

WWZ Workshop

Clean Code in Context

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13:00-16:00

Agenda

- 13:00-13:15 Recap Crash Course
- 13:15-14:15 File Structure, Data Formats and More
- 14:15-14:30 Break
- 14:30-15:15 Group Work
- 15:15-16:00 Example and Q&A

“I like my code to be **elegant and efficient**. The logic should be straightforward to make it hard for bugs to hide, the dependencies minimal to ease maintenance, error handling complete according to an articulated strategy, and performance close to optimal so as not to tempt people to make the code messy with unprincipled optimizations. **Clean code does one thing well.**”¹

- *Bjarne Stroustrup, inventor of C++ (emphasis mine)*

¹Cited in Martin, R. (2015): Clean Code. Upper Saddle River, NJ: Prentice Hall.

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- ▶ It is important for **reproducibility**
 - ▶ Being mindful of your code while working on a project will save time later when putting together reproduction materials

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- ▶ **DRY**: Don't Repeat Yourself

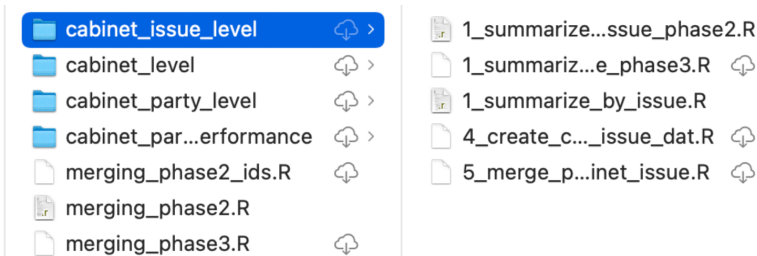
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- ▶ **KISS**: Keep It Simple, Stupid

File Structure



A good start, but not ideal

File Structure²

Why do it? The arguments for clean code apply here as well:

²Based on this [explainer](#) by MIT Communication Lab.

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Why do it? The arguments for clean code apply here as well:

- ▶ It simplifies cooperation
 - ▶ Create a more streamlined analysis workflow
 - ▶ No time wasted when trying to understand project structure
 - ▶ Reproducibility

²Based on this [explainer](#) by MIT Communication Lab.

File Structure

General good practice:

- ▶ Have one main folder per project
- ▶ Subfolders: number and type depends on project (see [here](#) for examples)
- ▶ Separate raw data from edited data
- ▶ Be consistent with naming subfolders and files

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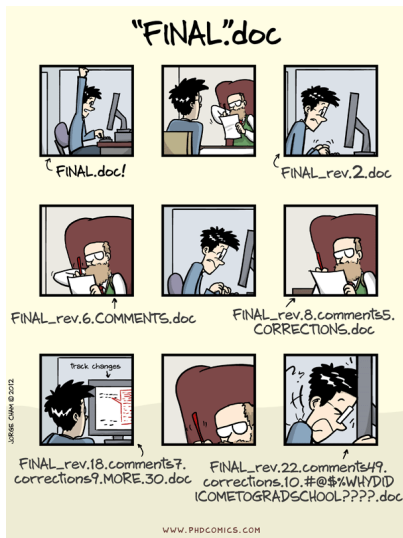
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Another option is camelCase: e.g. `firstNameLastName`

Mixing delimiters can work well in some cases (e.g. camelCase and periods; `20240305.AntheaAlberto.v1.csv`), but I would avoid mixing hyphens, underscores and periods.

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If you use dates (which can make a lot of sense): ideally use YYYYMMDD format (or variations thereof, like YYYY-MM-DD).

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| | |
|-------------|---|
| — Makefile | |
| — README.md | <- If you don't have a README did you even make a repo? |
| — data | <- OTU tables (if small enough), QIIME 2 outputs, metadata excel files, trees, etc. |
| — src | <- All code: scripts, notebooks, etc. |
| — final | <- Final figures, supp files, tables. |

Example folder structure (Source: [Claire Duvallet](#))

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This sound negligible, but it can be a time saver if your data frame takes a while to load.

