DATA 8

Fall 2016

Lecture 3, August 29

Expressions

Slides created by Ani Adhikari and John DeNero

Announcements

- Office hours are in Weekly Schedule in the top menu bar of data8.org
- Homework 1 is due on Thursday at 5 pm; you get a bonus point for turning it in by Wednesday at 5 pm.
- Submission instructions are in the post “HW 1 Posted” on Piazza and have also been sent by email.

From last time ...

Key to establishing causality

If the treatment and control groups are *similar apart from the treatment,* then differences between the outcomes in the two groups can be ascribed to the treatment.

Trouble

If the treatment and control groups have systematic differences other than the treatment, then it might be difficult to identify causality.

Such differences are often present in **observational studies.**

When they lead researchers astray, they are called confounding factors.

Randomize!

- If you assign individuals to treatment and control **at random,** then the two groups are likely to be similar apart from the treatment.

- You can account – mathematically – for variability in the assignment.

- **Randomized Controlled Experiment**

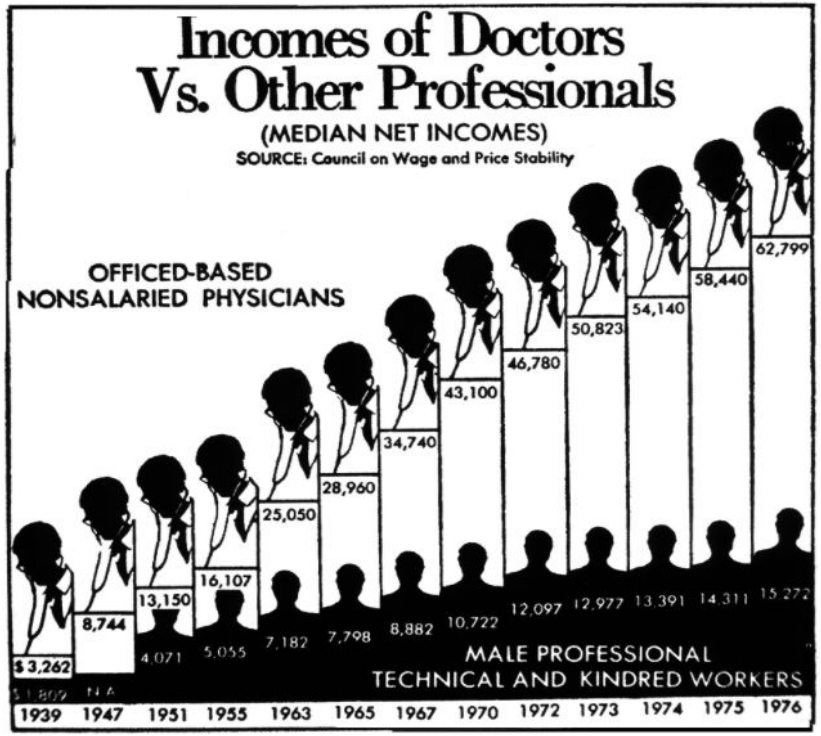
Careful ...

Regardless of what the dictionary says,
in data science

Random ≠ Haphazard

Working with data

Bad. Really bad.

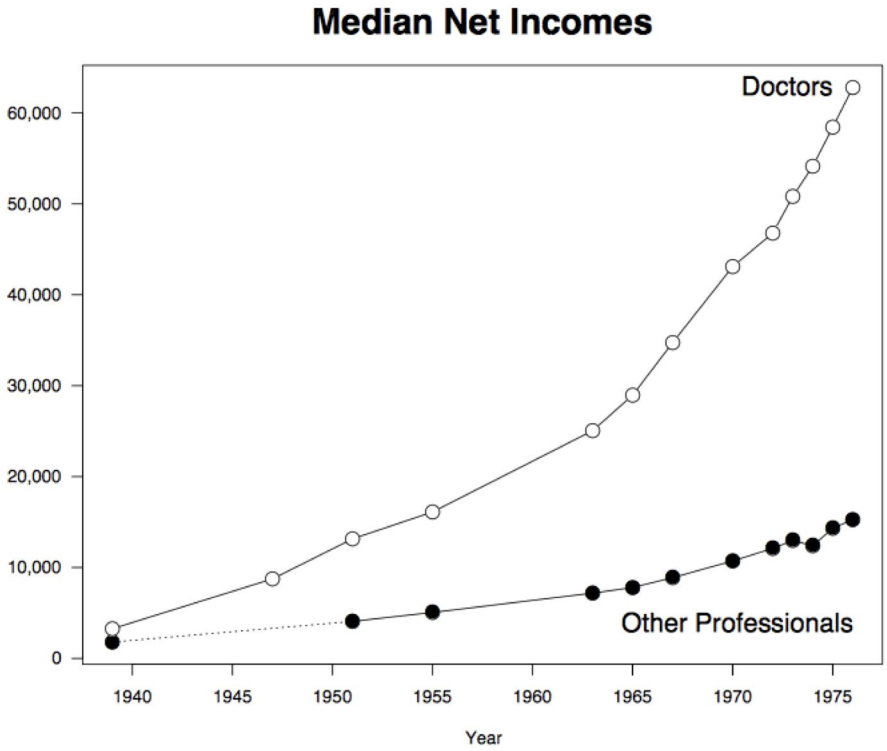


Chartjunk

- A term coined by Edward Tufte – look him up!
- It means **needless graphics**, especially if they **distract** from the main point.

Much better

Plot by Ross Ihaka, Cal Stat PhD and one of the creators of R.



