

CompSci 190: Tables & Graphs

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Plan For Today (PFTW)

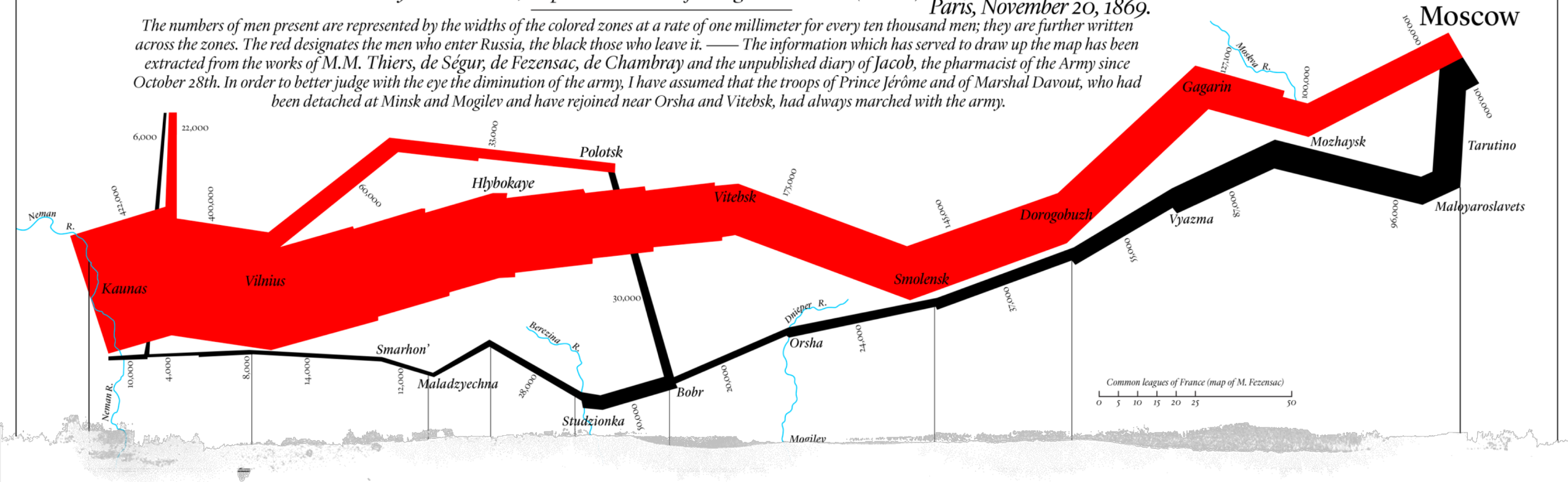
- Create tables from datafiles and other sources
- Consider different methods for visualizations of data
- Start working on HW 1

Figurative Map of the successive losses in men of the French Army in the Russian campaign 1812 ~ 1813

Drawn by M. Minard, Inspector General of Bridges and Roads (retired).

Paris, November 20, 1869.

The numbers of men present are represented by the widths of the colored zones at a rate of one millimeter for every ten thousand men; they are further written across the zones. The red designates the men who enter Russia, the black those who leave it. — The information which has served to draw up the map has been extracted from the works of M.M. Thiers, de Ségur, de Fezensac, de Chambray and the unpublished diary of Jacob, the pharmacist of the Army since October 28th. In order to better judge with the eye the diminution of the army, I have assumed that the troops of Prince Jérôme and of Marshal Davout, who had been detached at Minsk and Mogilev and have rejoined near Orsha and Vitebsk, had always marched with the army.



Minard's Visualization

- Napoleon's 1812 invasion of Russia
 - # of soldiers
 - direction of the march
 - latitude and longitude of each city
 - temperature on the return journey
 - dates

Data in a tabular form

- What information does this visualization hide? What is more clear?

float:
decimal number

| Longitude | Latitude | City | Direction | Survivors |
|-----------|----------|-------------|-----------|-----------|
| 32 | 54.8 | Smolensk | Advance | 145000 |
| 33.2 | 54.9 | Dorogobouge | Advance | 140000 |
| 34.4 | 55.5 | Chjat | Advance | 127100 |
| 37.6 | 55.8 | Moscou | Advance | 100000 |
| 34.3 | 55.2 | Wixma | Retreat | 55000 |
| 32 | 54.6 | Smolensk | Retreat | 24000 |
| 30.4 | 54.4 | Orscha | Retreat | 20000 |
| 26.8 | 54.3 | Moiodexno | Retreat | 12000 |

string:
text

int:
integer

Table Operations

- `t.select(label)` - constructs a new table with just the specified columns
- `t.drop(label)` - constructs a new table without the specified columns
- `t.sort(label)` - constructs a new table, with rows sorted by the specified column
- `t.where(label, condition)` - constructs a new table with just the rows that match the condition

Table Methods

- Creating and extending tables:
 - `Table().with_columns` and `Table.read_table`
- Finding the size: `t.num_rows` and `t.num_columns`
- Referring to columns: labels, relabeling, and indices
 - `t.labels` and `t.relabeled`; column indices start at 0
- Accessing data in a column
 - `t.column` takes a label or index and returns an array
- Using array methods to work with data in columns
 - `a.item(row_index)` returns a value in an array
 - `a.sum()`, `a.min()`, `a.max()` or `sum(a)`, `min(a)`, `max(a)`

Manipulating Rows

- `t.sort(column)` sorts the rows in increasing order
- `t.take(row_numbers)` keeps the numbered rows
 - Each row has an index, starting at 0
- `t.where(column, are.condition)` keeps all rows for which a column's value satisfies a condition
- `t.where(column, value)` keeps all rows for which a column's value equals some particular value
- `t.with_row` makes a new table that has another row

Decennial Census

- Count how many people are in the US
- U.S. Constitution. Article I, Section 2

"Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers . . . The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of **ten Years**, in such Manner as they shall by Law direct."

- Census Bureau estimates the population in intervening years

Census Table

- Values have column-dependent interpretations
 - The SEX column: 1 is *Male*, 2 is *Female*
 - The POPESTIMATE2010 column: *7/1/2010 estimate*
- In this table, some rows are sums of other rows
 - The SEX column: 0 is *Total* (of *Male* + *Female*)
 - The AGE column: 999 is *Total* of all ages
- Numeric codes are often used for storage efficiency. Why?
- Values in a column have the same type, but are not necessarily comparable (AGE 12 vs AGE 999)

<http://www2.census.gov/programs-surveys/popest/datasets/2010-2015/national/asrh/nc-est2015-agesex-res.pdf>

Growth Rate

- The rate of increase per unit time
- After one time unit, a quantity **x** growing at rate **g** will be

$$\mathbf{x * (1 + g)}$$

- After **t** time units, a quantity **x** growing at rate **g** will be

$$\mathbf{x * (1 + g) ** t}$$

- If **after** and **before** are measurements of the same quantity taken **t** time units apart, then the *growth rate* is

$$\mathbf{(after/before) ** (1/t) - 1}$$

What is the annualized growth rate of the population?

What's next?

- Read Chapter 6-7 of [*Computational and Inferential Thinking*](#)
- Start working on Homework 1