

Basic elements of file management

ME 447/547 Visualizing Data

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December 2018

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Effective file management begins when the project begins

Plan your directory
structure

- carpentry
- data
- data-raw
- design
- figures
- reports
- README.Rmd
- portfolio.Rproj

Adopt a scheme to consistently
name your files

Explicitly link files using
relative file paths



Planning the structure

The portfolio project has a mandatory structure

 carpentry 

 data 

 data-raw 

 design 

 figures 

 manage 

 practice 

 reports 

 resources 



























 .gitignore 

 .Renviron 



























 README.Rmd 

 portfolio.Rproj 














Open **portfolio.Rproj** to start every work session

	carpentry	
	data	
	data-raw	
	design	
	figures	
	manage	
	practice	
	reports	
	resources	
	.gitignore	
	.Renviron	
	README.Rmd	
	portfolio.Rproj	 Sets the project directory as the working directory














README introduces your portfolio to the reader

	carpentry	
	data	
	data-raw	
	design	
	figures	
	manage	
	practice	
	reports	
	resources	
	.gitignore	
	.Renviron	
	README.Rmd	 Creates the main page of your portfolio website
	portfolio.Rproj	














Other top-level files perform administrative duties

 carpentry	◀
 data	◀
 data-raw	◀
 design	◀
 figures	◀
 manage	◀
 practice	◀
 reports	◀
 resources	◀
 .gitignore	◀ Directs Git to ignore specific files
 .Renviron	◀ Stores packages in a library separate from base R
 README.Rmd	◀
 portfolio.Rproj	◀














Raw data are never edited manually

	carpentry	<
	data	<
	data-raw	< Data in its original form
	design	<
	figures	<
	manage	<
	practice	<
	reports	<
	resources	<
	.gitignore	<
	.Renviron	<
	README.Rmd	<
	portfolio.Rproj	<














Data carpentry converts raw data to tidy data

 carpentry	◁ R scripts that turn raw data into tidy data
 data	◁
 data-raw	◁ Data in its original form
 design	◁
 figures	◁
 manage	◁
 practice	◁
 reports	◁
 resources	◁
 .gitignore	◁
 .Renviron	◁
 README.Rmd	◁
 portfolio.Rproj	◁














Data carpentry converts raw data to tidy data

 carpentry	◁ R scripts that turn raw data into tidy data
 data	◁ Tidy data saved here, read by design scripts
 data-raw	◁
 design	◁
 figures	◁
 manage	◁
 practice	◁
 reports	◁
 resources	◁
 .gitignore	◁
 .Renviron	◁
 README.Rmd	◁
 portfolio.Rproj	◁



























Graph design converts to tidy data to graphs

 carpentry	◀
 data	◀ Tidy data saved here, read by design scripts
 data-raw	◀
 design	◀ R scripts that create and save graphs
 figures	◀
 manage	◀
 practice	◀
 reports	◀
 resources	◀
 .gitignore	◀
 .Renviron	◀
 README.Rmd	◀
 portfolio.Rproj	◀






















Graph design converts to tidy data to graphs

 carpentry	<
 data	<
 data-raw	<
 design	< R scripts that create and save graphs
 figures	< Graphs saved here, imported by report scripts
 manage	<
 practice	<
 reports	<
 resources	<
 .gitignore	<
 .Renviron	<
 README.Rmd	<
 portfolio.Rproj	<














Reports commingle data, scripts, graphs, prose, and references

 carpentry	
 data	
 data-raw	
 design	
 figures	 Graphs saved here, imported by report scripts
 manage	
 practice	
 reports	 Reports draw from data, graphs and resources
 resources	 Image downloads and bibliography files
 .gitignore	
 .Renviron	
 README.Rmd	
 portfolio.Rproj	














README creates the main page of your portfolio website

 carpentry	
 data	
 data-raw	
 design	
 figures	
 manage	
 practice	
 reports	 Reports draw from data, graphs and resources
 resources	
 .gitignore	
 .Renviron	
 README.Rmd	 Provides explicit links to every report
 portfolio.Rproj	

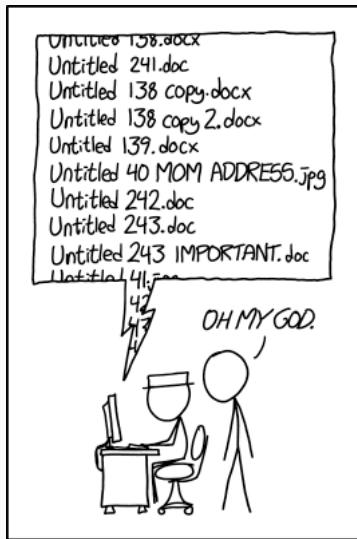
Reduce clutter by excusing some resources from version control

 carpentry	<
 data	<
 data-raw	< Version control optional
 design	<
 figures	<
 manage	< Correspondence and project management
 practice	< Scripts for practicing and learning R
 reports	<
 resources	<
 .gitignore	< Directs Git to ignore specific files
 .Renviron	<
 README.Rmd	<
 portfolio.Rproj	<

Summary: Use the given directory structure for the portfolio

 carpentry	◁ R scripts that create and save tidy data
 data	◁ Tidy data saved here, read by design scripts
 data-raw	◁ Data in its original form (version control optional)
 design	◁ R scripts that create and save graphs
 figures	◁ Graphs saved here, imported by report scripts
 manage	◁ Correspondence and project management
 practice	◁ Scripts for practicing and learning R
 reports	◁ One report per display type
 resources	◁ Image downloads and bibliography files
 .gitignore	◁ Directs Git to ignore specific files
 .Renvi	◁ Stores packages in a library separate from base R
 README.Rmd	◁ Creates the main page of your portfolio website
 portfolio.Rproj	◁ Sets the project directory as the working directory

Naming files



PROTIP: NEVER LOOK IN SOMEONE
ELSE'S DOCUMENTS FOLDER.

