

MI255: Exposure-Response Modeling of Categorical, Count and Time-to-Event Data Using Bayesian and Maximum Likelihood Methods (2 CR)

MI255 is an intensive course providing an introduction to modeling of categorical, count, and time-to-event data, and the practical use of WinBUGS and NONMEM[®] for such applications. The course provides some basic theory and illustrates some of the advantages of using Bayesian methods for these types of data sets. Participants may apply the 2 credit hours from this course to the Metrum Institute Certificate Program in Pharmacometrics.

Instructors

Bill Gillespie, Marc Gastonguay, and Metrum Institute staff

Prerequisites

Experience with PK-PD modeling and some familiarity with nonlinear regression, mixed-effects modeling, basic Bayesian principles, WinBUGS and R (or S-Plus) is required. Applicable MI courses include: MI200, MI205 (formerly MI220), MI210, MI212 and MI250, or contact us: info@metruminstitute.org.

Computer Hardware/Software

This course requires a Windows laptop computer with an available USB 2.0 port. All required software used for hands-on examples will be freeware/open-source software and simple instructions will be provided for users to configure their computers before the course.

Summer 2010 Schedule

Tuesday, August 17 8:30am-4:30pm
Wednesday, August 18 8:30am-4:30pm

Location

College of the Atlantic
105 Eden Street
Bar Harbor, ME 04609

Accommodations

Metrum Institute does not provide hotel accommodations for students. All travel accommodations must be arranged independently.

Fees

Regular registration: \$2000 USD / Academic & government registration: \$1000 USD

Course Outline

1. Motivating examples
2. General theory/background
 - Modeling from a probabilistic viewpoint: the likelihood function.
 - Maximum likelihood (ML) for continuous data
 - Extending ML to odd-type data
 - Hierarchical (mixed effects) modeling of longitudinal odd-type data
 - Bayesian modeling of odd-type data
3. Modeling binary data
 - Logistic regression models
 - Bernoulli model for individual binary data
 - Binomial model for summary data
 - Mixed effects modeling of longitudinal binary data
4. Hands-on problem 1: Logistic regression for binary data
5. Model evaluation, esp. simulation-based approaches
6. Hands-on problem 2: Longitudinal binary data
7. Modeling ordered categorical data

- Cumulative logit models
 - Modeling longitudinal data: comparative performance of approx. ML and MCMC
8. Hands-on problem 3: Longitudinal ordinal data
 9. Modeling count data
 - The Poisson model
 - Variations on the Poisson model to deal with over-dispersion or “zero inflation”
 10. Hands-on problem 4: Longitudinal count data
 11. Modeling time-to-event data for a single event per individual
 - Principles and methods of survival analysis for modeling censored data
 12. Hands-on problem 5: Time-to-event data: constant hazard model
 13. Model with time-varying hazard
 14. Modeling repeated time-to-event data
 15. Closing discussion