biostatistics: Theory and Applications in R (Virtual)

Introduction to



Prof. Dr. Swapan Kumar Sarker

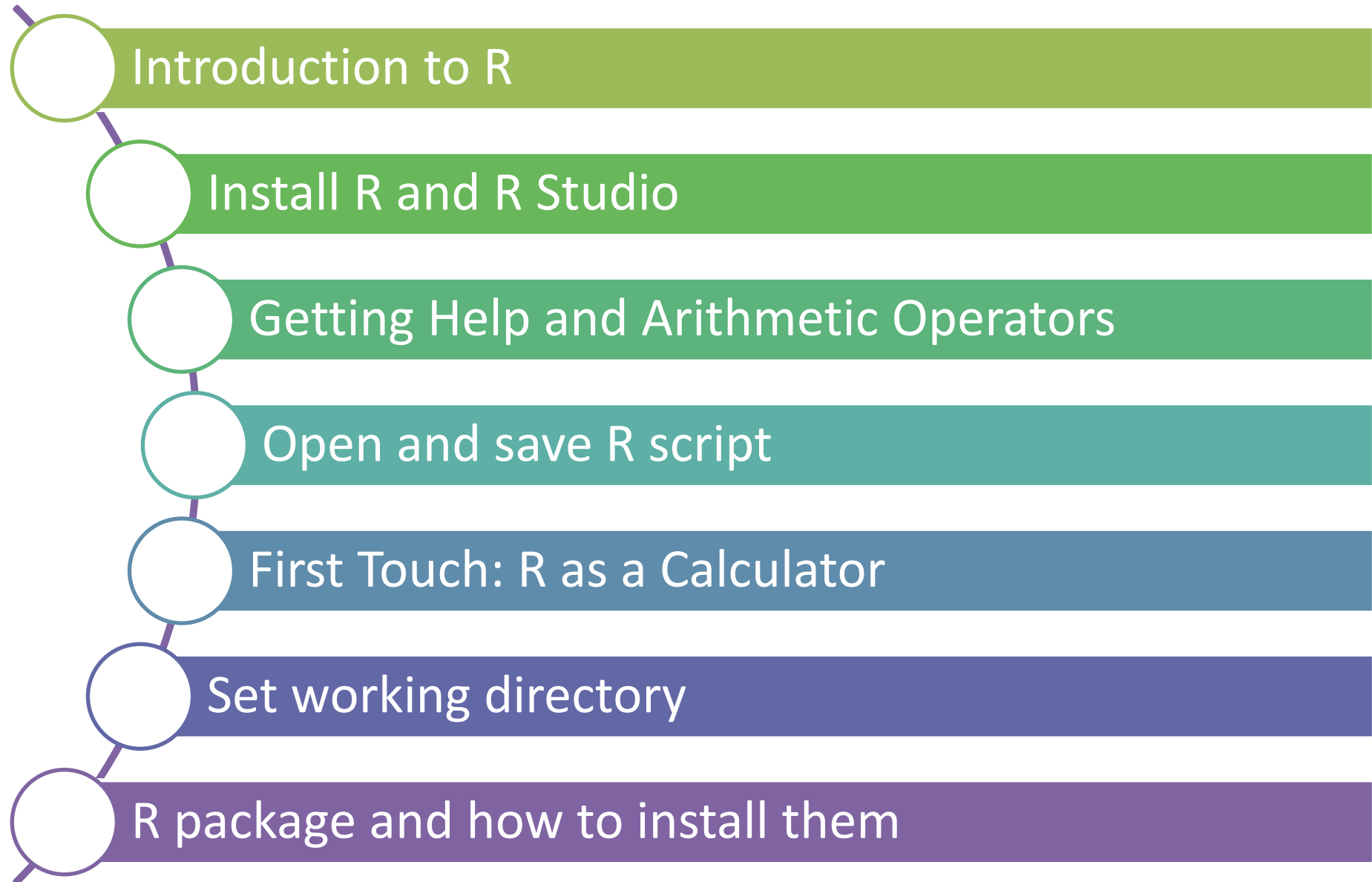
Department of Forestry and Environmental Science
Coordinator: BTAR Training program
Shahjalal University of Science and Technology
Sylhet, Bangladesh



