Measurement error models

The series of lectures provide an introduction to measurement error, more recent work on Bayesian analyses and nonparametric regression, respectively. The audience is assumed to be familiar with standard topics in statistics and data analysis such as linear and generalized linear models, random effects, maximum likelihood estimation, and Bayes theorem.

- Introduction, Examples, Effects of Measurement Error in Linear Models
  - Why we need special methods for measurement errors
  - Measurement error examples
  - Structure of a measurement error problem
  - Classical error model in linear regression
- Data Types, Nondifferential Error, Estimating Attentuation, Exact Predictors
  - Nondifferential measurement error
  - Estimating the attenuation
  - Replication and validation data
  - Internal and external subsets
  - Transportability across data sets
  - Is there an "exact" predictor?
- Berkson/Classical, Structural/Functional, Regression Calibration
  - Berkson and classical measurement error models
  - Functional, classical structural, and flexible structural modeling
  - Regression calibration
  - Multiplicative error
- SIMEX And Instrumental Variables
  - The key idea behind SIMEX (Simulation/Extrapolation)
  - An empirical version of SIMEX
  - Details of simulation extrapolation algorithm
  - Example: measurement error in SBP in Framingham study
  - IV (instrumental variables): rationale
  - IV via prediction and the IV algorithm
  - Example: Calibrating a FFQ
  - Example: CHD and Cholestrol

- Bayesian Methods
  - Likelihood: outcome, measurement, and exposure models
  - Priors and posteriors
  - MCMC
  - Example: linear regression
  - Example: Mixtures of Berkson and classical error and application to thyroid cancer and exposure to fallout
- Nonparametric Regression With Measurement Error
  - Earlier approaches: deconvolution kernels, SIMEX, regression calibration
  - New Bayesian spline approach
  - Simulation results
  - Example: ...
- Misclassification
- ....