Introduction to R and RStudio

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Monday, September 13, 2021

Approximate time: 120 minutes

Learning Objectives

- Describe what R and RStudio are.
- Interact with R using RStudio.
- Use the various components of RStudio.
- Setting up a GitHub profile and creating first GitHub repository

What is R?

The common misconception is that R is a programming language but in fact it is much more than that. Think of R as an environment for statistical computing and graphics, which brings together a number of features to provide powerful functionality.

The R environment combines:

- effective handling of big data
- collection of integrated tools
- graphical facilities
- simple and effective programming language

Why use R?

R is a powerful, extensible environment. It has a wide range of statistics and general data analysis and visualization capabilities.

- Data handling, wrangling, and storage
- Wide array of statistical methods and graphical techniques available
- Easy to install on any platform and use (and it's free!)
- Open source with a large and growing community of peers

What is RStudio?

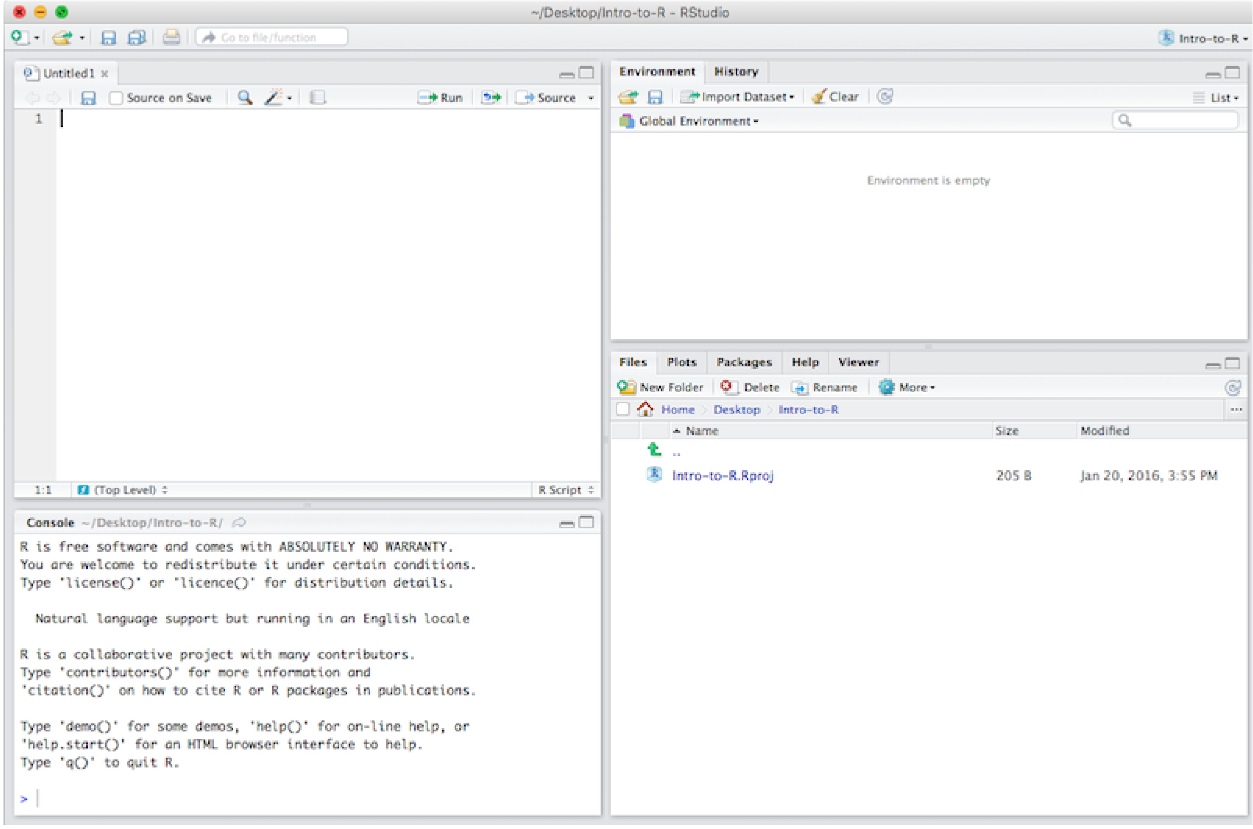
RStudio is freely available open-source Integrated Development Environment (IDE). RStudio provides an environment with many features to make using R easier and is a great alternative to working on R in the terminal.

