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BAK3: Introduction to Quantitative Methods

Week 1: Introduction to the Course and to R

Leonardo Carella

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The Big Questions

- Who am I?
- Who are you?
- What are we doing here?

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The Dream

- Become a wizard.
- Learn to do fancy math stuff.
- Learn to code.

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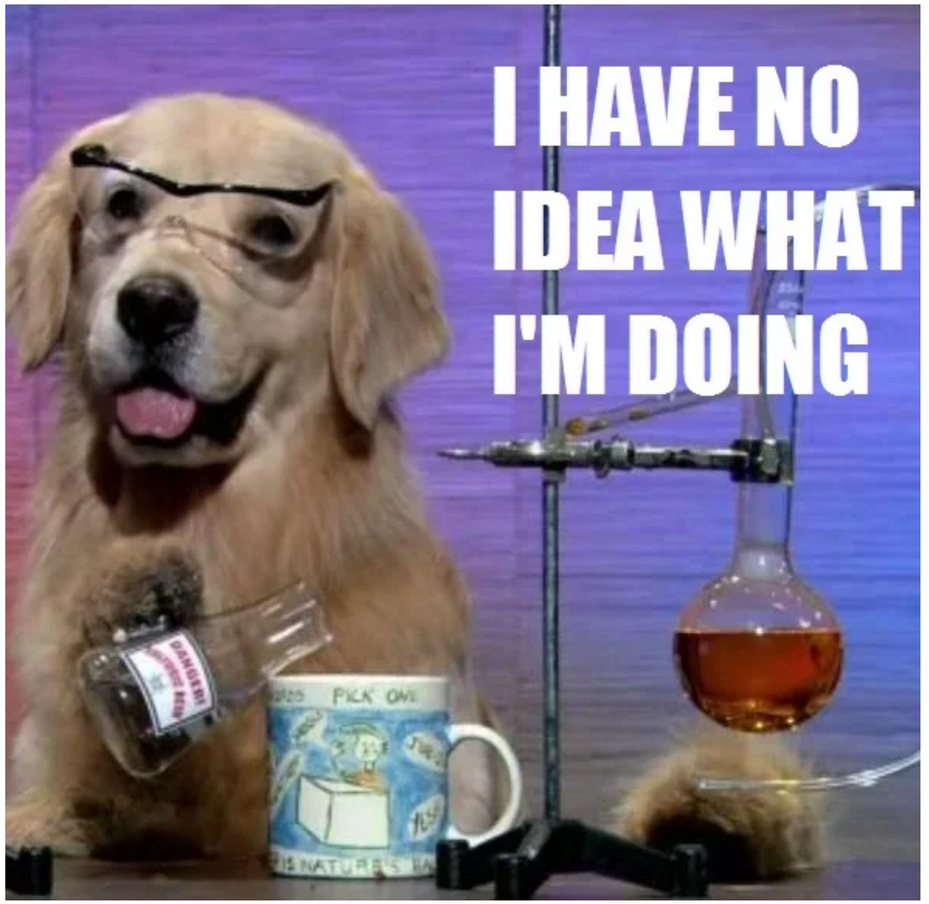
The Reality

- Bewilderment.
- Just trying to pass a required course.
- Rage against the machine (RStudio).



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So Why Bother?

- Bewilderment:
  - Totally true. It never goes away. But it's better with friends.
- Just trying to pass a required course:
  - Think of it as learning a new language: quantitative political science.
  - Even very basic literacy in this language 'unlocks' a huge part of our field.
- Rage against the machine:
  - Coding is a transferable, in-demand skill. Get mad now, get a great job later.