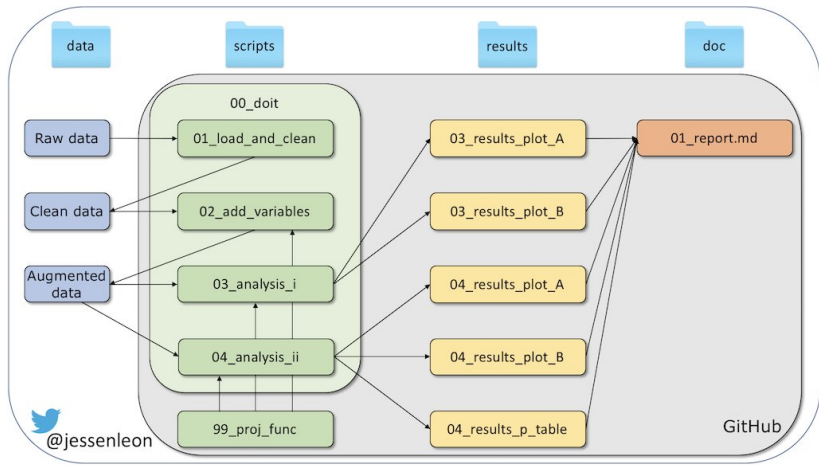
Folder structure

Case Study 2: A Simple Hierarchy

```
PROJECT/
├── bin/           <- compiled binaries.
├── data/
│   ├── raw/
│   └── clean/
├── figures/       <- figures used in place of a "results" folder.
├── scripts/
│   ├── process/  <- scripts to manipulate data between raw, cleaned, final stages.
│   └── plot/     <- intermediate plotting.
├── src
│   ├── model1/   <- various experimental models.
│   ├── model2/
│   └── model3/
├── LICENSE
├── Makefile
└── readme.md
```

Source: [Case studies from mitcommlab](#)

Folder structure/scripts



Source: [Leon Eyrich Jessen on Twitter](#)

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If you have an operation that takes a long time, it might be a good idea to save the results as an `.RData` file and make a new script were you simply load it.

You can find a discussion [here](#).

Examples & Resources

Examples for different project types [here](#).

[Tips, tricks and philosophies on computational work](#) by Claire Duvallet

File formats

There are [a lot](#) of them.

Generally, you should strive to use something that is usable across operating systems; something not Mac or Windows specific.

I'd recommend .rtf (text) and .csv (spreadsheets), and, more generally, \LaTeX .



LaTeX is a typesetting software designed to work independently of OS.

The learning curve is quite steep at the beginning, but it's worth it.

I can recommend [Overleaf](#), an online LaTeX editor.

I teach an intro course on LaTeX for [GRACE Transferable Skills](#).

File encoding

If possible, use **UTF-8** encoding for all your documents.

UTF-8 solves most internationalization issues (meaning it can handle a variety of alphabets without returning gibberish).

Still, you should avoid using special characters (for example ä, ü, ö) in file and folder names etc, since this can lead to issues.

File encoding

In R and Python you can specifically choose UTF-8 as encoding when saving a file (useful when working with text data, currency signs...).

You can also change a document's encoding when loading it into your environment. This may require some trial and error, however.

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You can find an introduction plus tips & tricks here: [R Markdown](#)

Integrating GitHub with RStudio

Follow [the instructions here](#) if you want to integrate GitHub with RStudio.

After following the steps, you'll be able to make commits directly via RStudio, and not use the Desktop app as an in-between.

Integrating GitHub with RStudio

12.4 Make local changes, save, commit

From RStudio, modify the `README.md` file, e.g., by adding the line "This is a line from RStudio". Save your changes.

Commit these changes to your local repo. How?

From RStudio:

- Click the "Git" tab in upper right pane.
- Check "Staged" box for `README.md`.
- If you're not already in the Git pop-up, click "Commit".
- Type a message in "Commit message", such as "Commit from RStudio".
- Click "Commit".

Source: [Happy Git with R Chapter 12](#)

Group Work

Group Work

In groups of 3, make a list of things to think about when starting a new project. What needs to be clarified to make your life easier?

- ▶ Items on the list can refer to working alone or with others
- ▶ You can include your own experiences as well as things you've learned in the course
- ▶ The main aim is to have some sort of checklist you can refer to: it should be helpful to you & other students

- ▶ **Showcase** prepared for teaching purposes
- ▶ A **visualization project** supported by RISE (naming could use work, though!)