Applied Statistics: R
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Basics on Git & LaTeX

Throughout the course we will use these tools. Please install the software and make sure you understand the basics. If you need assistance, ask Google.

1 Github

Git is a software that allows to do subversions of a projects with invited collaborators.

1.1 Installation

For Linux and Mac users, just open the terminal and write

```
> sudo apt-get install git
> git --version
```

Windows users can download Git directly from here.

1.2 Configuration

First configure your credentials

```
> git config --global user.name "Tu nombre"
> git config --global user.email Tu-email
```

and verify that everything worked:

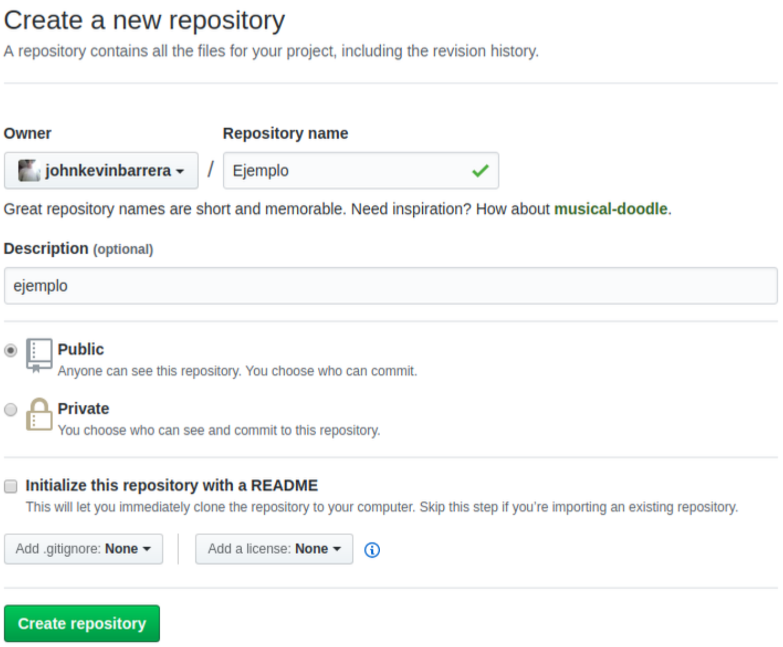
```
> git config --list
```

1.3 Projects

There are two ways of creating a new project: on line (called repository) and locally. To create an online project, use Github, which allows you to dump your stuff in the cloud. To do so, follow these steps:

1. Create a new account
2. Create a new repository for your project. See figure 1.

Figure 1: Creating a new repository.



Create a new repository

A repository contains all the files for your project, including the revision history.

Owner: johnkevinbarrera / Repository name: Ejemplo ✓

Great repository names are short and memorable. Need inspiration? How about musical-doodle.

Description (optional): ejemplo

● Public
Anyone can see this repository. You choose who can commit.

○ Private
You choose who can see and commit to this repository.

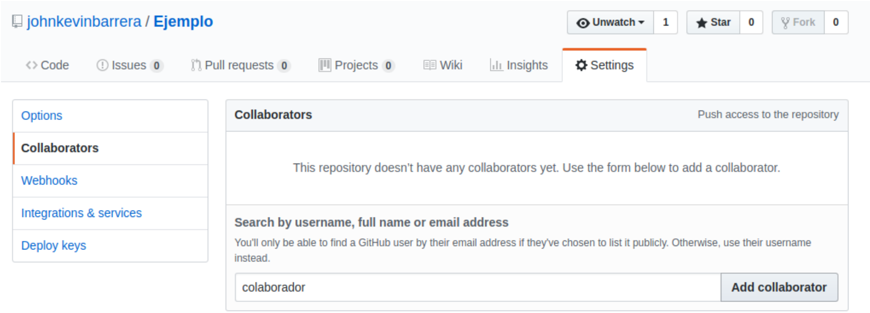
□ Initialize this repository with a README
This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

Add .gitignore: None

Add a license: None

3. Add collaborators to the project. See figure 2.

Figure 2: Adding collaborators to the project.