- Graphical user interface, not just a command prompt
- Great learning tool
- Free for academic use
- Platform agnostic
- Open source

Creating a new project directory in RStudio

Let's create a new project directory for our "Introduction to R" lesson today.

1. Open RStudio
2. Go to the `File` menu and select `New Project`.



Name	Size	Modified
..		
Intro-to-R.Rproj	205 B	Jan 20, 2016, 3:55 PM

```
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.

> 
```

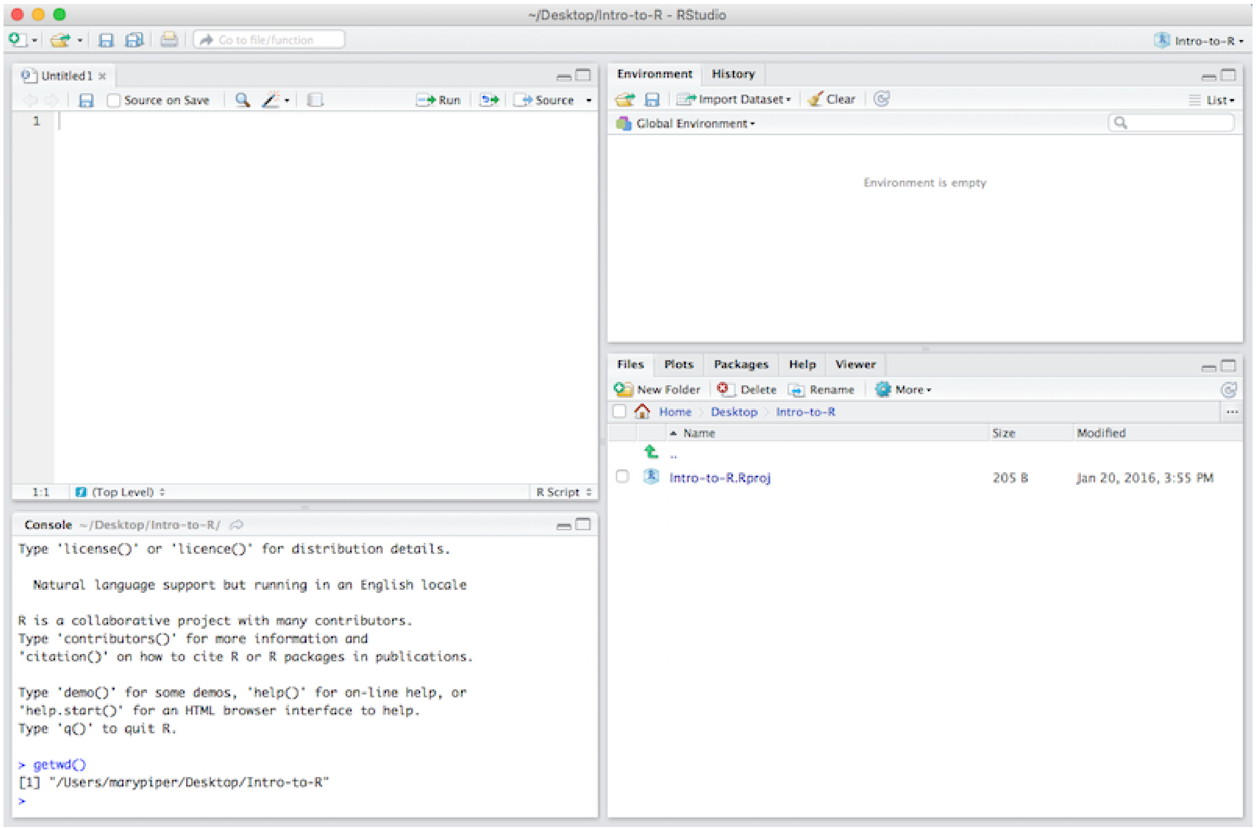
Figure 1: RStudio interface

3. In the `New Project` window, choose `New Directory`. Then, choose `Empty Project`. Name your new directory `Intro-to-R` and then "Create the project as subdirectory of:" the Desktop (or location of your choice).
4. Click on `Create Project`.
5. After your project is completed, if the project does not automatically open in RStudio, then go to the `File` menu, select `Open Project`, and choose `Intro-to-R.Rproj`.
6. When RStudio opens, you will see three panels in the window.
7. Go to the `File` menu and select `New File`, and select `R Script`. The RStudio interface should now look like the screenshot below.

RStudio Interface

The RStudio interface has four main panels:

1. **Console**: where you can type commands and see output. *The console is all you would see if you ran R in the command line without RStudio.*
2. **Script editor**: where you can type out commands and save to file. You can also submit the commands to run in the console.
3. **Environment/History**: environment shows all active objects and history keeps track of all commands run in console
4. **Files/Plots/Packages/Help**



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Type 'q()' to quit R.

> getwd()
[1] "/Users/marypiper/Desktop/Intro-to-R"
>
```

Figure 2: Viewing your working directory

Organizing your working directory & setting up

Viewing your working directory

Before we organize our working directory, let's check to see where our current working directory is located by typing into the console:

```
getwd()
```

Your working directory should be the `Intro-to-R` folder constructed when you created the project. The working directory is where RStudio will automatically look for any files you bring in and where it will automatically save any files you create, unless otherwise specified.