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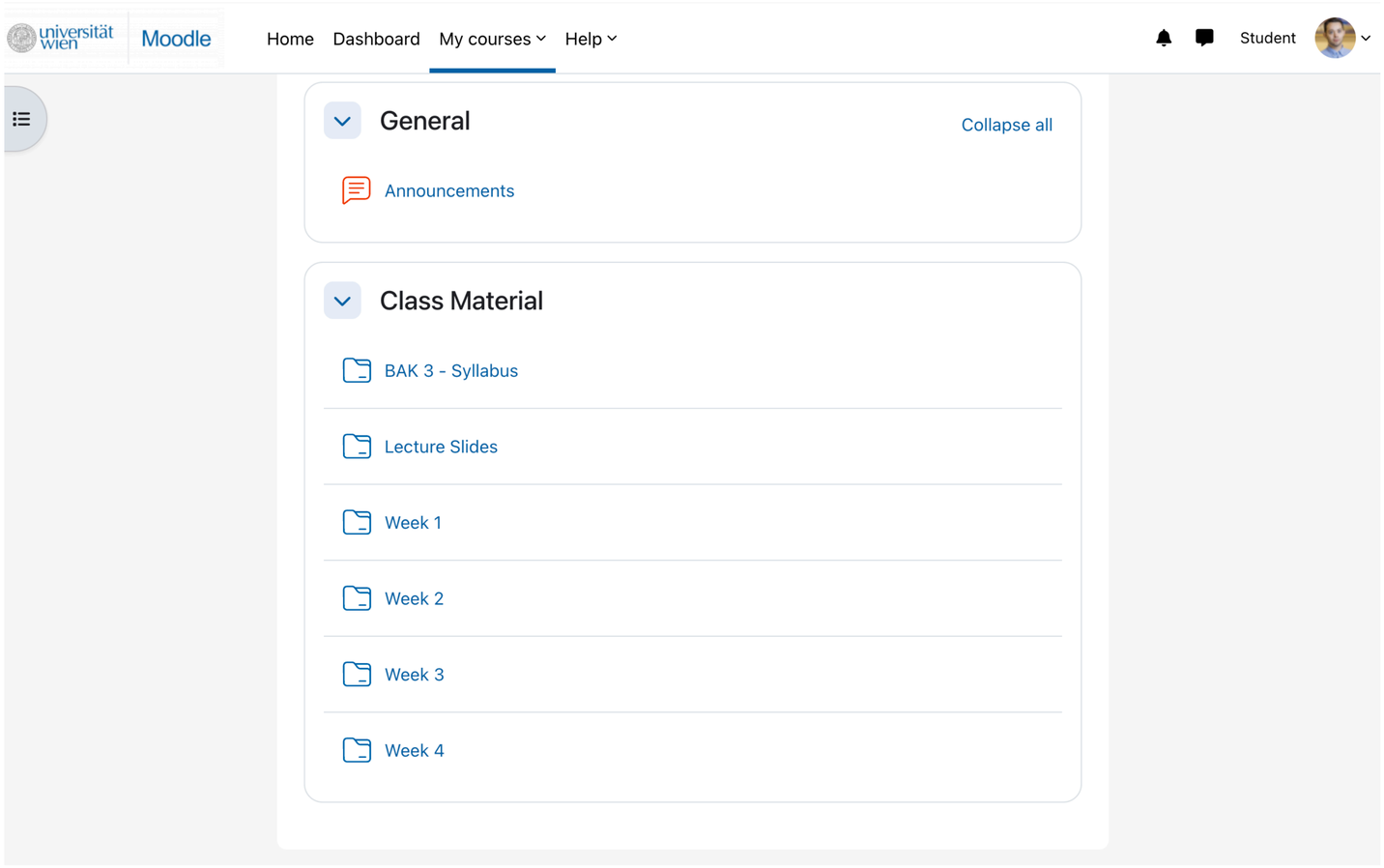
This Course

- Research Design
- Statistics
- Coding in R

Course Material

- **Core material:**
  - Slides
  - Handouts
  - Textbooks



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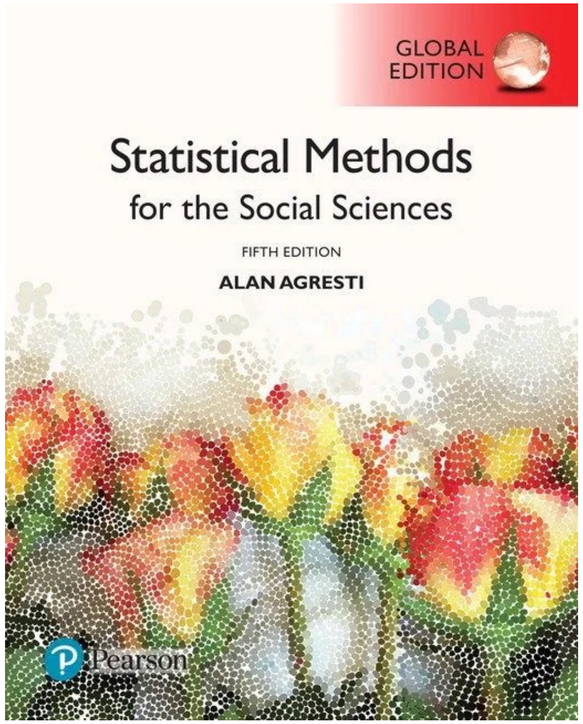