Prof. Dr. Md Abu Sayed Arfin Khan (Nobel)

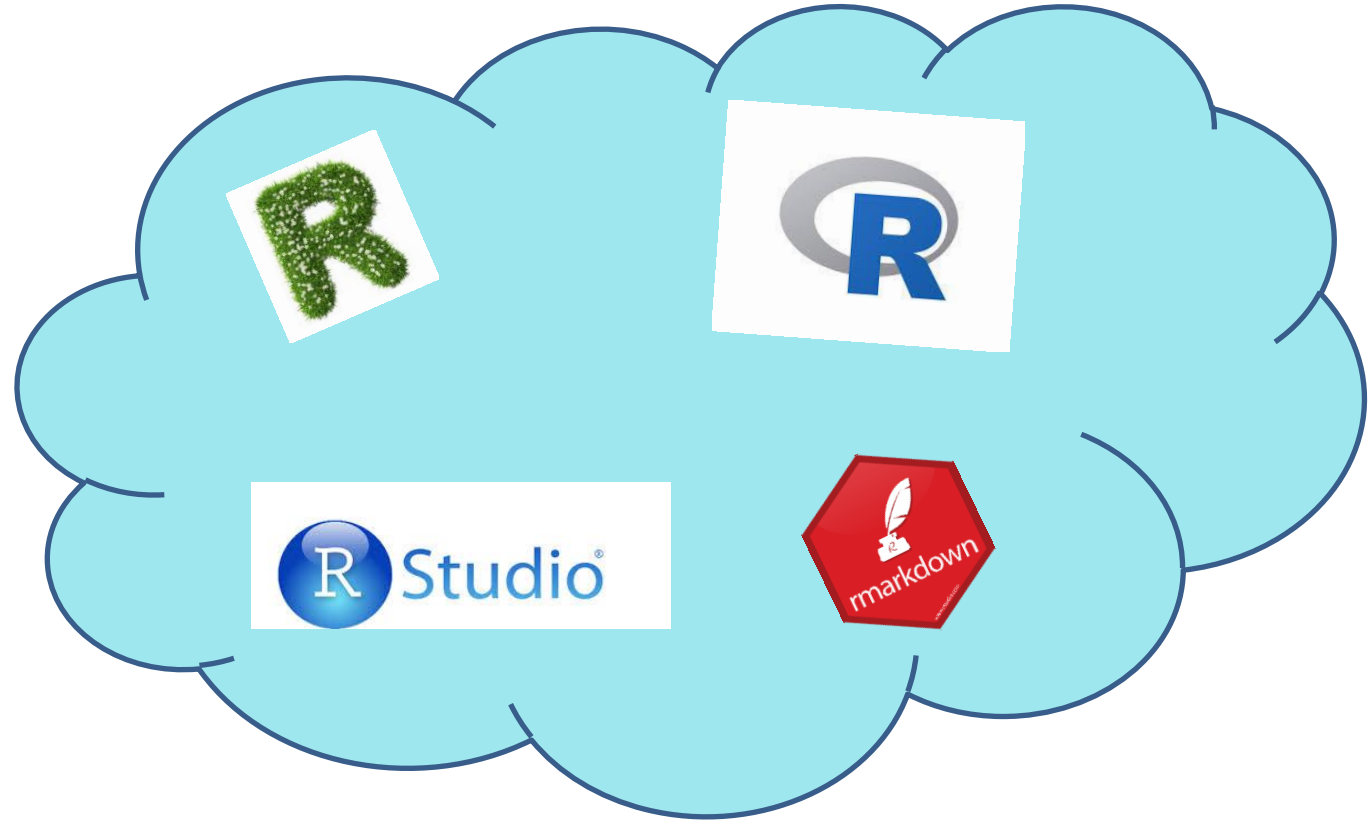
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Outline of the class



What is R?

