STAT 512 sp 2020 Lec 00 slides

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These slides are an instructional aid; their sole purpose is to display, during the lecture, definitions, plots, results, etc. which take too much time to write by hand on the blackboard. They are not intended to explain or expound on any material.

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Goal of statistics:

Learn from random outcomes about the process which generated them.

DGP (experiments) \rightarrow data (outcomes)

Experiment

An experiment is a process which generates an outcome such that there is

- (i) more than one possible outcome
- (ii) the set of possible outcomes is known
- (iii) the outcome is not known in advance

STAT 511 introduced set theory, probability theory, and then random variables.

STAT 511 topics under random variables (rvs):

- Probability distributions
- Cumulative distribution function (cdf)
- Probability density/mass function (pdf/pmf)
- Expected value and variance
- Suite of ought-to-know pmfs and pdfs
- Quantiles
- Moments and moment generating functions (mgfs)
- Joint and marginal distributions when considering multiple rvs
- Conditional distributions, conditional expectation/variance
- Independence of random variables
- Covariance and correlation
- Hierarchical models

But in STAT 512, we study how to learn from the data...

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Overview of STAT 512:

- Study the distributions of transformations of rvs (like 511 cont.)
- Introduce a DGP called the random sample
- Of Define statistics as functions of the values in a sample.
- Study the sampling distributions of statistics.
- Learn how to learn about the DGP via
 - Estimation of quantities related to the "population distribution"
 - Inference about these quantities in the form of
 - * Confidence intervals
 - ★ Hypothesis testing (this more in STAT 513)