STAT 135 - Lab 2
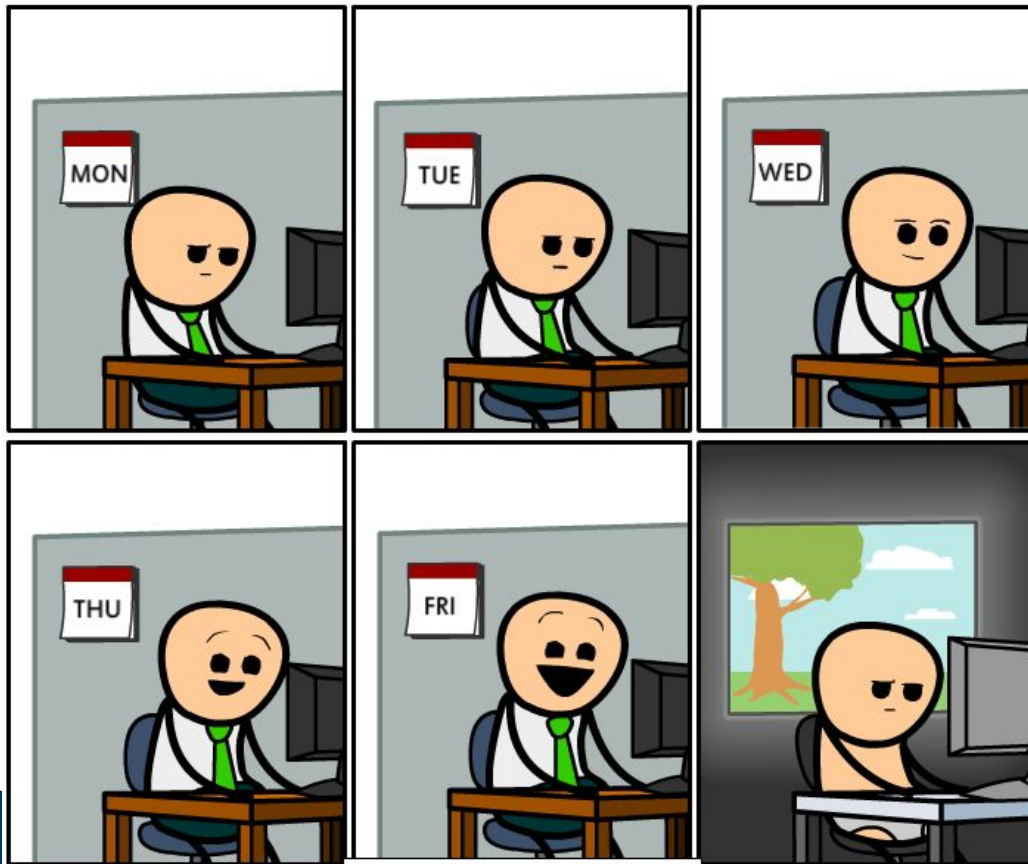
GSI: Yutong Wang
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Check in

Any questions for HW1 or class?

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To-do Today

- SD of combined list
- Method of Moments (MoM)
- Proof a lemma of SD
- R Practice: Bootstrap a CI

1A. SD of combined list

A population consists of n men and n women. The heights of the men have an average of μ_m and an SD of σ_m. The heights of the women have an average of μ_w and an SD of σ_w. Find a formula for the SD of the heights of all $2n$ people, in terms of μ_m, μ_w, σ_m and σ_w.

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1B. SD of combined list

Two populations are surveyed with simple random samples. A sample of size n_1 is used for population I, which has a population standard deviation σ_1; a sample of size $n_2 = 2n_1$ is used for population II, which has a population standard deviation $\sigma_2 = 2\sigma_1$. Ignoring finite population corrections, in which of the two samples would you expect the estimate of the population mean to be more accurate?

2. Method of Moments (MoM)

Consider the i.i.d. random variables $X_1, X_2, \ldots, X_n \sim N(\mu, \sigma^2)$ with both μ and σ^2 unknown. Find $\hat{\mu}_{MM}$ and $\hat{\sigma}^2_{MM}$, i.e., the MoM estimators of the mean and the variance.

3. Lemma for SD

Let $x_1, x_2, \ldots, x_n$ be a list of numbers with mean μ and SD σ. Show that

$$\sigma^2 = \frac{1}{n}\sum_{i=1}^{n} x_i^2 - \mu^2. \tag{1}$$

4. R Practice

Goal: nonparametric bootstrapping a 95% CI

Instructions:

Go to bCourses (STAT 135)

---> Pages

---> Labs

---> lab2.Rmd

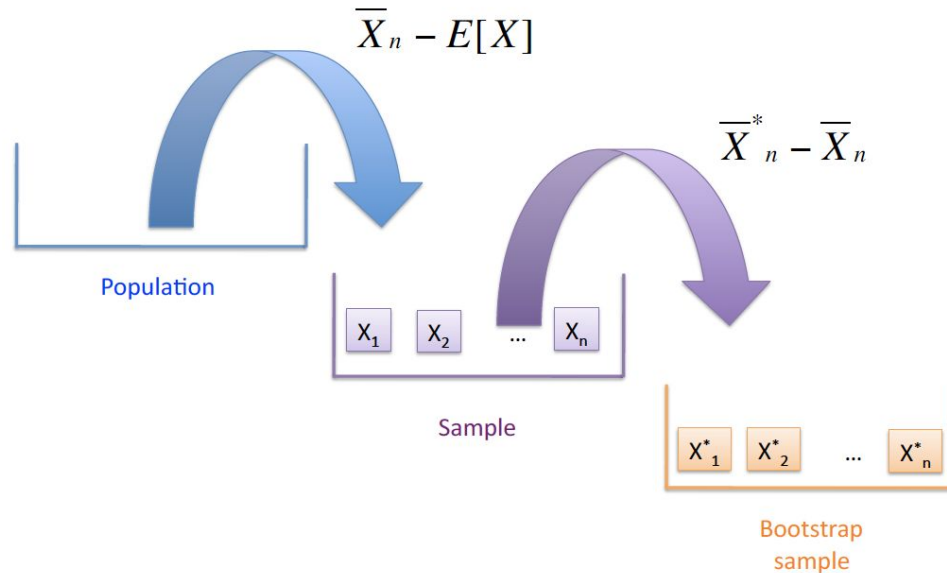# Nonparametric Bootstrap

Figure 1: *Bootstrapping the mean.* The distribution of $\bar{X}_n - E[X]$ is approximated by the distribution of $\bar{X}_n^* - \bar{X}_n$.

Lecture slide in STAT C245C, Fall 2018, taught by Sandrine Dudoit at UC Berkeley

Learning Resources for Bootstrap

1. Lecture notes of STAT 200:Introduction to Statistical Inference, at Stanford

   http://web.stanford.edu/class/stats200/Lecture19.pdf

2. Which Bootstrap when? (lecture notes of STATS 36-402, Spring 2013, at CMU)

   https://www.stat.cmu.edu/~cshalizi/uADA/13/lectures/which-bootstrap-when.pdf