Week 1: Introduction

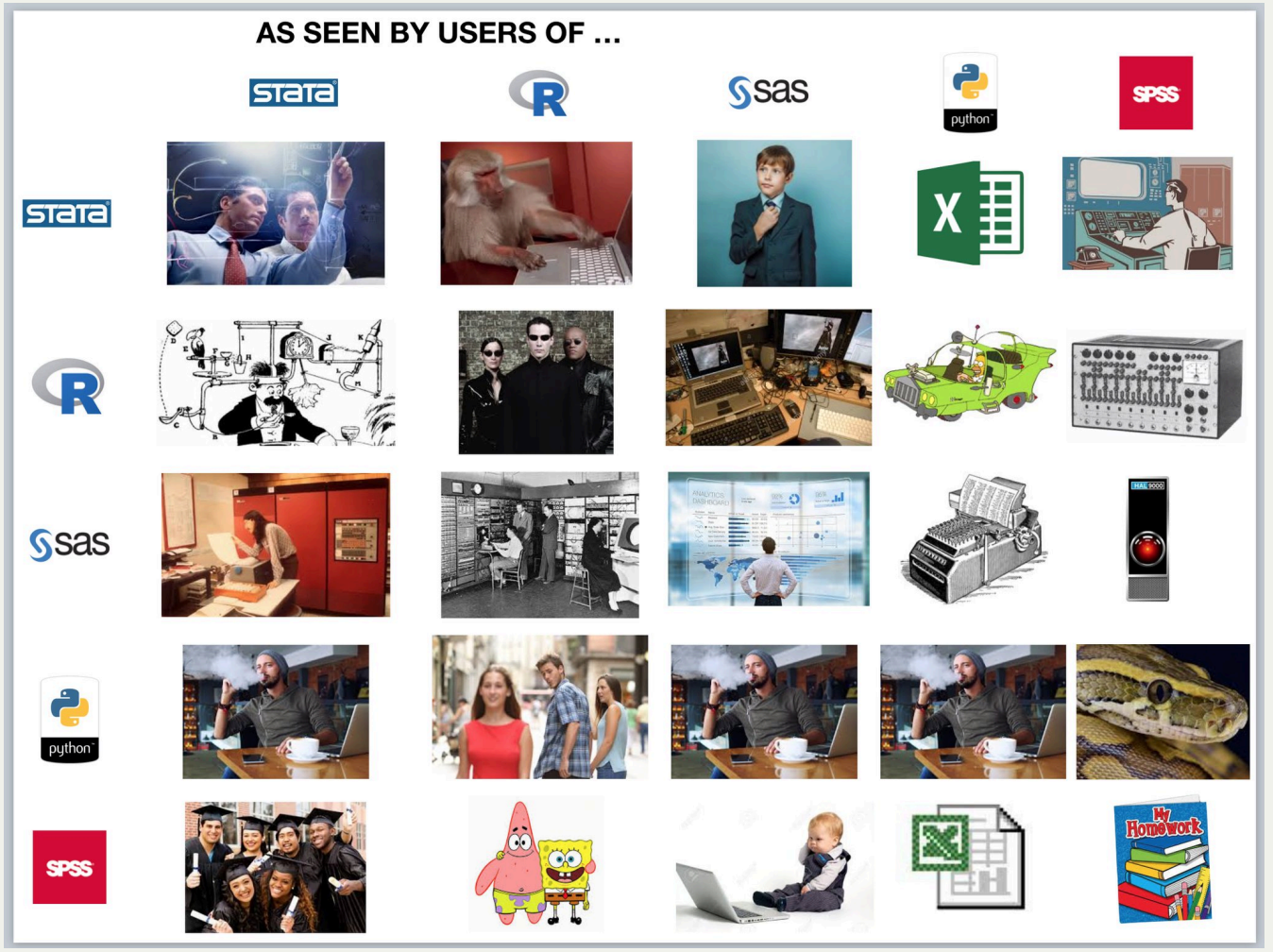
POP77001 Computer Programming for Social Scientists

Tom Paskhalis

Overview

- Module objectives
- Prerequisites and software
- Materials and books
- Module meetings
- Assessment and collaboration
- Weekly schedule

Programming Languages for Data Analysis



Reddit

Module Objectives

- Introduce the fundamentals of computer programming;
- Get familiar with R and Python programming languages;
- Develop understanding of core software design principles;
- Learn crucial data science techniques;
- Practice these concepts using social science examples.