Source: <https://xkcd.com/1459/>

Three basic principles should guide your choice of filenames

Filenames should be **machine readable**

- use delimiters “_” and “-” instead of spaces
- avoid symbols, punctuation marks, and case-sensitivity

Filenames should be **human readable**

- include information about the file content

Filenames should be **friendly to default ordering**

- start filenames with a numeric ID
- use leading zeros, e.g., 001, 002, ..., 999

A sample set of portfolio file names illustrates the principles

Numeric display ID starts every file name: **d1, d2, ..., d7**

Hyphenated **content-information** supports human readability

```
carpentry/ d7_extract-and-tidy.R
data/      d7_survey-data.csv
data-raw/  d7_survey-data-raw.csv
design/     d7_div-stack-bar.R
figures/   d7_div-stack-bar.png
reports/   d7_report.Rmd
```

All lowercase, no special symbols, no spaces

Underscores support machine readability

Add a sequence number 01, 02, etc., for related files

When related files are run in order


















```
carpentry/ d7_01-extract-financials.R  
           d7_02-extract-mortality.R  
           d7_03-tidy-inequality-data.R
```

When content is saved in different forms

```
data/      d7_01-survey-data.csv  
           d7_02-survey-data-wide.csv
```

Not version numbers. For version control, use version control (git).

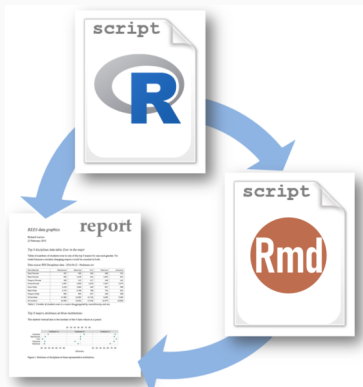
With a plan for managing files, we can start writing them

 carpentry	 d7_extract-and-tidy.R
 data	 d7_survey-data.csv
 data-raw	 d7_survey-data-raw.csv
 design	 d7_div-stack-bar.R
 figures	 d7_div-stack-bar.png
 manage	
 practice	 d7_practice-div-stack-bar.R
 reports	 d7_report.Rmd
 resources	 d7_Heiberger-Robbins-2014-Likert.pdf

Icons for csv, pdf, and png by [Freepik](#) from [Flaticon](#) licensed [CC BY 3.0](#).

Linking files

Explicitly linking files supports reproducibility



Remove all ambiguity about what files are used to create a report

portfolio.Rproj sets the working directory and supports relative file paths

Relative file paths document the **data tidying** workflow

Write an R script for data tidying

 **carpentry/d7_extract-and-tidy.R**

that reads the raw data, prepares it for graphing,

 **read_csv("data-raw/d7_survey-data-raw.csv")**

and writes the tidy dataframe to the data directory.

 **write_csv(dataframe, "data/d7_survey-data.csv")**

Relative file paths document the **graph design** workflow

Write an R script for graph design

 **design/d7_div-stack-bar.R**

that reads the tidy data, creates the graph,

 **read_csv("data/d7_survey-data.csv")**

and writes the image to the figures directory.

 **ggsave("figures/d7_div-stack-bar.png")**

The **report script** runs all the files in order

Write an Rmd report script containing the report text

 **reports/d7_report.Rmd**

interleaved with Rmd code chunks that run every R script,

 **source("carpentry/d7_extract-and-tidy.R")**

 **source("design/d7_div-stack-bar.R")**

import data to print a data table,

 **read_csv("data/d7_survey-data.csv")**

and import figures.

 **include_graphics("figures/d7_div-stack-bar.png")**

The **README script** includes links to each report



README.Rmd

creates the portfolio main webpage

`## Displays and critiques`

Your prose as needed.

`[D1 Title](reports/d1_report.md)`

`[D2 Title](reports/d2_report.md)`

`[D3 Title](reports/d3_report.md)`

`[D4 Title](reports/d4_report.md)`

`[D5 Title](reports/d5_report.md)`

`[D6 Title](reports/d6_report.md)`

`[D7 Title](reports/d7_report.md)`

Portfolio of data displays

Your name

2018-12-04

(Place an image to illustrate your best work.)

Introduction

Your prose.

Displays and critiques

Your prose as needed.

[D1 Title](#) (graph type)

[D2 Title](#) (graph type)

[D3 Title](#) (graph type)

[D4 Title](#) (graph type)

[D5 Title](#) (graph type)

[D6 Title](#) (graph type)

[D7 Title](#) (graph type)

Discussion notes

Your prose as needed.

[Reading prompts](#)

[Presentation prompts](#)

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References

Bryan J (2015) Naming things. <https://speakerdeck.com/jennybc/how-to-name-files>

Bryan J (2018) Excuse me, do you have a moment to talk about version control? *The American Statistician* **72**(1), 20–27 (doi:10.1080/00031305.2017.1399928)

Wilson G, Bryan J, Cranston K, Kitjes J, Nederbragt L and Teal TK (2017) Good enough practices in scientific computing. *PLoS Computational Biology* **13**(6) (doi:10.1371/journal.pcbi.1005510)