You can visualize your working directory by selecting the `Files` tab from the **Files/Plots/Packages/Help** window.

If you wanted to choose a different directory to be your working directory, you could navigate to a different folder in the `Files` tab, then, click on the `More` dropdown menu and select `Set As Working Directory`.

Structuring your working directory

To organize your working directory for a particular analysis, you should separate the original data (raw data) from intermediate datasets. For instance, you may want to create a `data/` directory within your working directory that stores the raw data, and have a `results/` directory for intermediate datasets and a `figures/` directory for the plots you will generate.

Let's create these three directories within your working directory by clicking on `New Folder` within the `Files` tab.

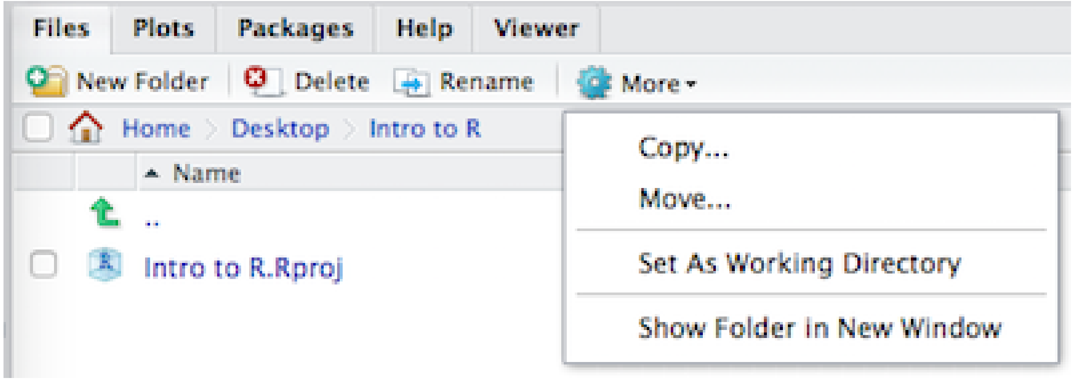


Figure 3: Setting your working directory

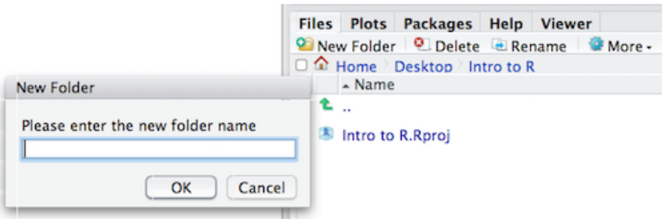


Figure 4: Structuring your working directory

When finished, your working directory should look like:

Adding files to your working directory

There are a few files that we will be working with in the next few lessons and you can access them using the links provided below. If you right click on the link, and "Save link as..". Choose `~/Desktop/Intro-to-R/data` as the destination of the file. You should now see the file appear in your working directory. **We will discuss these files a bit later in the lesson.**

- Download the **data set contains information about the trees located on Belfast streets.** by clicking on this link

  NOTE: If the files download automatically to some other location on your laptop, you can move them to the your working directory using your file explorer or finder (outside RStudio), or navigating to the files in the `Files` tab of the bottom right panel of RStudio

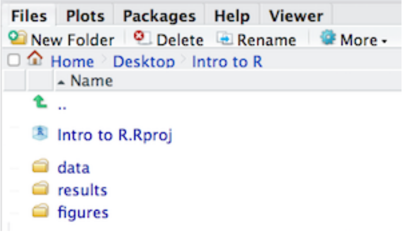
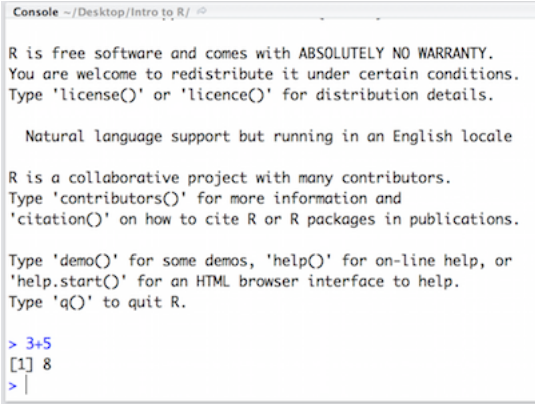


Figure 5: Your organized working directory



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Type 'q()' to quit R.

> 3+5
[1] 8
> 
```

