

DARTH Framework

made with xaringan

DARTH workgroup

2020/01/10 (updated: 2020-11-10)

How most * people currently work

(* includes me)

Specialized software

Most of us use **many different software programs** and do not have a **clear, concise** and **consistent** file storage structure.

For example, I used:

- **MS Word** for manuscripts
- **MS Excel** for data collection
- **MS PowerPoint** for presentations and figures
- **Adobe Illustrator, Adobe InDesign** and **MS PowerPoint** for figures and posters
- **R** for data analysis
- **SPSS** or **STATA** for data analysis with others
- **TreeAge** for decision models
- ...

and I saved it without a clear naming convention or folder structure.

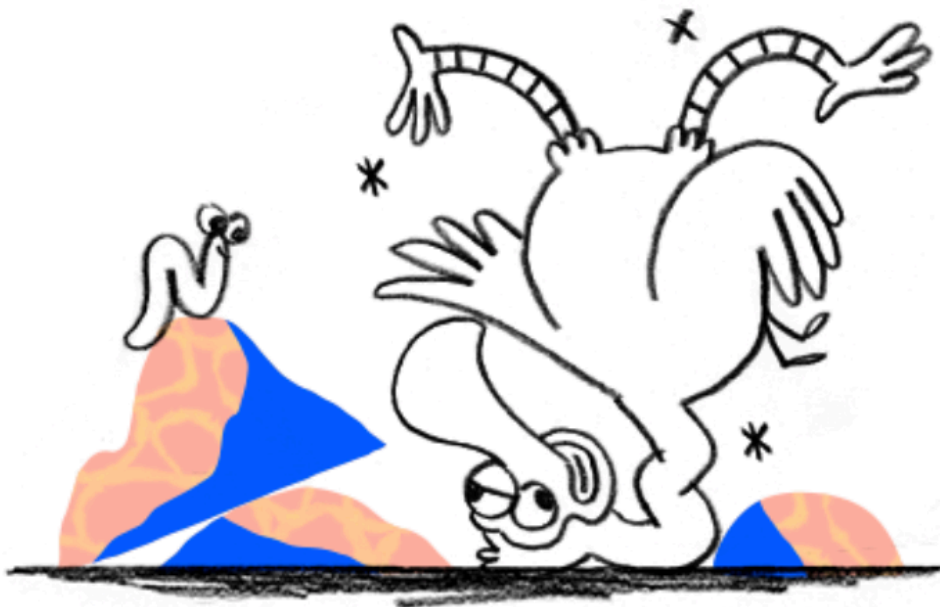
Result?

Uhm??

Right!

Naam	Bewerkingsdatum
▼ Diagnostic Assignments (CE02) - Excel and R	✓ Vandaag 10:35
Diagnostics_Assignment instructions in Excel_17.06.19.docx	✓ 19 jun. 2017 17:41
▼ Assignments in R	✓ 12 sep. 2018 08:11
ROC package.R	✓ 28 okt. 2015 13:55
Introduction to R_Clinical Epidemiology.pptx	✓ 5 jan. 2016 16:30
DecisionTreeSolution.png	✓ 6 jul. 2017 11:56
color_template_NIHES.docx	✓ 17 jul. 2017 15:01
Tip & Tricks from your colleagues .docx	✓ 18 jul. 2017 09:49
Copy of ROCTutorial.xls	✓ 18 jul. 2017 09:51
Diagnostics_Assignment instructions in R & Solutions.Rmd	✓ 18 jul. 2017 10:54
Diagnostics_Assignment_instructions_in_R__Solutions.docx	✓ 18 jul. 2017 10:54
▼ Extra's	✓ 12 sep. 2018 08:17
CAD example.dta	✓ 11 jun. 2013 16:35
CAD example June 2013.do	✓ 12 jun. 2013 16:12
CAD example June 2013.log	✓ 2 okt. 2015 15:41
Building Tree instructions.docx	✓ 5 okt. 2015 14:26
DR_Report_Eline & Ilse_Groep A-1 (1).pdf	✓ 8 okt. 2015 11:08
Diagnostic research	✓ 12 okt. 2015 18:42
Decision Tree in R.R	✓ 14 okt. 2015 11:53
Markov model for assignment 2.R	✓ 14 okt. 2015 12:30
Diagnostic research exercises2 - Copy.R	✓ 14 okt. 2015 14:54
Diagnostic research exercises edits MGH.R	✓ 19 okt. 2015 13:49
ROCR.pdf	✓ 28 okt. 2015 13:04
ROCR.pdf.crdownload	✓ 28 okt. 2015 13:04
DR_Excel sheet exercises_v1.2-3.xlsx	✓ 28 okt. 2015 13:19
▼ Old files	✓ Vandaag 10:35
Diagnostic research exercises.R	✓ 14 okt. 2015 16:07
Assignment instruction in R.docx	✓ 16 okt. 2015 14:22
Diagnostic research exercises edits MGH.R	✓ 17 okt. 2015 20:56
Backup of Assignment instruction in R edits MGH.docx	✓ 17 okt. 2015 20:56
Assignment instruction in R edits MGH.docx	✓ 18 okt. 2015 02:20
Assignment 3.2 difficult.R	✓ 20 okt. 2015 17:06
Assignment 2.7 difficult.R	✓ 20 okt. 2015 17:06
Diagnostic research exercises correct with edits MGH .R	✓ 22 okt. 2015 16:01
Assignment instruction in R_10.21.15 edits MGH.docx	✓ 22 okt. 2015 16:02
Diagnostic research exercises_10.21.15 edits MGH.R	✓ 22 okt. 2015 16:02
Assignment instruction in R_10.22.15.docx	✓ 22 okt. 2015 23:55
Diagnostic research exercises_10.22.15.R	✓ 22 okt. 2015 23:55