“R is a language and environment for statistical computing and graphics. R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, ...) and graphical techniques, and is highly extensible”.



Why to use R?

- ✓ a powerful tool for all sorts of statistical problems (and more)
- ✓ standard in science
- ✓ increasingly popular in ecology, economy & industry

Advantages and disadvantages of R

Advantages

- extremely powerful once you get the hang of it
- good for big data sets
- good for repetitive tasks
- recycle old code for new tasks
- no "how on earth did I do this last month?"
- lots of things you simply can't do in Excel
- free, open source

Disadvantages

- kind of scary
- steep learning curve
- not always intuitive
- slow for certain applications
(but more than fast enough for what most people do with it)

How to install R?

<https://cran.r-project.org/>
or <https://cran.rstudio.com/>
or <https://www.rstudio.com/products/rstudio/download/>
<https://posit.co/download/rstudio-desktop/>

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R for Windows

Subdirectories:

[base](#) Binaries for base distribution. This is what you want to [install R for the first time](#).
[contrib](#) Binaries of contributed CRAN packages (for R \geq 3.4.x).
[old contrib](#) Binaries of contributed CRAN packages for outdated versions of R (for R $<$ 3.4.x).
[Rtools](#) Tools to build R and R packages. This is what you want to build your own packages on Windows, or to build R itself.

Download R 4.2.2 for Windows (76 megabytes, 64 bit)



R-4.2.2 for Windows

[Download R-4.2.2 for Windows](#) (76 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](#)

Rstudio: Download the RStudio IDE

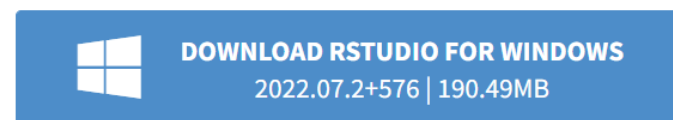
<https://www.rstudio.com/products/rstudio/download/>
<https://posit.co/download/rstudio-desktop/>

RStudio Desktop	RStudio Desktop Pro	RStudio Server	RStudio Workbench
Open Source License	Commercial License	Open Source License	Commercial License
Free	\$995 /year	Free	\$4,975 /year (5 Named Users)
DOWNLOAD Learn more	BUY Learn more	DOWNLOAD Learn more	BUY Evaluation Learn more
✓	✓	✓	✓



RStudio Desktop 2022.07.2+576 - [Release Notes](#)

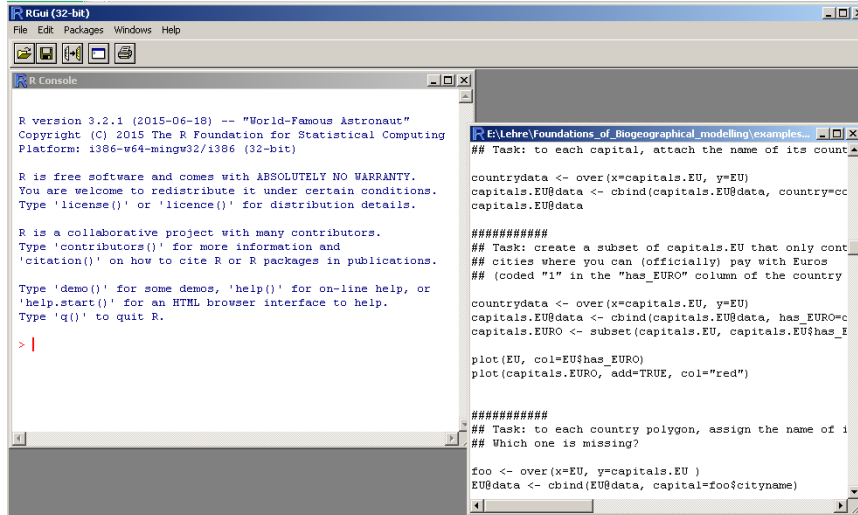
1. Install R. RStudio requires R 3.3.0+.
2. Download RStudio Desktop. Recommended for your system:



Requires Windows 10/11 (64-bit)

What does it look like?