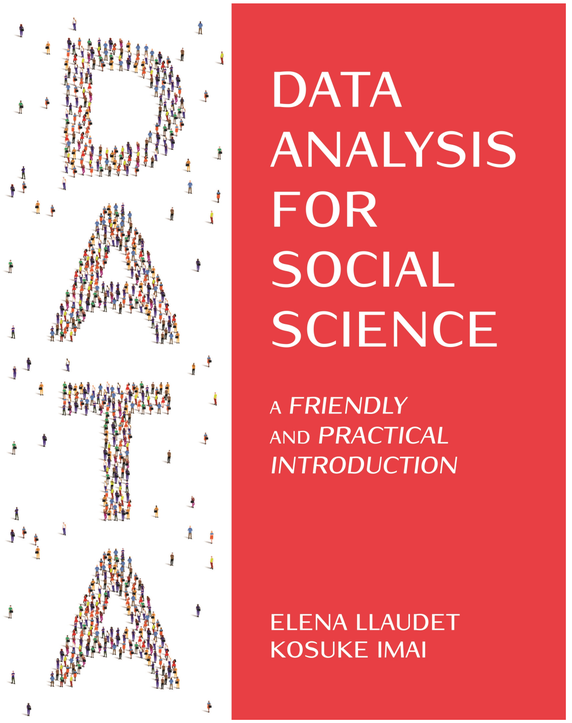

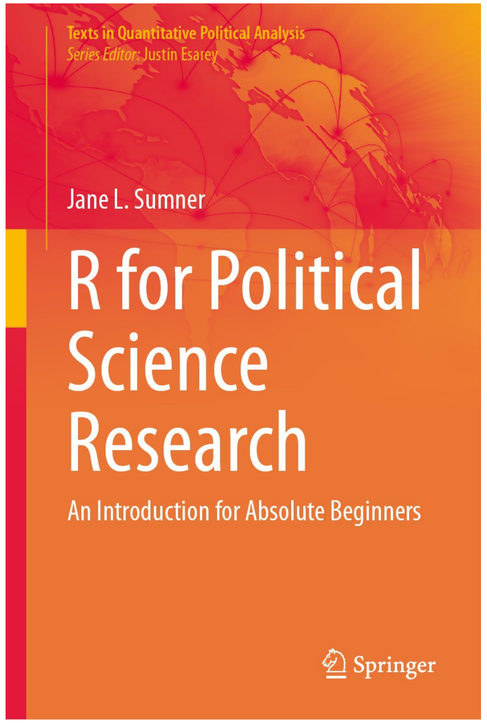

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Assessment

- **Assessment Components:**
  - Attendance and Participation (10%)
  - Homework Assignments (5 x 5% each)
    - Test Coding + Statistics. Due Monday Weeks 4, 6, 8, 12, 14.
  - Mid-Term Test (25%)
    - Tests Statistics + Research Design. Online, Week 10.
  - Seminar Paper (40%)
    - Tests Coding + Statistics + Research Design. Due on 27 February 2026.

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AI Policy

- You **cannot** use AI for **any** part of **any** assessment in this course.
- But can I just…?
  - **No.**
- Not even…?
  - ***No.***

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Collaboration Policy

- You **may discuss** homework assignments with your course mates. Preferably, you would **compare** your work *after trying on your own.*
- Provided that: (1) Each submission is **your own** work, not group work. (2) There's no plagiarism: i.e. passing someone else's words, code etc. as your own, (3) You note in the assignment who you discussed it with.
- No collaboration allowed in the mid-term exam or for the seminar paper.