Figure 6: Running in the console

Interacting with R

Now that we have our interface and directory structure set up, let's start playing with R! There are **two main ways** of interacting with R in RStudio: using the **console** or by using **script editor** (plain text files that contain your code).

Console window

The **console window** (in RStudio, the bottom left panel) is the place where R is waiting for you to tell it what to do, and where it will show the results of a command. You can type commands directly into the console, but they will be forgotten when you close the session.

Let's test it out:

```r
3 + 5
```

What is GitHub?

GitHub is a code hosting platform for version control and collaboration. It lets you and others work together on projects from anywhere. Here we will teaches you GitHub essentials such repositories, branches, commits, and Pull Requests. You'll create your own `Introduction2R` repository and commit all your work day-by-day.

#

To use GitHub you need a GitHub account and Internet access. You don't need to know how to code. However, please focus why we are using it. Now, please click here Sign-Up to create a GitHub account.

After creating GitHub account, please follow the given steps:

Step 1. Create a Repository

A repository is usually used to organize a single project. Repositories can contain folders and files, images, videos, spreadsheets, and data sets – anything your project needs. We recommend including a README, or a file with information about your project. GitHub makes it easy to add one at the same time you create your new repository. It also offers other common options such as a license file.

Your `Introduction2R` repository can be a place where you store ideas, resources, or even share and discuss things with others.

Step 2. To create a new repository

In the upper right corner, next to your avatar or identicon, click and then select New repository.

1. Name your repository `Introduction2R`.
2. Write a short description.
3. Select Initialize this repository with a README.
4. Click `Create repository`.

Step 3. Make and commit changes

1. Click the README.md file.
2. Click the pencil icon in the upper right corner of the file view to edit.
3. In the editor, write a bit about yourself.
4. Write a commit message that describes your changes.
5. Click Commit changes button.