Consequence



404

We can't find what you're looking for.

Image from [Dropbox](#)

Does this sound familiar?

Than you are probably also familiar with

problems setting the **working directory**?

re-running your code to produce results or graphs?

working with both **data, a script** and **a report**?

opening your **own work** and **got lost** in your own files?

getting lost in the code of a colleagues?

Exactly

Our motivation:

maximize effectiveness, reduce frustration, facilitate collaboration and increase readability of your work

Streamline your work using R

You can use R for

- Data synthesis
- Data analysis
- Reporting
- Presenting

R has the potential to facilitate **transparency**, **reproducibility**, and **shareability**

But this all comes with a **very steep learning curve** which can cause a lot of frustration.

How you can do better

"If you spend too much time thinking about a thing, you'll never get it done" - Bruce Lee

But in this case spending a little time upfront can save a lot of time later on

Apply a structure

1. File system

"There is no single best way to organise a file system. The key is to make sure that the structure of directories and location of files are consistent, informative and works for you." [1]

2. Coding convention

More about file organization: Data Management:File Organization - Christine Malinowski - MITLibraries - January 21, 2016. [link](#) and Cooper N, Hsing P-Y, editors. A Guide to Reproducible Code in Ecology and Evolution. London, UK: British Ecology Society; 2017.

DARTH Framework

‘A coding framework for improving transparency in decision modeling’

Pharmacoeconomics (2019) 37:1329–1339
<https://doi.org/10.1007/s40273-019-00837-x>

PRACTICAL APPLICATION



A Need for Change! A Coding Framework for Improving Transparency in Decision Modeling

Fernando Alarid-Escudero¹ · Eline M. Krijkamp² · Petros Pechlivanoglou³ · Hawre Jalal⁴ · Szu-Yu Zoe Kao⁵ · Alan Yang⁶ · Eva A. Enns⁵

