

Basic elements of file management

ME 447/547 Visualizing Data









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Effective file management starts at the beginning of a project

Planning the structure

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



























Naming files

-  d1_nces_survey-data-raw.csv
-  d1_nces_extract-and-tidy.r
-  d1_nces_survey-data.csv
-  d1_nces_boxplot.r




























Linking files explicitly

```
source("carpentry/d1_nces_extract-and-tidy.r")
source("design/d1_nces_boxplot.r")
source("data/d1_nces_survey-data.csv")
include_graphics("figures/d1_nces_boxplot.png")
```



























Given the project directory 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 create and save 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	
 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	
 manage	
 practice	
 reports	 One Rmd report per graph
 resources	
 .gitignore	
 .Renviron	
 README.Rmd	 Provides links to individual reports
 portfolio.Rproj	














Resource files support the portfolio appearance and format

 carpentry	
 data	
 data-raw	
 design	
 figures	
 manage	
 practice	
 reports	 Reports explicitly call on resource files
 resources	 Image downloads and bibliography files
 .gitignore	
 .Renviron	
 README.Rmd	
 portfolio.Rproj	

Reduce clutter by excusing some resources from version control

 carpentry	
 data	
 data-raw	
 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	

Project directory summary

 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
 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	◁ Reports explicitly call on resource files
 resources	◁ Image downloads and bibliography files
 .gitignore	◁ Directs Git to ignore specific files
 .Renvirom	◁ 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

Three basic principles should guide your choice of filenames

Filenames should be **machine readable**

- avoid spaces, use delimiters “_” and “-” deliberately
- avoid punctuation, symbols, 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
e.g., d1, d2, ... or yyyy-mm-dd
- use leading zeros
e.g., 01, 02, ..., 99 or 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 logical ordering when a process requires several files

For example, suppose the data tidying requires 3 files, run in order,

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


Or if the same content is rearranged

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

Creating explicit links

Workflow begins by acquiring and saving the raw data

Raw data are never edited manually

 `data-raw/d7_data-raw.csv`

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

Write an R script for data tidying

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

In this R script, read the raw data

 `read_csv(data-raw/d7_data-raw.csv)`

prepare it for graphing and write the dataframe

 `write_csv(data/d7_data.csv)`

to the data directory

 **data**/d7_data.csv

Plan a file-naming scheme

Write an R script for data tidying

 `carpentry/d1_01_data-carpentry.R`

In this R script, read the raw data

 `read_csv(data-raw/d1_01_raw-data.csv)`

prepare it for graphing and write the dataframe


 `write_csv(data/d1_01_tidy-data.csv)`

to the data directory


 `data/d1_01_tidy-data.csv`

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

Write an R script for graph design

 **design**/d1_01_graph.R

In this R script, read the tidy data

 `read_csv(data/d1_01_tidy-data.csv)`

create the graph and write the image

 `ggsave(figures/d1_01_graph.png)`

to the figures directory

 **figures**/d1_01_graph.png

Use the **file-naming** scheme consistently

Write an R script for graph design

 **design/d1_01_graph.R**

In this R script, read the tidy data

 **read_csv(data/d1_01_tidy-data.csv)**

create the graph and write the image

 **ggsave(figures/d1_01_graph.png)**

to the figures directory

 **figures/d1_01_graph.png**

The **Rmd report** runs all the required files in order

Write an Rmd report

 **reports**/d1.Rmd

containing the report text interleaved with code chunks that

run every R script for this display

```
 source(carpentry/d1_01_data-carpentry.R)
```

```
 source(design/d1_01_graph.R)
```

import data to print a data table

```
 read_csv(data/d1_01_tidy-data.csv)
```

and import the figures

```
 include_graphics(figures/d1_01_graph.png)
```


Again, use the **file-naming** scheme consistently

Write an Rmd report

 **reports/d1.Rmd**

containing the report text interleaved with code chunks that

run every R script for this display

```
 source(carpentry/d1_01_data-carpentry.R)
```

```
 source(design/d1_01_graph.R)
```

import data to print a data table

```
 read_csv(data/d1_01_tidy-data.csv)
```

and import the figures

```
 include_graphics(figures/d1_01_graph.png)
```

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, Kitze J, Nederbragt L and Teal TK (2017) Good enough practices in scientific computing. *PLoS Computational Biology* 13(6)
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