SPH-Q 650
Semiparametric Regression with R

Fall 2017
Syllabus

A. Instructor:
   Jaroslaw Harezlak, Associate Professor

   Contact information:
   Department of Epidemiology and Biostatistics
   Indiana University School of Public Health-Bloomington
   1025 E 7th St., C107
   Bloomington, IN 47405

   Office: (812) 855-6719
   Email: harezlak@iu.edu

   Office hours: Mondays 10:30-11:30am or by appointment

B. Time and Place

   Mondays 2:30 – 5:00 PM
   Location: WM 195 (SouthWest corner of the Wildermuth Intramural Center – WIC)

   August 21st till December 10th, 2017
   NO class: 9/4 (Labor Day), 11/20 (Fall Break)

C. Course Description:
   Semiparametric regression methods build on parametric regression models by allowing more
   flexible relationships between the predictors and the response variables. Examples of semiparametric
   regression include generalized additive models, additive mixed models and spatial smoothing. Our
   goal is to provide an easy-to-follow applied course on semiparametric regression methods using R.
   There is a vast literature on the semiparametric regression methods. However, most of it is geared
   towards researchers with advanced knowledge of statistical methods. This course explains the
   techniques and benefits of semiparametric regression in a concise and modular fashion. Spline
   functions, linear mixed models and hierarchical models are shown to play an important role in
   semiparametric regression. There will be a strong emphasis on implementation in R with a lot of
   computing exercises. This course is based on the upcoming book ‘Semiparametric Regression with
   R’ by J. Harezlak, D. Ruppert, and M.P. Wand (Springer).

D. Prerequisites:
   SPH-Q 604 (Linear regression) or an equivalent course. Some familiarity with R statistical
   computing environment is assumed. Students who are uncertain about their level of preparation are
   encouraged to contact the instructor.
E. Course Description for Bulletin:

F. Educational objectives:
At the end of the course students:
- will know how to model in a principled way nonlinear relationships between the predictor and outcome variables
- will be able to apply appropriate methods using modern computational algorithms

G. Lecture schedule
1. Introduction to Semiparametric Regression
2. Linear Regression Methods Overview
3. Introduction to Smoothing
4. Linear Mixed Model Overview
5. Smoothing Parameter Selection
6. Linear Mixed Models and REML
7. Confidence Intervals, Confidence Bands and Hypothesis Testing
8. Simple Semiparametric Models
9. Additive Models
10. Semiparametric Mixed Models
11. Interaction Models
12. Introduction to Generalized Linear Models (GLM)
13. Generalized Additive Models
14. Bivariate and Spatial Smoothing
15. Large Sample Theory
16. Measurement Error Models

H. Required and Recommended Text:
No required text. Most of the material will be taken from (HRW) (HRW) “Semiparametric Regression with R” by J. Harezlak, D. Ruppert and M. Wand, Springer (to appear in early 2018)

Some helpful books:

I. Evaluation and Grading:
Students will be evaluated based on their performance on the homework assignments (40%), final presentation (20%), and the term paper (40%). Letter grades for the course are assigned using the following scale: A: 90-100; B: 80-89; C: 70-79; D: 60-69; F: less than 60. Within each letter grade, “+” and “-“will be assigned if the numeric score is in the top and bottom quintiles, respectively.
J. Cheating and Plagiarism:
Academic misconduct will not be tolerated and all cases will be reported. Examine the IU Code of Student Rights, Responsibilities, and Conduct at http://studentcode.iu.edu and in particular examine the rules regarding academic misconduct at http://studentcode.iu.edu/procedures/bloomington/discipline/academic-misconduct/
Violations of these rules will result in a grade of "F" (or 0%) for the assignment in question, and may result in an "F" for the course or even expulsion from the university.

K. Students with Disabilities
Students needing accommodations because of a disability will need to register with Disability Services for Students (DSS) and complete the appropriate forms issued by DSS before accommodations will be given. The DSS office is located in Herman B Wells Library, Suite W 302. You can also reach the office by calling (812) 855-7578. Visit https://studentaffairs.indiana.edu/disability-services-students/index.shtml for more information.