BIO247 – Lab 1

Description

In this lab, you will

- Download R and RStudio
- Learn to use R for basic math
- Learn how to save a project environment in RStudio
- Learn how to navigate via the command line and create new directories

Steps

Downloading R:

1. Find R download at http://cran.us.r-project.org/
2. Click on the download for your operating system, and download r-4.2.1.pkg
3. Install R, leaving all default settings

Downloading RStudio:

1. Go to the RStudio website: https://www.rstudio.com/products/rstudio/download/
2. Download the RStudio Desktop (FREE version)
3. If you would like to also download the RStudio Server (accessible via web)

Opening the terminal

- How you access the terminal (also called the command line) depends on your operating system
- Mac OSX: You can access your terminal by searching Launchpad, or often the terminal is pinned to the dock. The icon looks like this:

- Windows: on Windows the terminal is called the "command prompt." You can open the terminal by right-clicking the start icon or searching the start menu

Navigating the Terminal (Mac OSX)

- To move from one directory (folder) to another, you use the 'cd' command:
  cd Documents
- To show the contents of the folder you're in, you'll use the 'ls' command:
  ls
- To create a new directory, you use the 'mkdir' command:
  mkdir Bio247_test
- **On Mac, the file paths use the /**
  Users/casey/Desktop/BIO247-Lecture/BIO247-Chapter1.ppt

Navigating the Terminal (Windows)

- To move from one directory (folder) to another, you use the 'cd' command:
  cd Documents
- To show the contents of the folder you're in, you'll use the 'dir' command:
  dir

- To create a new directory, use the ‘mkdir’ command
  mkdir Bio247_test
- **On Windows, the file paths use **
  C:\casey\Desktop\BIO247-Lecture\BIO247-Chapter1.ppt

Report

1. You will upload your saved R project environment to the Lab 1 assignment on the BIO-247L Sakai Page
2. You will answer the questions on the following worksheet using full sentences, judging the robustness and reproducibility of research
3. This report is Due Monday, Sept 5, by 2:20pm

Lab 1 Worksheet – Robustness & Reproducibility

For each of the following 5 studies, think about whether the study is both robust and reproducible. In full sentences, describe why or why not. For Studies 1, 2, you may make your judgement based on the abstract alone, or from the methods in the paper (The papers are open access online). Please make it

Study 1: “Although human exposure to microplastics (MPs) and the health effects thereof are a global concern, little is known about the magnitude of exposure. In this study, we quantitatively determined the concentrations of polyethylene terephthalate (PET) and polycarbonate (PC) MPs in three meconium and six infant and 10 adult feces samples collected from New York State. PET and PC MPs were found in some meconium samples (at concentration ranges from below the limit of quantification [<LOQ] to 12,000 and <LOQ–110 ng/g dry weight, respectively) and all infant stool specimens (PET: 5700–82,000 ng/g, median, 36,000 ng/g; PC: 49–2100 ng/g, median, 78 ng/g). They were also found in most (PET) or all (PC) adult stool samples but at concentrations an order of magnitude lower than in infants for PET MPs (<LOQ–16,000 ng/g, median, 2600 ng/g). The estimated mean daily exposures from the diet of infants to PET and PC MPs were 83,000 and 860 ng/kg body weight per day, respectively, which were significantly higher than those of adults (PET: 5800 ng/kg-bw/day; PC: 200 ng/kg-bw/d). Our study suggests that infants are exposed to higher levels of MPs than adults.” [1]

Study 2: A research group publishes a data analytics tool. They only use publicly available databases as input on their tool, and they provide sample input and output in the supplemental data of their manuscript. However, they do not publish the code on git, the tool is only accessible through a downloadable graphic user interface (GUI).