Module Materials

- Module website: tom.paskhal.is/POP77001
- Blackboard

Books

- John Guttag. 2021 *Introduction to Computation and Programming Using Python: With Application to Computational Modeling and Understanding Data*. 3rd ed. Cambridge, MA: The MIT Press
- Norman Matloff. 2011. *The Art of R Programming: A Tour of Statistical Software Design*. San Francisco, CA: No Starch Press.
- Wes McKinney. 2022. *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter*. 3rd ed. Sebastopol, CA: O'Reilly Media.
- Roger D. Peng. 2016. *R Programming for Data Science*. Leanpub.
- Hadley Wickham, Mine Çetinkaya-Rundel, and Garrett Grolemund. 2023. *R for Data Science*. 2nd ed. Sebastopol, CA: O'Reilly Media.
- Hadley Wickham. 2019. *Advanced R*. 2nd ed. Boca Raton, FL: Chapman and Hall/CRC.

Additional Online Materials

- Git Book
- Learn R
- R Inferno
- An Introduction to R and Python For Data Analysis: A Side By Side Approach
- The Hitchhiker's Guide to Python
- Python For You and Me
- Python Wikibook
- Official documentation:
  - R Language Definition
  - Python Language Reference

Prerequisites and Software

- Introductory module - no formal prerequisites
- Laptop with Windows/Mac/Linux OS (no Chrome books)
- Required software:
  - **Jupyter** - web-based interactive computational environment
  - **Python** (version 3+) - versatile programming language
  - **R** (version 4+) - statistical programming language
- Additional software:
  - **Git** - version control system
  - **JupyterLab Desktop** - desktop application for Jupyter Notebooks
  - **RStudio** - integrated development environment for R
  - **Spyder** - integrated development environment for Python
  - **Visual Studio Code** - feature-rich text editor

Module Meetings

- 2-hour lectures
  - Monday 14:00 in 2041B Arts Building
- 2-hour tutorials
  - Group 1 - Thursday 16:00 in 1.24 D'Olier Street
  - Group 2 - Friday 16:00 in 5052 Arts Building
- No lecture/tutorial in Week 7 (Reading Week)
- Office hours:
  - Friday 11:00 - 13:00 online or in-person (booking required)

Assessment

- Participation (10%)
  - Tutorial attendance
- 4 assignments (30%)
  - Bi-weekly programming exercises
  - Due by 12:00 on Monday of weeks 4, 7, 10 and 12 on Blackboard
- Final project (60%)
  - Final R/Python project demonstrating familiarity with programming concepts and ability to communicate results
  - Due by 23:59 on Friday, 19 December 2025

Assessment criteria

1. ✔ Code exists
2. ⌚ Code runs and does what it has to do
3. 📜 Code is legible (meaningful naming, comments)
4. ⚙ Code is modular (no redundacies, use of abstractions)
5. 🏎 Code is optimized (no needless loops, runs fast)

Marks at Trinity:
https://www.tcd.ie/academicregistry/exams/student-guide/

Plagiarism

- Plagiarising computer code is as serious as plagiarising text (see Google LLC v. Oracle America, Inc.)
- All submitted programming assignments and final project should be done individually;
- You may discuss general approaches to solutions with your peers;
- But do not share or view each others code;
- You can use online resources but give credit in the comments.

Generative AI

- The use of generative AI is a grey area (normatively, pedagogically and legally).
- Fair use of generative AI includes:
  - Code explanation;
  - Code refactoring;
  - Final research project.
- Unfair use of generative AI includes:
  - Assignment completion;
  - Code plagiarism;
- Remember, in real world there will be many times when you need to write code without access to generative AI.

Module Outline

Week	Date	Language	Topic	Released	Due
1	15 September	-	Introduction to Computation		
2	22 September	R	R Basics	Assignment 1	
3	29 September	R	Control Flow in R		
4	6 October	R	Functions in R		Assignment 1
5	13 October	R	Debugging and Testing in R	Assignment 2	
6	20 October	R	Data Wrangling in R		
7	27 October	-	-		Assignment 2
8	3 November	Python	Fundamentals of Python Programming I	Assignment 3	
9	10 November	Python	Fundamentals of Python Programming II		
10	17 November	Python	Data Wrangling in Python	Assignment 4	Assignment 3
11	24 November	Python	Classes and Object-oriented Programming		
12	1 December	Python, R	Complexity and Performance		Assignment 4

Next

- Introduction to Computation