Collaborators

Push access to the repository

This repository doesn't have any collaborators yet. Use the form below to add a collaborator.

Search by username, full name or email address

You'll only be able to find a GitHub user by their email address if they've chosen to list it publicly. Otherwise, use their username instead.

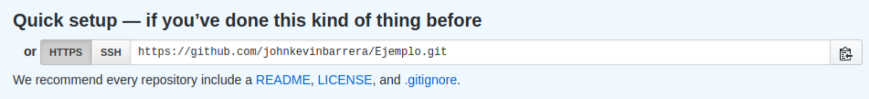
colaborador

4. Share the URL of the project. See figure 3.

To download and work with an existing project, write:

```
> git clone github_url
```

Figure 3: Sharing the URL of the project.



Quick setup — if you've done this kind of thing before

https://github.com/johnkevinbarrera/Ejemplo.git

We recommend every repository include a README, LICENSE, and .gitignore.

1.4 Commiting

To commit changes on your project, write:

```
> git add .
> git commit -m "nombre de tu nueva version"
```

This will allow you to have subversions of your project, i.e. being able to return to previous versions if needed. To visualize all previous commits, write:

```
> git log
```

To return to a specific commit, write:

```
> git checkout <commit_hash>
```

1.5 Updating

To update your repository with your local project, write:

```
> git push
# If you are using branching, write:
> git push -u origin name_of_branch
```

To do it the other way around, i.e. update your local project with your repository, write:

```
> git pull
```

GUI

There are many free GUI alternatives, e.g. Gitkraken. For more information look at the Git documentation here.

2 LaTeX

Lamport TeX is a document preparation system that handles math expressions easily. It is not a WYSIWSG processor, as the project needs to be compiled before printing. We recommend the use of TexStudio, which a software compatible with "big" OS's.

2.1 Basic Structure

A basic structure of a LaTeXdocument is:

```
\documentclass[options]{clase}
% Preamble
\begin{document}
% Document
\end{document}
```

For now consider in the `options` slot: `a4paper,12pt`.

1. Spaces:
   - If needed, an “extra” blank space can be added by writing the backslash symbol followed by a spacebar hit.
   - Arbitrary horizontal and vertical spaces can be added, e.g.

     ```
     \hspace{4mm} or \vspace{1cm}
     ```

   - Predefined horizontal and vertical spaces are also used, e.g.

     ```
     \smallskip, \medskip, \bigskip.
     ```

2. Special symbols
   - Spanish. Accents and ortographic signs with no standard ASCII codes, e.g. “á”, “ñ”, “¿”or “¡”, are obtained as

     ```
     \'a     \~n     ?`     !`
     ```

     respectively.
   - Protected symbols. Some symbols do have an ASCII code, but are protected. E.g. “$” ,“&”, “%”, “{” or “}”, which should be written as

     ```
     \$     \&     \%     \{     \}
     ```

     respectively.

3. Size and style
   - Shape. Upright, Italic, Slanted, boldface or Small Caps can be obtained using

     ```
     \upshape, \itshape, \slshape, \textbf and \scshape
     ```

   - Size. Available predefined sizes are

     ```
     \tiny, \scriptsize, \footnotesize, \small, \normalsize or \large
     ```

2.2 Some Math

1. Modes. Two modes are *text* and *display.* The same instruction can give different results depending on the mode. For example $\sum_{n=1}^\infty\frac1{2^n} = 1$ is in *text* mode, while

   $$\sum_{n=1}^\infty\frac1{2^n} = 1,$$

   is in display mode. Both results are obtained by writing

   ```
   $\sum_{n=1}^\infty\frac1{2^n} = 1$, and
   $$\sum_{n=1}^\infty\frac1{2^n} = 1$$,
   ```

   respectively, which means that wrapping an expression with "$" returns a math expression in *text* mode, while wrapping it with $$ returns the same in *display* mode.