Arithmetic

Programming Languages

- Python is popular both for data science & general software development
- Data science requires mastering several extensions to the core language, such as tables, plots, & notebooks
- Mastering the language fundamentals is also critical
- Learn through immersion, not by reading the dictionary

(Demo)

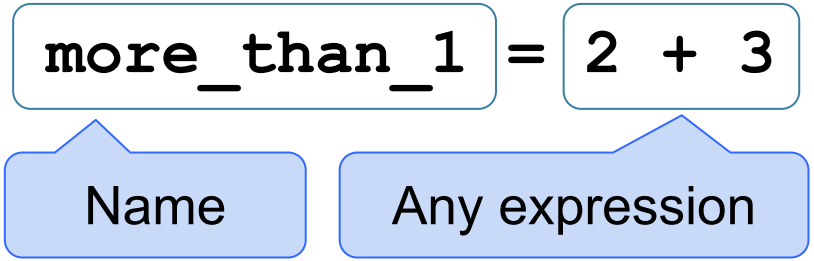
Arithmetic Operators

Operation	Operator	Example	Value
Addition	+	2 + 3	5
Subtraction	-	2 - 3	-1
Multiplication	*	2 * 3	6
Division	/	7 / 3	2.66667
Exponentiation	**	2 ** 0.5	1.41421

(Demo)

Names

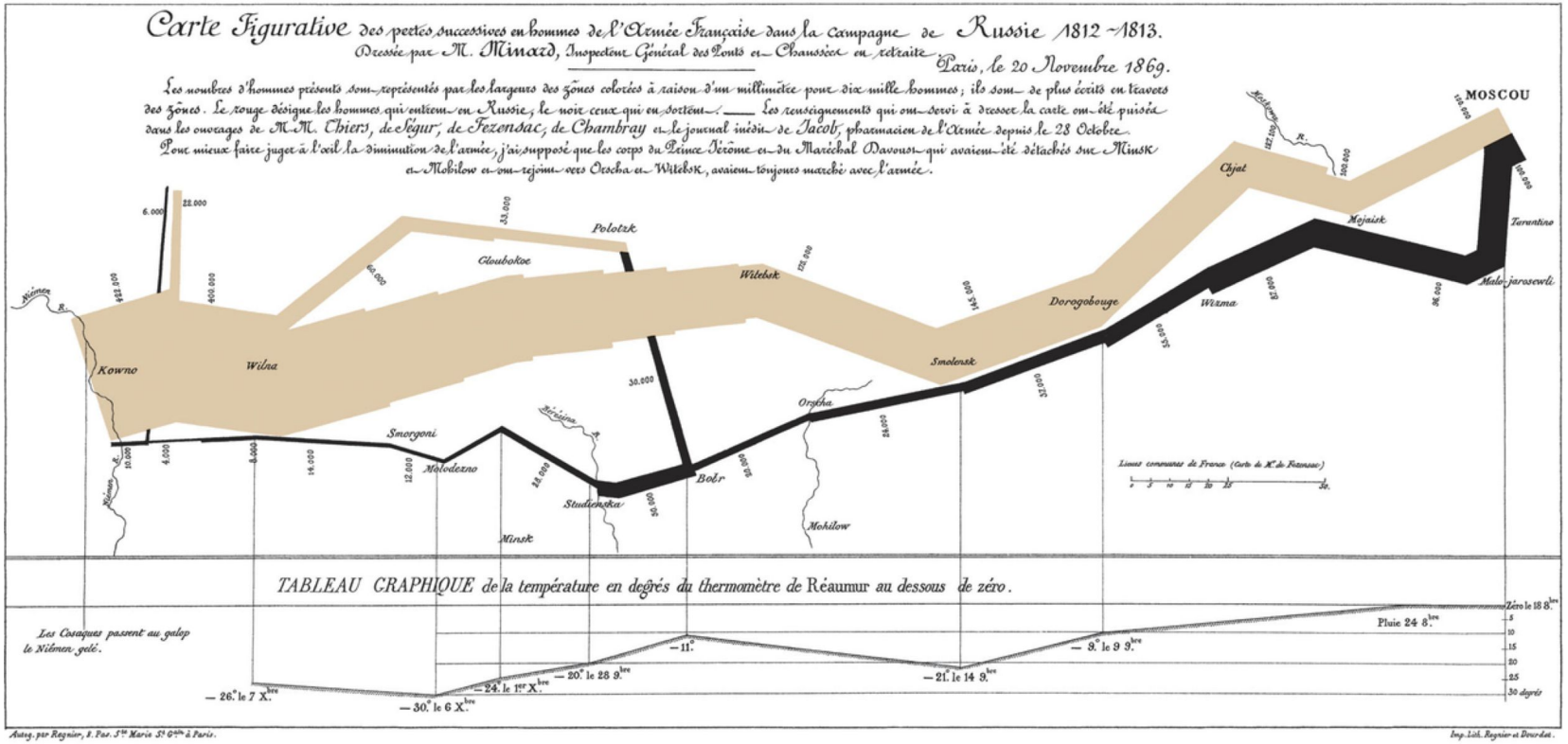
Assignment Statements



- Statements don't have a value; they perform an action
- An assignment statement changes the meaning of the name to the left of the = symbol
- The name is bound to a value (not an equation)

(Demo)

Good. Really good.



Charles Joseph Minard, 1781-1870

Tufte called Minard's visualization of Napoleon's 1812 march "probably the best statistical graphic ever drawn."

(Demo)