Building a reproducible workflow in R

Project-oriented workflow

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Learning Objectives

Today we will learn...

- how to implement a project-oriented workflow in R
- how to organise folders and file names
- how to set up our first R project

Building a reproducible workflow in R

- we now know some important principles of a reproducible workflow

  - and that 'reproducibility' is not black-and-white
  - but even the reproducibility spectrum is an oversimplification (Peng, 2011)

- some additional resources that provide a list of tips include:

    - Bowers & Voors (2016); Nagler (1995); Wilson et al. (2017); Corker (2022)

Broadening the reproducibilty spectrum

- there are different levels of reproducibility

    - the *bare minimum* is sharing the code and data
    - *and* including session information:
        * which operating system was used
        * which software/package versions were used

- going bigger:

    - project-oriented workflow
    - project-specific filepaths
    - contained in a single project folder

- we will be using RProjects to achieve this

Project management

- folder structure
- project-relative file paths
- appropriate documentation

    - e.g., README

- it's great to map out your project structure early on

    - but it will grow as you go along
    - reproducible principles facilitate adapting as it grows

Literate programming

Instead of imagining that our main task is to instruct a *computer* what to do, let us concentrate rather on explaining to *human beings* what we want a computer to do.

— Knuth (1984), p. 97

- originally used to refer to writing programs
- but also applies to analysis code

- especially if we're aiming for reproducibility

- main concepts:

  - code is linear (this pre-dates Knuth, 1984)
  - informative but concise commenting

- main benefits:

  - facilitates maintenance
  - helpful for future-you, collaborators, etc.

Documentation

- metadata

  - project README
  - codebook/data dictionary

- README should contain

  - a project description
  - relevant links
  - description of folder structure

- can be updated as the project develops

- README.md files in GitHub/Lab are automatically used as a project description

  - `.md` is a plain text document
  - uses markdown syntax

Version control (not covered in this workshop)

- git: local tracking
- useful for the analysis and writing phases

  - but can be tricky for collaboration

- GitHub/GitLab: remote tracking

  - store your changes to your local git repository
  - then push them to your remote repository

- safe guards against local hardware/software issues

  - lost or damaged computer or local files

- and allows for collaboration or sharing

Persistant (public) storage

- GitHub/Lab are sub-optimal

  - developer-focused
  - typically lack thorough documentation/metadata
  - not very user-friendly for non-users

- OSF, Zenodo

  - Open Science-focused
  - can be linked to a GitHub/Lab repository
  - facilitate thorough documentation
  - user-friendly

Writing (not covered in this workshop)

- dynamic reports with Markdown syntax

  - e.g., Rmarkdown, Quarto
  - integration of data, code, and prose
    * facilitates cross-referencing within document
    * integration of citation management tools
    * supports LaTeX syntax for example sentences and tables

- `papaja` package for APA-formatted Rmarkdown documents
- challenge: collaboration

  - not all collaborators know these tools
  - track changes not currently possible

Setting up a project

- tomorrow: hands-on
- required installations/recent versions of:
  - R
    * version `4.4.0`, "Puppy Cup"
    * check current version with `R.version`
    * download/update: https://cran.r-project.org/bin/macosx/
  - RStudio
    * version `2023.12.1.402`, "Ocean Storm"

∗ Help > Check for updates

∗ new install: https://posit.co/download/rstudio-desktop/

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References

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