Published online: 24 September 2019
© Springer Nature Switzerland AG 2019

File system

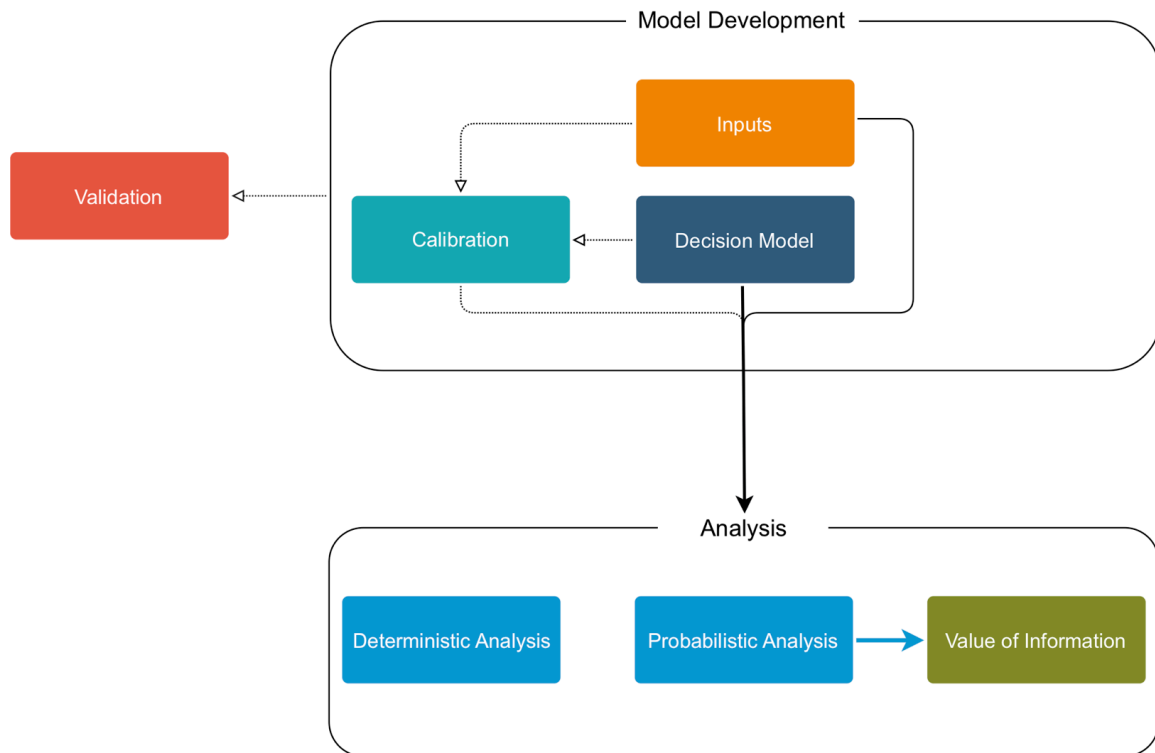
Most projects have similar elements:

- collecting data
- data cleaning
- analysis
- reporting results

Good project directory structure example:

- `data` - all input data (and metadata) used in the analysis
- `functions` - for functions to help us modify the data
- `R` - where interactive files for the analysis are stored
- `figs` - for the figures
- `tables` - for the tables
- `output` - any type of intermediate or output files
- *you might prefer an extra `cleaned-data` folder*
- `report` - for the RMarkdown manuscript or report of results

Schematic representation



"FINAL".doc



FINAL.doc!



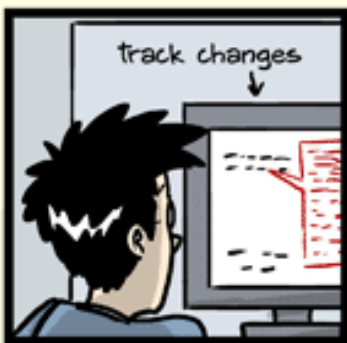
FINAL_rev.2.doc



FINAL_rev.6.COMMENTS.doc



FINAL_rev.8.comments5.
CORRECTIONS.doc



FINAL_rev.18.comments7.
corrections9.MORE.30.doc



FINAL_rev.22.comments49.
corrections.10.#@\$%WHYDID
ICOMETOGRADSCHOOL?????.doc

JORGE CHAM © 2012

DARTH naming convention (1)

Table 2 File and variable naming conventions in the proposed DARTH coding framework

Object type	Naming recommendation	Examples
Files	dir/<component number>_<description>.<ext>	analysis/01_model_inputs.R R/02_simulation_model_functions.R
Functions	<action!>_<description>	generate_init_params() generate_psa_params()
Variables	<x>_<y>_<var_name> where x = data type prefix y = variable type prefix var_name = brief descriptor	n_samp hr_S1D v_r_mort_by_age a_M l_params_all df_out_ce

DARTH naming convention (2)

