Reproducible science: principles, practices and tools

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Access instructions

The workshop will take place in the Maurice Shock Building (MSB). You can find access details here: https://www.accessable.co.uk/university-of-leicester/access-guides/maurice-shock-building.

MSB 206A and 208A can be found on the second floor.

Pre-session instructions

You would have been emailed instructions. They can be found on the GitHub repository as well: https://github.com/DavidSouto/ReproScience-Workshop/

Troubleshooting

- Let us know if this doesnt work.
- We can use the first hour of each day (Welcome) to troubleshoot issues with installation.
- If you have issues with internet we'll have local copies of packages

Course description

This workshop offers a hands-on introduction to the concepts and practices of reproducible science, aimed at enhancing the integrity and reliability of research. Participants will learn about the importance of reproducibility, open science, version control (with GitHub), computational reproducibility, and data management. The program combines theoretical elements and hands-on exercises, including setting up reproducible environments, collaborative projects on GitHub, and creating reproducible analyses with analysis notebooks.

This 3-day workshop will equip participants with the essential tools and knowledge (e.g. regarding preregistration) to ensure research integrity, transparency, and reproducibility.

Schedule at a glance

Day 1: Intro to R for Open and Reproducible Science

Maurice Shock (MSB) 206A

- 9-10am Welcome / Coffee served
- 10-12pm Introduction to RStudio
- 12pm-1pm Lunch
- 1pm-2:30pm Data wrangling
- 2:30-2:45pm Coffee break
- 2:45-4pm Data visualization

Day 2: Understanding challenges to reproducibility

Maurice Shock (MSB) 208A

- 9-10am Welcome / Coffee served
- 10-12pm P-values and forking paths
- 12pm-1pm Lunch
- 1pm-2:30pm Power and sample selection
- 2:30-2:45pm Coffee break
- 2:45-4pm Strength of evidence and sample selection

Day 3: Sharing plans, data and code

Maurice Shock (MSB) 208A

- 9-10am Welcome / Coffee served
- 10-12pm Pre-registration and registered reports
- 12pm-1pm Lunch
- 1pm-2:30pm Version Control with GitHub
- 2:30-2:45pm Coffee break
- 2:45-4pm Publishing

Syllabus

Day 1: Introduction to R for reproducible science

9-10am Welcome - Coffee, check installations

Session 1: Introduction to workshop & R for Open and Reproducible science

- **Exercise 1.1**: Workshop Packages
- **Exercise 1.2**: Organizing files
- **Exercise 1.3**: Finding errors in scripts and functions
- **Exercise 1.4**: Computational reproducibility
- **Exercise 1.5**: Documenting projects with README files

Session 2: Data wrangling

- **Exercise 2.1**: Loading datasets
- **Exercise 2.2**: Using pipes to manipulate datasets
- **Exercise 2.3**: Interactive reporting

Session 3: Data visualization

- **Exercise 3.1**: GGPlot logic
- **Exercise 3.2**: Displaying all data
- **Exercise 3.4**: Publication quality plots

Day 2: Understanding challenges to reproducibility

9-10am Welcome - Coffee, check installations

Session 1: P-values and forking paths

- **Exercise 4.1**: The dance of the p-values.
- **Exercise 4.2**: P-hacking challenge
- **Exercise 4.3**: Multiverse analyses

Session 2: Power and sample selection

- **Exercise 5.1**: Understanding power
- **Exercise 5.2**: Power from simulation with simple models
- **Exercise 5.3**: Power from simulation with complex models

Session 3: Strength of evidence and sample selection

- **Exercise 6.1**: Planning for precision
- **Exercise 6.2**: Example of sequential testing using Bayesian statistics
- **Exercise 6.3**: Example of how sequential testing works with NHST
- **Exercise 6.4** Are you a trend spotter?

Day 3: Sharing plans, data and code

9-10am Welcome - Coffee, check installation of GitHub Desktop / GitHub account

Session 1: Pre-registration and registered reports

- **Exercise 7.1**: Pre-registration how-to

Session 2: Version Control with GitHub

- **Exercise 8.1**: Setup & GitHub overview
- **Exercise 8.2**: Creating a repository
- **Exercise 8.3**: GitHub Desktop overview
- **Exercise 8.4**: Pushing and pulling
- **Exercise 8.5**: Merge conflict resolution

Session 3: Publishing your study

- **Exercise 8.1**: Publish an analysis as an html page
- **Exercise 8.2**: Workshop feedback