

BIOST 2021

Special Studies in Bayesian Data Analysis

Fall/2016

Class location: **Room A425 Crabtree Hall**

Class schedule: Monday, Wednesday 3:30PM-5:20PM (Four 50-minute lectures per week for eight weeks);
9/28 (Wed) - 11/21 (Mon)

Course homepage: use Blackboard

Lecturers: George C. Tseng, Li Zhu, Zhiguang(Caleb) Huo, Tianzhou(Charles) Ma, and invited speakers
(Abdus Wahed and Robert Krafty)

Office: A443 Crabtree Hall (George Tseng); Office hour: by appointment

Email address: ctseng@pitt.edu (George Tseng)

Telephone number: 412-624-5318

Lecturer's homepage: <http://www.pitt.edu/~ctseng> (George Tseng)

Course Description:

This is a 2-credit Special Studies course for introductory Bayesian analysis. We will follow selected chapters from the BDA textbook to help advanced graduate students lay foundation for research using Bayesian modeling. In the last two lectures, invited lecturers will give a few case studies (e.g. genomics applications, joint modeling in diabetes data and application of physiological time series data).

Tentative Schedule of Sessions and Assignments:

<i>Part I: Fundamentals of Bayesian Inference</i>	
9/28 (George)	Basic probability and inference for Bayesian (Ch 1)
10/3 (George)	Single parameter models (Ch 2)
10/5 (George)	Multiparameter models (Ch 3)
10/10 (George)	Asymptotics, connections to non-Bayesian approaches and hierarchical models (Ch4 and 5)
<i>Part II: Fundamentals of Bayesian Data Analysis</i>	
10/12 (Li)	Model checking (Ch 6)
10/17 (Li)	Evaluating, comparing and expanding models (Ch 7)
<i>Part III: Advanced Computation</i>	
10/19 (Caleb)	Intro to Bayesian computation (Ch 10)
10/24 (Caleb)	Basics of Markov chain simulation (Ch 11)
10/26 (Caleb)	Computationally efficient Markov chain simulation (Ch 12)
10/31 (Caleb)	Modal and distributional approximations (Ch 13)
<i>Part IV: Various models</i>	
11/2 (Charles)	Regression models (Ch 14)
11/7 (Charles)	Hierarchical linear models (Ch 15); Generalized linear models (Ch 16)
11/9 (Charles)	Finite mixture models (Ch 22);
11/14 (Charles)	Dirichlet process models (Ch 23)
11/16 (Wahed; Charles)	Two case studies in genomics: Abdus Wahed (joint longitudinal and survival modeling in diabetes), Charles Ma (meta-analysis of transcriptomic studies)
11/21 (Rob; Li)	Two case studies:; Robert Krafty (physiological time series modeling); Li Zhu (multi-layer overlapping group structure in genomic data)

Textbook:

Bayesian Data Analysis (third edition), by Andrew Gelman, John Carlin, Hal Stern, David Dunson, Aki Vehtari, and Donald Rubin

Grade:

(1) In-class participation and discussion (2) Homework