Basic built-in R GUI on Windows



```
R version 3.2.1 (2015-06-18) -- "World-Famous Astronaut"
Copyright (C) 2015 The R Foundation for Statistical Computing
Platform: i386-w64-mingw32/i386 (32-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.

> |

## Task: to each capital, attach the name of its count...
countrydata <- over(x=capitals.EU, y=EU)
capitals.EU@data <- cbind(capitals.EU@data, country=cc
capitals.EU@data

#####
## Task: create a subset of capitals.EU that only cont
## cities where you can (officially) pay with Euros
## (coded "1" in the "has_EURO" column of the country

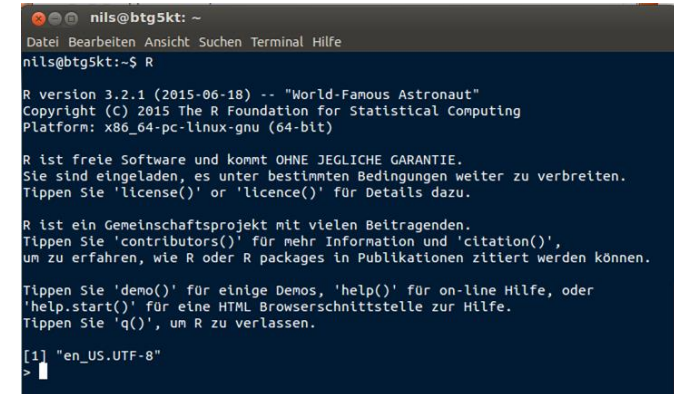
countrydata <- over(x=capitals.EU, y=EU)
capitals.EU@data <- cbind(capitals.EU@data, has_EURO=c
capitals.EURO <- subset(capitals.EU, capitals.EU$has_E

plot(EU, col=EU$has_EURO)
plot(capitals.EURO, add=TRUE, col="red")

#####
## Task: to each country polygon, assign the name of i
## Which one is missing?

foo <- over(x=EU, y=capitals.EU )
EU@data <- cbind(EU@data, capital=foo$cityname)
```

