Housekeeping:

- Catching up with reviewing project 1 - apologies - been a little outta bandwidth! But have a nice tutorial I wrote up on that for your review and input.
- Feel free to proceed to Project 2 without waiting for my thoughts about your dataset. Given the performance all term, you'll do fine. Remember, tho, you need a hypothesis or something you want to explore - without some boundary like this you'll be lost at the end of your project.
- Amazing job on some of the projects ...

Today: Visualization ... [This is my area so I've a lot to stay ... but won't (grin).]

Activities:

- *Romp thru slides and discussion.*
- *Two candidate activities - one about Swiss Heart disease, one not.*

Main Points:

1. Visualizations should represent a "truthful representation" of the data.
2. As a graphic language, visualizations are open to wide interpretations - so what kind of supporting data (warrant) will you provide?
3. Models: Communication model - let the end-user explore the data to discover "candidate answers" and settle the significance of the data ...
   a. versus "empirical" - biological in/out responsiveness and self-evident data or stats as sufficient reason to believe
4. Data ≠ Information: Data are static; information is the result of human cognition, establishing meaningfulness and enabling further action. [Vital, imho]

5. No settled theory of how to determine what data and what visualization technique to use. But ... trends are emerging and the data sometimes suggest what to do - e.g., time series?
6. Keep up on the literature about visualization and applications in your work domain.
7. As much a philosophical, ethical question as a computational one.

A quick history

- From columns of numbers (one *language*) to representations using another language (*visuals*).

- The set of pie charts, bar graphs, line graphs, etc., were the original "*exploratory data analysis*." [But the term is used promiscuously today for anything related to learning from data.]

- Impacted by graphic design --> information graphics. Links us to advertising art and modernism - of *speaking to the mind* without social filters. [Hmmm.... See German Idealism, Plato *Phaedrus*, Kant's *Kritik der Urteil*, Putnam, *Pragmatics*.]

- For representing things too small (like a virus) or too large (like the universe) but all things in the physical realm - *scientific visualization*. Stating the facts of science, as it were.

- The *purpose* of representing data in an aesthetic language is to explain, explore. Later in the philosophy and history of science comes "to predict." This marries the topic to forms of evidence, usually statistics.

- This, in turn, raises questions of *interpretation* and the sources of *evidence*. [Raises great questions in the history of science in the 1970s - the Strong

Empiricist program (as in Math) or the Social Constructionist (motivated by *ordinary language philosophy*). See Rorty "Ordinary language philosophy"; Feuerabend; Kuhn, and others about philosophy of science.

- Popularization and use of desktop computers ...

Drucker, J. *Grapheisis: visual forms of knowledge production.*

Geroimenko, V., & Chen, C. (eds.). *Visual information using SVG and X3D.*

Murray, S. *Interactive information visualization for the web.* *** Recommended.

Ware, C. *Information visualization: perception for design.*

Muntzner, T.

Steele, J. & Iliinsky, N. *Beautiful visualization.*

Meirelles, I. *Design for information.*

Benoit, G. *Introduction to information visualization.*

Lima, M. *Visual complexity: mapping patterns of information.*

Communications of the ACM.

Tufte, E. R. *Envisioning information*

Visual explanations

Visual display of quantitative information

Beautiful evidence