Exam 2 Topics

BIOE 498/598 PJ

Spring 2021

1. Steepest Ascent
    - Design space, design radius, center points
    - First-order response surfaces
    - Finding direction of steepest ascent
    - Standardized step sizes
    - Testing for pure error and lack of fit
2. RSM
    - Quadratic response models
    - Central composite designs (CCDs)
    - Uniform precision
    - Rotatable designs
    - Calculating factor levels
    - Finding stationary points
    - Responses at the stationary point
    - Testing for maxima/minima/saddle points
    - Alternative designs: BBD, Hoke, Koshal, Roquemore Hybrid, SCD, DSD
3. Mixtures
    - Slack variable and Scheffe models
    - SLD vs. SCD
4. Crossover Designs
    - Motivation for crossover designs
    - Washout, carryover
    - Blocking in crossover designs
5. Surrogate Optimization
    - Global vs. local optimization
    - Latin Hypercube Designs
    - Maximin Designs
    - Gaussian Process Regression
        - Kernels
        - Hyperparameters: scale, nugget, lengthscale

- Sequential design using mean, variance, and expected improvement
- Exploration vs. exploitation

6. Reinforcement Learning
    - Markov Decision Processes: state, action, policy, reward, trajectory, episode
    - Value functions
    - Rollout
    - Discount factors
    - TD learning for value functions
    - Q-factors
    - SARSA, Q-learning, and Double Q-learning
    - Neural networks: neurons, layers, activation functions, width, depth, loss, stochastic gradient descent
    - Deep Q-learning
    - Policy-based methods and REINFORCE