Basic R in a Linux terminal



```
nils@btg5kt: ~
Datei Bearbeiten Ansicht Suchen Terminal Hilfe
nils@btg5kt:~$ R

R version 3.2.1 (2015-06-18) -- "World-Famous Astronaut"
Copyright (C) 2015 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (64-bit)

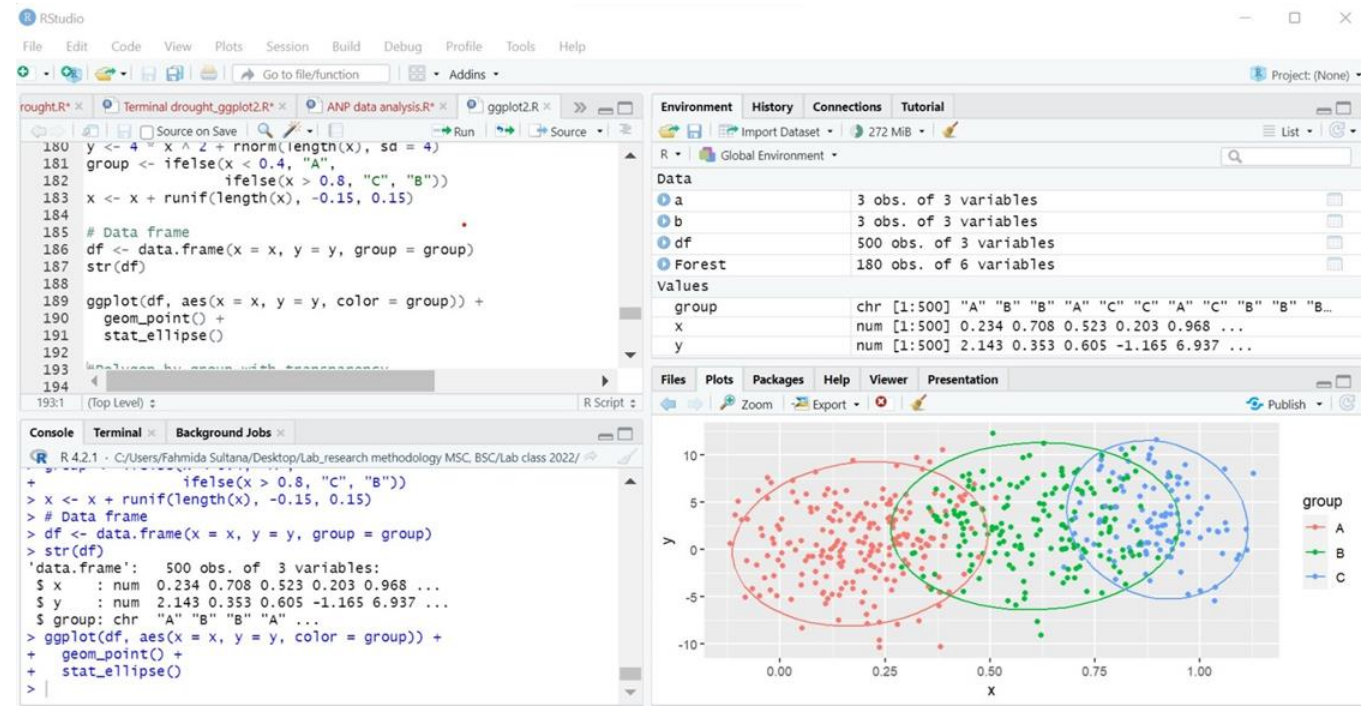
R ist freie Software und kommt OHNE JEGLICHE GARANTIE.
Sie sind eingeladen, es unter bestimmten Bedingungen weiter zu verbreiten.
Tippen Sie 'license()' or 'licence()' für Details dazu.

R ist ein Gemeinschaftsprojekt mit vielen Beitragenden.
Tippen Sie 'contributors()' für mehr Information und 'citation()',
um zu erfahren, wie R oder R packages in Publikationen zitiert werden können.

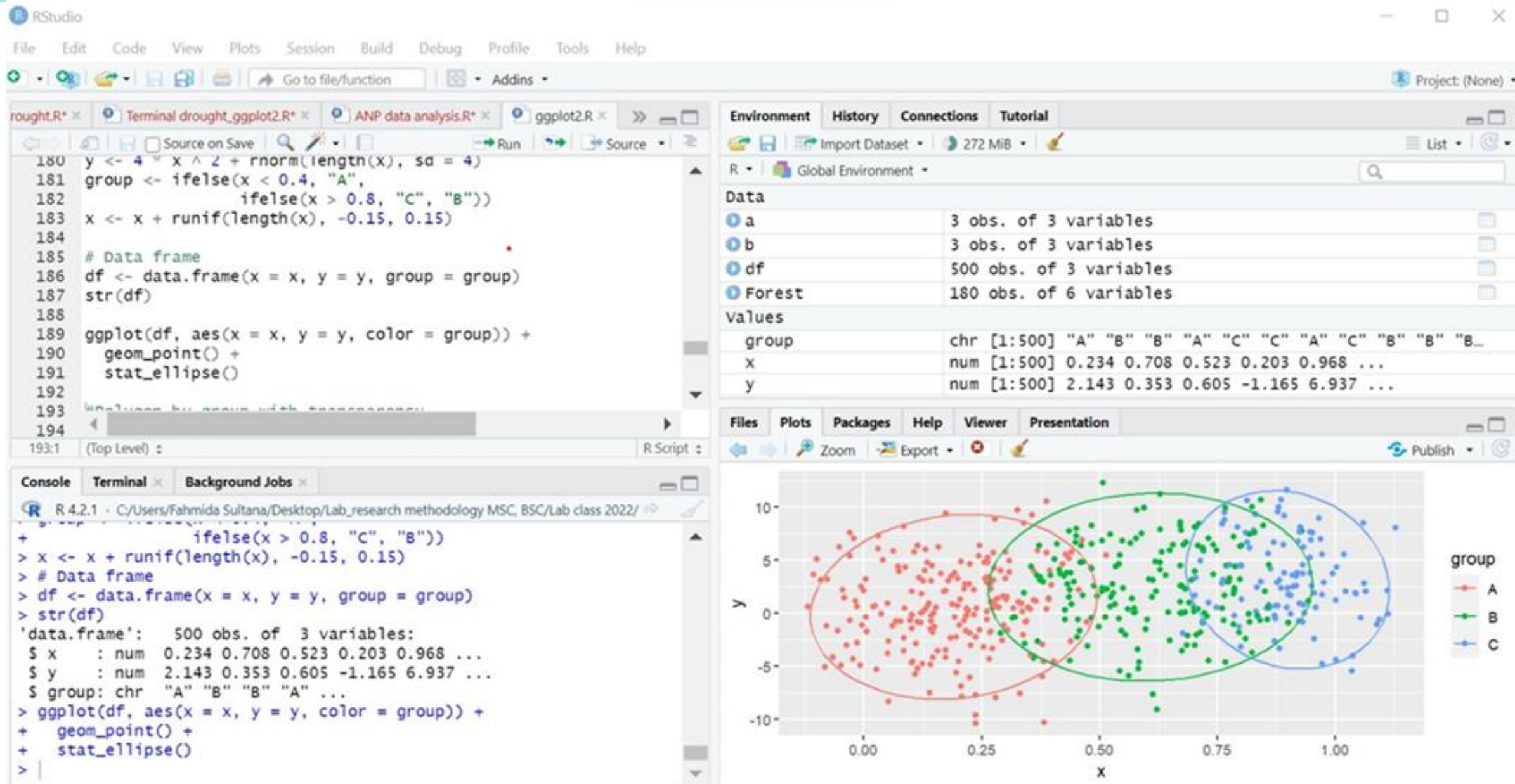
Tippen Sie 'demo()' für einige Demos, 'help()' für on-line Hilfe, oder
'help.start()' für eine HTML Browserschnittstelle zur Hilfe.
Tippen Sie 'q()', um R zu verlassen.

[1] "en_US.UTF-8"
> |
```

