

# Preface

## **I-optimal Design of Experiments Using R**

1. Preface
2. A Short Introduction to R
  1. R, R Studio, and user-written libraries
  2. Data types
  3. Reading and writing data
  4. Operations with vectors and matrices
  5. Logical operators
  6. Base R graphics
  7. Selected R libraries (plot3D, mix.DOE, and the optimization one)
3. Response Surface Models
  1. Amount models (Cartesian space)
  2. Mixture models (Simplex space)
  3. Mixture-amount models (Combined space)
  4. Mixture-process models (Combined space)
  5. Mixture-amount-process models (Combined space)
4. Constructing I-optimal Designs
  1. Point optimization
    1. Weighting matrix construction
    2. Space matrix construction
    3. Point selection and optimization
  2. Pick-and-exchange algorithms

3. Design visualization using R
5. Experiments in 2-D Cartesian Space
  1. Unconstrained spaces
  2. Constrained spaces
6. Experiments in 3-D Cartesian Space
  1. Unconstrained spaces
  2. Constrained spaces
7. Experiments in 4-D and Higher Cartesian Spaces
  1. Unconstrained spaces
  2. Constrained spaces
8. 3-Component Mixtures
  1. Unconstrained spaces
  2. Constrained spaces
9. 4-Component Mixtures
  1. Unconstrained spaces
  2. Constrained spaces
10. 5-Component and Higher Mixtures
  1. Unconstrained spaces
  2. Constrained spaces
11. Mixture Experiments in the Complete Simplex
  1. 3-component mixtures
  2. 4-component mixtures
  3. 5- and higher component mixtures
12. Mixture Experiments in the Constrained Simplex
  1. 3-component mixtures
  2. 4-component mixtures

- 3. 5- and higher component mixtures
  - 4. Design construction using R
    - 1. Point optimization
    - 2. Pick-and-exchange
  - 5. Design visualization using R
13. Mixture-Amount Experiments
- 1. 3-component mixture-amount experiments
  - 2. 4-component mixture-amount experiments
  - 3. 5- and higher component mixture-amount experiments
  - 4. Design construction using R
    - 1. Point optimization
    - 2. Pick-and-exchange
  - 5. Design visualization using R
14. Constrained Mixture-Amount Experiments
15. Mixture-Processing Experiments
16. Mixture-Amount-Processing Experiments
17. Designs using Non-linear Response Surface Models
- Appendix 1 – Design Visualization Using ggplot