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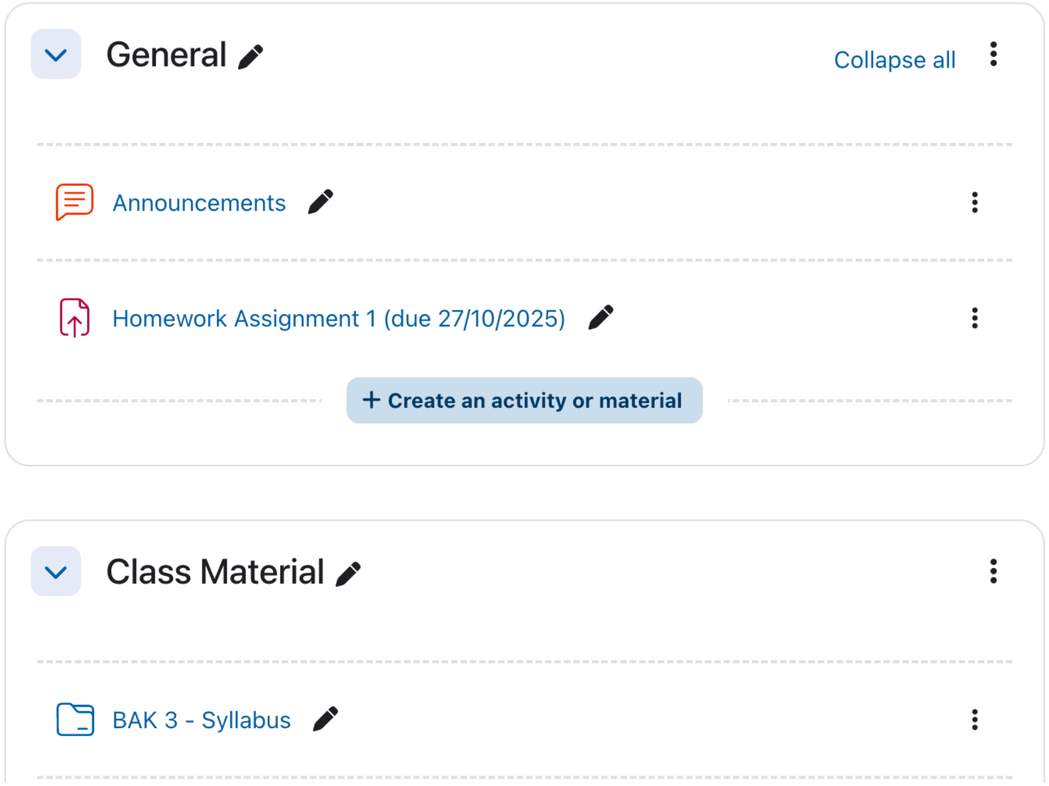
Moodle

- If you're unsure about anything: first check the Syllabus (on Moodle).
- Otherwise, I'm here to help: leonardo.carella@univie.ac.at
- All assignments are submitted through Moodle. Submission deadlines are always at 23:59.
- Any questions?



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(Quantitative) Research Design