Advanced IDE "RStudio"



RStudio



Present the windows

Workspace- tells you the variables that you've created

Saves the commands that you used and you can reuse them

R source editor
-type commands
and scripts

Console
Execute
script

The screenshot shows the RStudio environment with several windows and annotations:

- Source Editor:** The top-left pane shows an R script with comments and basic math operations. An arrow points to it from the text "R source editor -type commands and scripts".
- Console:** The bottom-left pane shows the output of the script execution. An arrow points to it from the text "Console Execute script".
- Environment:** The top-right pane shows the current workspace, which is empty. An arrow points to it from the text "Workspace- tells you the variables that you've created".
- History:** The top-right pane shows the history of commands. An arrow points to it from the text "Saves the commands that you used and you can reuse them".
- Files, Plots, Packages, Help, Viewer:** The bottom-right pane shows the R documentation for the `read.table` function. A red circle highlights the tabs at the top of this pane. An arrow points to it from the text "Files Plots Packages Help Viewer".

Getting Help

- Overview at r-project.org/help
- [FAQs at CRAN](#)
- Official manual "An Introduction to R"
 - [as html](#) (for online viewing)
 - [as PDF](#) (for downloading)
- Many more in different languages
- Built-in Help
 - type **help.start()** for interactive help in web browser
 - type **?functionname** for documentation of specific functions/commands (example: **?print**)
 - single letters like "R" are difficult for search engines
 - a customized Google search for R is available at <http://rseek.org/>

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Arithmetic Operators

Operator	Description
+	addition
-	subtraction
*	multiplication
/	division
^ or **	exponentiation

The ^ operator raises the number to its left to the power of the number to its right: for example 3^2 is 9.

Introduction to R

Presentation

- Introduction to R
- Install R and R Studio
- Getting Help
- Arithmetic Operators

Done

R session

- Open and save R script
- First Touch: R as a Calculator
- Set working directory
- R package and how to install them

**Please
open
RStudio**

Thank you