Statistics 514: Design of Experiments

Topic 9 Summary

ANCOVA

- Nuisance factor x is unknown covariate.
- Often group then premeasure
- Want simple model of x with y

Mechanics

- *Objective* – variance reduction
- Center covariates (keep $\hat{\tau}_i$, $\hat{\mu}_i$ unbiased)
- Extra assumptions: linear model, independence from treatment, domain
- Simple formulas for estimators
- Most interest in testing effects (intercepts)
- Can also test slopes, contrasts
- Can "check" (i.e., negate) ANOVA assumptions
- *Geometry*
  - Fit each group with same slope
  - Compare intercepts
  - `lsmeans` predicts at $\bar{x}$
- *Regression* – adds columns to design matrix
- *Nonconstant slope*
  - Interaction with treatment group
  - Plot for each group to diagnose

Optimal Designs

- Assign continuous factor levels
- Different goals and properties and optimality criteria lead to different designs.
- Linear regression – spread out points and center; does not check linearity
- Optimization often done iteratively over set of candidate points.
- Weights often reflect non-constant variance in addition to optimal weighting.