Prefix	Data type	Prefix	Variable type
<> (no prefix)	scalar	n	Number
v	vector	p	Probability
m	matrix	r	Rate
a	array	u	Utility
df	data frame	c	Cost
dtb	data table	hr	Hazard ratio
l	list	rr	Relative risk
		ly	Life years
		q	QALYs
		se	Standard error

Suggested approach

- Start with a R-project
- Create a folder structure
- Save the data files in the data folder
- Load the data into your R environment
- Draft code for the data analysis
- Create a Markdown to finalize the analysis and to build the report

darthpack

darthpack **0.1.0**

Get started

Reference

Articles ▾

Changelog

github

darthpack

darthpack is an R package that showcases the [Decision Analysis in R for Technologies in Health \(DARTH\)](#) coding framework to construct model-based cost-effectiveness analysis in R. The main website of darthpack can be found [here](#).

darthpack is part of the following manuscript:

- Alarid-Escudero F, Krijkamp E, Pechlivanoglou P, Jalal H, Kao SY, Yang A, Enns EA. "A need for change! A coding framework for improving transparency in decision modeling". *PharmacoEconomics* 2019;37(11):1329–1339. <http://dx.doi.org/10.1007/s40273-019-00837-x>

The release that accompanies the published article has been archived in zenodo: <https://zenodo.org/record/3445451>.

Preliminaries

- Install [RStudio](#)
- Install devtools to install darthpack as a package and modify it to generate your own package

```
# Install release version from CRAN
install.packages("devtools")
```

```
# Or install development version from GitHub
# devtools::install_github("r-lib/devtools")
```

- Install pkgdown to publish darthpack or your own darthpack-based repository or package as a website (optional)

```
# Install release version from CRAN
install.packages("pkgdown")
```

```
# Or install development version from GitHub
```



Links

Browse source code at
<https://github.com/DARTH-git/darthpack>

Report a bug at
<https://github.com/DARTH-git/darthpack/issues>

License

file [LICENSE](#)

Developers

Fernando Alarid-Escudero
Author, maintainer

Eline Krijkamp
Author

Petros Pechlivanoglou
Author

Hawre Jalal
Author

Szu-Yü Kao
Author

Alan Yang
Author

Eva Enns
Author

[All authors...](#)

Structure course material

The framework is used to structure the assignments



▼ Markov models	27 Jan 2020 at 20:55	--	Folder
desktop.ini	26 Jan 2020 at 12:22	136 bytes	Document
▶ Markov 3-state	28 Jan 2020 at 09:29	--	Folder
▼ Markov Sick-Sicker	28 Jan 2020 at 15:49	--	Folder
▶ data	26 Jan 2020 at 12:22	--	Folder
▶ exercise worksheets	Today at 11:13	--	Folder
▶ figures	27 Jan 2020 at 17:21	--	Folder
▶ functions	26 Jan 2020 at 12:22	--	Folder
Markov Sick-Sicker.Rproj	28 Jan 2020 at 15:49	205 bytes	R Project
▶ output	26 Jan 2020 at 12:22	--	Folder
▶ solutions	26 Jan 2020 at 12:22	--	Folder
▶ tables	26 Jan 2020 at 12:22	--	Folder
▶ templates	26 Jan 2020 at 12:22	--	Folder
▶ Slides	Yesterday at 11:12	--	Folder

R Markdown Cheat Sheet

learn more at rmarkdown.rstudio.com



.Rmd files

An R Markdown (.Rmd) file is a record of your research. It contains the code that a scientist needs to reproduce your work along with the narration that a reader needs to understand your work.

Reproducible Research

At the click of a button, or the type of a command, you can rerun the code in an R Markdown file to reproduce your work and export the results as a finished report.

Dynamic Documents

You can choose to export the finished report as a html, pdf, MS Word, ODT, RTF, or markdown document; or as a html or pdf based slide show.

Workflow

- 1 Open a new .Rmd file** at File > New File > R Markdown. Use the wizard that opens to pre-populate the file with a template.
- 2 Write document** by editing template.
- 3 Knit document to create report** Use knit button or `render()` to knit.
- 4 Preview Output** in IDE window.
- 5 Publish** (optional) to web or server. Use knit button to sync publish button to accounts at `rpubs.com`, `shinyapps.io`, `RStudio Connect`. Reload document. Find in document. File path to output document.
- 6 Examine build log** in R Markdown console.
- 7 Use output file** that is saved alongside .Rmd.