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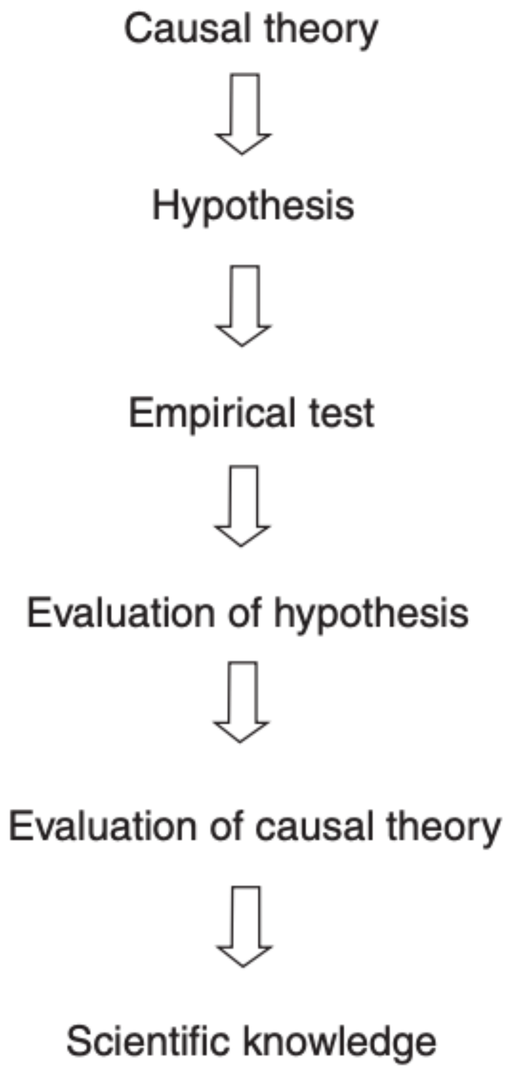
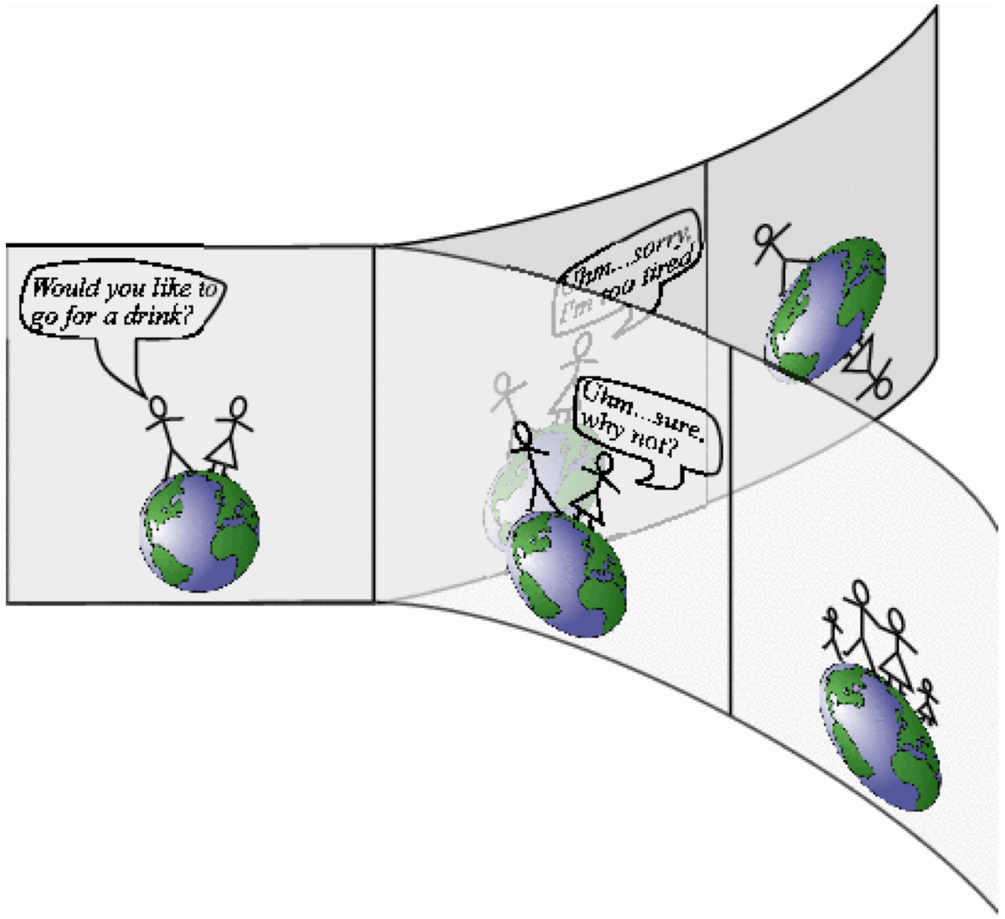
Doing Science

- Political (social) *science* applies the **scientific method** to the study of politics (the social world).
- Core concern of theory in the SM: **cause-effect relations**. Does X have an effect on Y? What causes Y?
- Develops **falsifiable** hypotheses: theory-based statements about a relationship that we expect to observe
- Ultimate interest: **classes** of phenomena ('revolutions'), rather than specific instances ('*the* French Revolution').
- Applies both to **qualitative** and **quantitative** research.



Causality

- X is said to cause Y if, in absence of X, Y would not have happened.
- The problem: We want to observe the value of Y the world in which X happened, and the **counterfactual**: a world in which X did not happen.
- But in the real world, we only observe one or the other.



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Two Approaches

- More common in **qualitative** research: piece together evidence (or **causal process observations**) that lead from X to Y in one or a few cases. Is the evidence consistent with our theory?
- More common in **quantitative** research: observe Y across a large number of cases (**data-set observations**) that differ in X **and only in X**. Do X and Y **co-vary** in a way that is consistent with our theory?
- In practice, it's much more complex. More on this next week.

