Decision Theory:
How do we make “good” decisions?

Data 102 Fall 2022 Lecture 5

Today’s lecture will be a little more math-heavy than what we’ve done so far.

You can follow along with the typed up lecture notes posted on the website.

Weekly Outline

- So far: multiple decisions, controlling error rates
- **Today: decision theory**
  - How do we make the “best” decisions (and what does “best” mean, anyway)?
- Next week: Bayesian modeling

Binary Decision-Making: Review

- Goal: Make binary **decisions** under **uncertainty**
  - p-values / decision probabilities => decisions
- Understand the impact of **assumptions**
  - e.g., controlling FWER vs FDR
- Setup: we need to make multiple binary decisions
- Could be binary predictions (e.g., logistic regression)
- Could be hypothesis tests
  - Different tests on the same dataset
  - Same test on different datasets
  - Many tests on many datasets
- Goal: make as few mistakes as possible (but what kind of mistakes?)
- Different goals and problems lead to different algorithms
  - Naive (no correction) vs Bonferroni vs B-H vs LORD