.Rmd structure

YAML Header
Optional section of render (e.g. pandoc) options written as key-value pairs (YAML).
• At start of file
• Between lines of ---

Text
Narration formatted with markdown, mixed with:

Code chunks
Chunks of embedded code. Each chunk:
• Begins with ````{r}`
• Ends with `````
R Markdown will run the code and append the results to the doc.
It will use the location of the .Rmd file as the working directory

render()

Use `markdown::render()` to `render/knit` at cmd line.
Important args:
input - file to render
output_format - List of render options (as in YAML)
output_file
output_dir
params - list of params to use
envir - environment to evaluate code chunks in
encoding - of input file

Interactive Documents

Turn your report into an interactive Shiny document in 4 steps

- 1 Add runtime: shiny to the YAML header.
- 2 Call Shiny input functions to embed input objects.
- 3 Call Shiny render functions to embed reactive output.
- 4 Render with `rmarkdown::run` or click Run Document in RStudio IDE

```

---
output: html_document
runtime: shiny
---
numericInput("n", "How many cars?", 5)
renderTable({
  head(cars, input$n)
})
    
```

Embed a complete app into your document with `shiny::shinyAppDir()`

* Your report will be rendered as a Shiny app, which means you must choose an html output format, like `html_document`, and serve it with an active R Session.

Embed code with knit syntax

Inline code

Insert with `<code>`. Results appear as text without code.

```

Built with
r.getVersion()
    
```

Built with 3.2.3

Code chunks

One or more lines surrounded with ````{r}` and `````. Place chunk options within curly braces, after `r`. Insert with `⌘`.

```

```{r echo=TRUE}
getVersion()
```
    
```

Global options

Set with `knitr::opts_chunk$set()`, e.g.

```

```{r include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```
    
```

Important chunk options

- cache** - cache results for future knits (default = FALSE)
- cache.path** - directory to save cached results in (default = "cache/")
- child** - file(s) to knit and then include (default = NULL)
- collapse** - collapse all output into single block (default = FALSE)
- comment** - prefix for each line of results (default = "#")
- dependson** - chunk dependencies for caching (default = NULL)
- echo** - Display code in output document (default = TRUE)
- engine** - code language used in chunk (default = 'R')
- error** - Display error messages in doc (TRUE) or stop render when errors occur (FALSE) (default = TRUE)
- eval** - Run code in chunk (default = TRUE)
- fig.align** - 'left', 'right', or 'center' (default = 'default')
- fig.cap** - figure caption as character string (default = NULL)
- fig.height**, **fig.width** - Dimensions of plots in inches
- highlight** - highlight source code (default = TRUE)
- include** - Include chunk in doc after running (default = TRUE)
- message** - display code messages in document (default = TRUE)
- results** - (default = 'markup') 'asis' - passthrough results 'hide' - do not display results 'hold' - put all results below all code
- tidy** - tidy code for display (default = FALSE)
- warning** - display code warnings in document (default = TRUE)

Options not listed above: R options, aniopts, autodep, background, cache.comments, cache.lazy, cache.rebuild, cache.vars, dev, dev.args, dpi, engine.opts, engine.path, fig.asp, fig.env, fig.ext, fig.keep, fig.la, fig.path, fig.pos, fig.process, fig.retina, fig.scap, fig.show, fig.showext, fig.subcap, interval, out.extra, out.height, out.width, prompt, purr, ref.label, render, size, split, tidy.opts

Parameters

Parameterize your documents to reuse with different inputs (e.g., data sets, values, etc.)

- 1 Add parameters
Create and set parameters in the header as sub-values of `params`
- 2 Call parameters
Call parameter values in code as `params$<name>`
- 3 Set parameters
Set values with `Knit with parameters` or the `params` argument of `render()`

```

render("doc.Rmd",
  params = list(n = 1, d = as.Date("2015-01-01"))
)
    
```

Enjoy working efficient!

 <http://darthworkgroup.com>

 info@darthworkgroup.com

 [@darthworkgroup](https://twitter.com/darthworkgroup)

 [@DARTH-git](https://github.com/DARTH-git)