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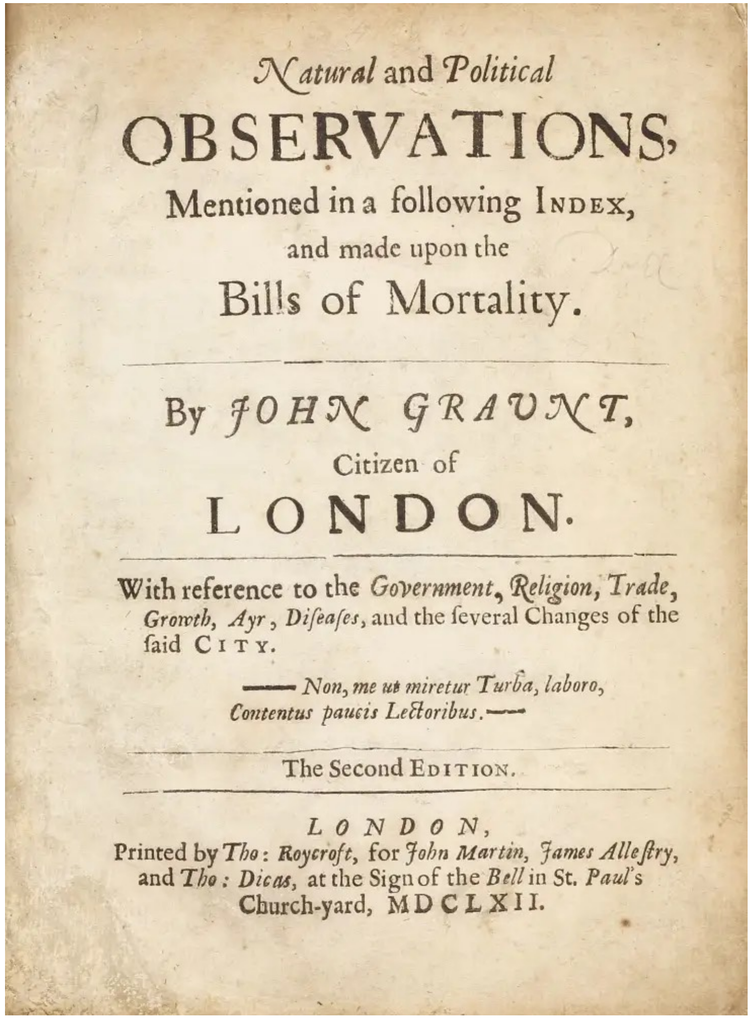
Statistics

Statistics

- A set of tools to analyse **large quantities of information (data)**. In the modern sense, it is a branch of mathematics.
- Older connection of the word statistics to politics: ***Statistik*** as the “science of state”, referring to the collection of large quantity of demographic and economic information in early-modern states.



Natural and *Political*

OBSERVATIONS,

Mentioned in a following INDEX,

and made upon the

Bills of Mortality.

By JOHN GRAUNT,

Citizen of

LONDON.

With reference to the *Government*, *Religion*, *Trade*, *Growth*, *Ayr*, *Diseases*, and the several Changes of the said CITY.

—— *Non, me ut miretur Turba, laboro,*
Contentus paucis Lectoribus. ——

The Second EDITION.

LONDON,
Printed by *Tho: Roycroft*, for *John Martin*, *James Allestry*, and *Tho: Dicas*, at the Sign of the *Bell* in St. *Paul's* Church-yard, MDCLXII.

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What's it good for?

- **Description**: summarising large quantities of information (the data) into smaller, more manageable pieces of information (an average, a graph, a table, a correlation etc.).
- **Inference**: making predictions, using what we know about the data to *infer* what's likely to be 'true' more generally. Involves dealing with uncertainty. We'll worry about this from week 7 onwards.

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Coding in R

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R and RStudio

- **R** (https://cran.rstudio.com/): free, open-source programming language for statistics and data analysis.
- **RStudio** (https://posit.co/download/rstudio-desktop): 'integrated development environment' for R. A user-friendly interface that makes it easier to execute R functions. In practice, we're always going to use this. But it won't run if you haven't installed R.
- Both pre-installed on the computers of the ZID (https://zid.univie.ac.at/computer-rooms/) but you ***must*** have them on your device.

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And now, let's open RStudio…