2. Spaces. Sometimes extra spaces are helpful. For example, the differential expression $dy = 2x\,dx$ is preferred to $dy = 2xdx$. To obtain the first case one can write

   ```
   $$dy=2x\,dx$$, or
   $$dy=2x\quad dx$$, or
   $$dy=2x\qquad dx$$.
   ```

3. Sub– and supra–indices. For subindices use underscore and for supra indices use the power symbol. For example $a_{ij} = 3^i-b_{i_j}$ is produced by

   ```
   $a_{ij} = 3^i-b_{i_j}$.
   ```

4. Fractions. We obtain $1+\frac{1}{1+\frac{1}{5}}$ and $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$, by writing

   ```
   $$1+\frac{1}{1+\frac{1}{5}}$$, and
   $$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$
   ```

   respectively.

5. Greek letters. The whole greek alphabet. The coding is rather obvious

   ```
   \alpha,  \beta, \gamma,  \delta, ...
   \Alpha,  \Beta, \Gamma,  \Delta, ...
   ```

6. Special symbols. Also very useful

   ```
   \|,    \emptyset,    \nabla,    \forall,
   \exists,    \infty,    \partial,    \neg
   ```

7. Binary operators

   ```
   \pm,    \mp,    \times,    \circ,
   \cap,    \cup,    \circ,    \cdot
   ```

8. Relations

```
\approx,    \neq,    \leq,    \geq,    \equiv,    \sim,    \in,
\notin,    \subset,    \subseteq,    \supset,    \supseteq,
```

9. Operators

```
\arccos,    \cos,     \sec,     \ln,     \lim,     \max,     \sup
\arcsin,     \sin,    \csc,     \log,     \ker,    \min,    \inf
\arctan,    \tan,    \cot,    \exp,     \det,     \dim,    \arg
```

2.3 Matrices and Tables

To write matrices and tables we use the *array* and *tabular* environments

1. Matrices. The matrix

$$A = \left[\begin{array}{rccl} 1.234 & -5 & x & 0.234 \\ 280 & 0 & x^2+2 & 1.22 \end{array} \right]$$

was obtained by writing the following

```
$$
A = \left[
\begin{array}{rccl}
1.234 & -5 & x & 0.234\\
280 & 0 & x^2+2 & 1.22
\end{array}
\right]
$$,
```

where letters rccl should be read as right-center-center-left alignment for column. Also, matrix structures can be used to represent objects that are not necessarily matrices. For example, if we write

```
$$
f(x) = \left\{
\begin{array}{cl}
x^2+y&\mbox{si } x > y\\
y^3&\mbox{si } x\leq y
\end{array}\right.
$$
```

we obtain

$$f(x) = \left\{ \begin{array}{cl} x^2+y & \mbox{si } x > y \\ y^3 & \mbox{si } x \leq y \end{array} \right.$$

It is also common to use the *bmatrix* environment for matrices, and the *cases* environment for functions with critical values.

2. Tables. Similar to matrices. The table

	Price
Product	Min–Max
A	100–300
B	1.230–2.000
C	3.000–5.000

was obtained by writing

```
\begin{center}
\begin{tabular}{|c|r@{--}l|}
\hline
&\multicolumn{2}{c|}{Price}\\
\cline{2-3}
Product &Min      &Max\\
\hline
A       &100      &300\\
B       &1.230    & 2.000\\
C       &3.000    & 5.000\\
\hline
\end{tabular}
\end{center}
```

3. Equation alignment. The equation

$$\begin{array}{rcl}
x &=& y\\
x^2 &=& xy\\
x^2-y^2 &=& xy-y^2\\
(x+y)(x-y) &=& y(x-y)\\
x+y &=& y\\
2y &=& y\quad \mbox{(using the first equality)}\\
2 &=& 1
\end{array}$$

is obtained by writing

```
\begin{eqnarray*}
x&=&y\\
x^2&=&xy\\
x^2-y^2&=&xy-y^2\\
(x+y)(x-y)&=&y(x-y)\\
x+y&=&y\\
2y&=&y\quad \mbox{(using the first equality)}\\
2&=&1
\end{eqnarray*}
```