Study 3: “In order to explore the spatiotemporal evolution of land use function and its driving factors in China, taking both sides of the Hu Line as an example, we used Exploratory Spatial Data Analysis and Geographically Weighted Regression methods to reveal dynamic evolution law, spatial characteristics and influencing factors of the “Production-Living-Ecology” functions of 288 prefecture-level cities on both sides of the Hu Line. The results show that: (1) In the temporal dimension, the coordination of “Production-Living-Ecology” functions of land use in China has been improved, and the Hu Line can be roughly used as the boundary of China’s territorial space use. (2) In the spatial dimension, there is a significant positive spatial correlation between “Production-Living-Ecology” functions of land use in China, and the coordination gap between “Production-Living-Ecology” functions of land use on both sides of the Hu Line is gradually narrowing. (3) In terms of influencing mechanism, the coordination of “Production-Living-Ecology” functions is mainly driven by internal factors and is supplemented by external ones. The influence pattern of most driving factors is consistent with the layout characteristics of “strong east and weak west” of the Hu Line.” [2]

Study 4: A certain professor creates a tool which automatically judges the quality of machine curated information. The tool is built to take input from existing tools and databases, which have been in use for several years. The tool is published with extensive documentation, and the source code is publicly available. The tool is also published with 2 sets of test input/out: One set created from existing tools, one manufactured “toy” input, to show the specific functions of the tool work properly.

Study 5: “The economic valuation of ecosystem services in part reflects the desire to use conventional economic tools (markets and economic instruments) to conserve ecosystem services. However, for regulating and supporting ecosystem services that depend on ecosystem structure and function, estimation of economic value requires estimates of the current level of underlying ecological functions first. This primary step is in principle, the job of environmental scientists, not economists. Here, we provide a coarse-level quantitative assessment of the relationship between the research effort expended by environmental scientists (on the biophysical values) and economists (on the monetary values) on 15 different regulating and supporting services in 32 ecosystem types using peer-reviewed article hits retrieved from bibliographic databases as a measure of research effort. We find a positive, moderately strong (r = 0.69) correlation between research efforts in the two domains, a result that, while encouraging, is likely to reflect serendipity rather than the deliberate design of integrated environmental science-economics research programs. Our results suggest that compared to environmental science research effort economic valuation is devoted to a smaller, less diverse set of ecosystem services but a broader, more diverse, set of ecosystem types. The two domains differed more with respect to the ecosystem services that are the major focus of research effort than they did with respect to the ecosystem types of principal research interest. For example, carbon sequestration, erosion regulation, and nutrient cycling receive more relative research effort in the environmental sciences; air quality regulation in economic valuations. For both domains, cultivated areas, wetlands, and urban/semi-urban ecosystem types received relatively large research effort, while arctic and mountain tundra, cave and subterranean, cryosphere, intertidal/littoral zone, and kelp forest ecosystem types received negligible research effort. We suggest ways and means by which the field of sustainability science may be improved by the design and implementation of a searchable database of environmental science and economic valuation literature as well as a global ecosystem service research network and repository that explicitly links research on the estimation and prediction of biophysical ecosystem functions with that of the social sciences and other knowledge systems. These suggestions would, at least in principle, facilitate a more efficient research agenda between economists and environmental scientists and aid management, regulatory and judicial decision-makers.” [3]

[1] Zhang J, Wang L, Trasande L, Kannan K. "Occurrence of Polyethylene Terephthalate and Polycarbonate Microplastics in Infant and Adult Feces" *Environmental science & technology letters* 8, no. 11 (2021): 989-994. doi: 10.1021/acs.estlett.1c00559

[2] Chen Y, Zhu M. Spatiotemporal Evolution and Driving Mechanism of "Production-Living-Ecology" Functions in China: A Case of Both Sides of Hu Line. Int J Environ Res Public Health. 2022 Mar 15;19(6):3488. doi: 10.3390/ijerph19063488. PMID: 35329174; PMCID: PMC8953988.
[3] Kadykalo AN, Kelly LA, Berberi A, Reid JL, Findlay CS. Research effort devoted to regulating and supporting ecosystem services by environmental scientists and economists. PLoS One. 2021 May 28;16(5):e0252463. doi: 10.1371/journal.pone.0252463. PMID: 34048482; PMCID: PMC8162671.