

Exam 1 Topics

BIOE 498/598 PJ

Spring 2022

Factorial designs

- Vocabulary
 - OFAT design
 - Factorial design
 - Qualitative factor
 - Quantitative factor
 - Treatment
 - Run
 - Replicate
 - Duplicate
 - Design matrix
 - Planning matrix
- Main effects: definition and calculation
- Interactions: definition and calculation
- Given a set of effects, find the optimal factor levels
- Hidden replication in factorial designs

Linear models

- Writing a linear model to predict a response
- Comparing effect sizes and regression coefficients
- Interpreting farplots

Active effects

- Practical vs. statistical significance
- Interpreting effect dotplots
- Interpreting halfnormal plots

Fractional factorial designs

- Effect principles
 - Effect sparsity
 - Effect hierarchy
 - Effect heredity
- Notations (2^{k-p})
- Confounding
- Base designs
- Generators, Defining relations, and generator algebra
- Calculating confounding for effects (alias structure)
- Degrees of freedom and number of estimable effects in linear models
- Design guidelines

- Resolution
- Aberration
- Clarity
- Foldover designs
- Mirror image designs
- Blocking

Replication

- Reasons for replicating designs
- Sample variance
- Standard error of effects
- Location vs. dispersion
- $\ln s^2$ as an estimate of dispersion
- Nominal-the-best optimization
 - Nominal values
 - Adjustment factors
- Robust parameter design
 - Control factors
 - Noise factors
 - Importance of interactions

Screening designs

- Reasons for factor screening
- Resolution III designs
 - Pros and cons
- PB designs
 - Pros and cons
 - Definition of complex aliasing
 - Relationship to fractional factorial designs
 - Creating PB designs by cyclic rearrangement
 - Assigning factors to columns
 - Interpreting linear models of PB designs
 - All-subsets regression

Topics *not* covered

- Definitive screening designs
- Bayesian model selection
- The R programming language