Variability

Randomness

Uncertainty

- how to measure them
  quantify

- how to make decisions when confronted by them.

Rainfall - easy to measure
  very variable.

# deer on campus - hard to measure
  very variable.

# chocolate chips in a cookie.

Is a new drug better than an old one in preventing/treating a disease?
How to design a trial to test a new drug?

Will the student sitting next to you say yes if you ask them on a date?

Should you ask them?

Probability - theoretical aspects of randomness

Inference - learning from data, taking randomness into account
Descriptive statistics
- describes the available data.
- computed from the data you have
  no uncertainty
% of AMS 5 students who are psychology majors.

Inferential Statistics
- making educated guesses based on data.

Is the % of social psychology majors in this room representative of the campus as a whole?

How well can we estimate the campus % from the data about the AMS 5 students?
Population - the entire set of interest
  eg all registered voters
  all UCSC students
  all deer on campus.

Sample - the part of the population
  about which we have collected
  data.

  eg. the students in this class

What your population is and what your
sample is depends on the question you're asking.

Is the sample representative of the
population?

If not, we call it biased.
268 enrolled students

27 Fresh 10%
127 Soph. 47%
77 Juniors 29%
37 Seniors 14%

Is this sample biased as is it a representative sample?

- depends on what the population is.

population:
all UCSC students - biased.
All students who have taken AMS 5 too few Fresh/Senior
in the last 5 years - representative.
Parameter - the unknown quantity of interest.
- often difficult to observe directly.
  eg % of US population < 16 years old.
  % of USC students who are female

Statistic - a value computed from a sample
- which can be used to estimate a parameter

data types

categorical vs numerical
  (qualitative) (quantitative)

  nominal (un-ordered)
  ordinal (ordered)

  discrete (quantized)
  continuous (not)

  # home runs
  # deer on campus.

  heights
  weights