Week 4 Stats, Monday

Announcements/Questions:

- Stats Reading getting a little heavy? Stats Main Page has pages to emphasize!
    - This week: Ch. 7 (it's short & sweet). Priorities (most to least important)
        1. pp 162-182, 200-204 – the bestiary
            - categorical x, continuous y - ANOVA 1-way layout
            - categorical x, categorical y - tabular designs (week 7?)
        2. pp 182-194 - ANOVA 2-way layouts, split plot designs, 3+ factors
        3. pp 194-200 – experiments over time, fully crossed design (experimental regression)

- *Stats Syllabus* redone as blogs page (not doc)
- No class Wednesday (Day of Absence) – see week's schedule for activities

- OK to post .docx lecture notes instead of .pdf's?
- Evergreen grad (UMass/Amherst grad student) questioned stats of eminent Harvard profs!

Today

- Type I and Type II Errors (Ch. 4)

Your choice	**Retain H_0**	**Reject H_0**
In the real world		
H_0 true	Correct Decision	Type I error
H_0 false	Type II error	Correct Decision

I

Examples:

- What is our H0 for anthropogenic Climate Change?

  If indeed climate change is anthropogenic, and we incorrectly fail to reject a false H0. We retain the null hypothesis and do nothing to slow climate change
  we have committed a Type II error. This is indeed grave.
  In this case, we want a high β, and are willing to sacrifice α

  "Precautionary Principle"

- Similarly, what is your H0 for a new chemical pesticide?

  Assume it does no harm until proven otherwise?

- Analogy to "producer" vs. "consumer" errors.
  What does this mean to you, as a consumer?

- p-values vs. power – α vs. β
  Parametric statistics tend to control α, the probability of a type I error
  an inverse, but not simple relationship.
  typically, you'll need a larger n for greater statistical power (or will have to relax p)

  p. 103, figure 4.5

- Ch. 5: The 3 Frameworks (Parametric, Monte Carlo, Bayesian)
  - parametric vs monte carlo
  - next week – something about Bayesian

- Ch. 6: Field Experiments

- What makes a good study design?
  - Recognizing a bad one….
- Basic kinds of field experiments

- Ch. 7: Bestiary of Experimental and Sampling Designs (see slides)

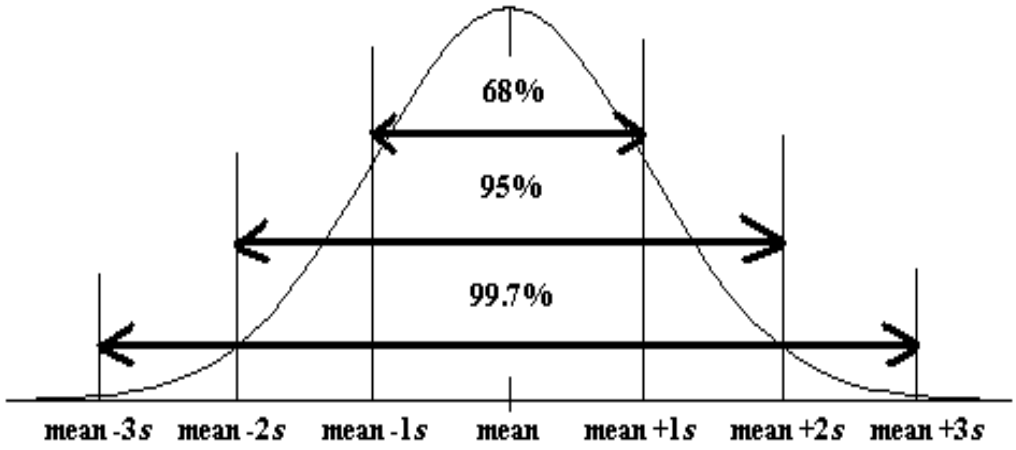
- T-test – comparing 2 means
  - Independent samples, randomly selected
  - Drawn from a randomly distributed population
  - Student's (Gosset's) t-distribution (2-sample t-test t-tables)
    - For $t_{critical}$, need p-value & degrees of freedom (n1 + n2 -2)
  - Example p. 109 (#ants in field vs. ants in forest)
  - H0 :
  - Ha :

- ANOVA – comparing more than 2 means (chalk talk – next week)
  - H0 :
  - Ha :
  - assumptions for parametric ANOVA–
    - normality (Shapiro-Wilks test)
    - equal variances (Levene's test)

- Discussion: Parametric vs. nonparametric ANOVA

- **Advanced ANOVA topics – deferred to Week 5**

- **Standard Deviation vs. Standard Error (vs. Covariance)**



- To review for next week's quiz? What to expect next week? A take home exam?