Stat 136 (Bayesian Statistics)
Course Outline

Course Information

Course Code: Stat 136

Course Title: Bayesian Statistics

Pre-requisite: Stat 131 (Mathematical Statistics III)

Credit: 3.0 units

Semester Offered: Second Semester

Number of Contact Hours per Week: 2 hours lecture (9-11 W) and 3 hours laboratory (8-11 Th) per week

Course Description: Elements of Bayesian inference; assessment of prior, likelihood, and posterior distributions; Bayesian estimation and hypothesis testing; predictive distribution and asymptotics; Bayesian hierarchical models; introduction to Empirical Bayes

Course Outcomes

1. Differentiate Bayesian and classical/frequentist inference;
2. Perform Bayesian inference for the parameter(s) of discrete distributions;
3. Perform Bayesian inference for the parameter(s) of continuous distributions; and
4. Bayesian regression, and Markov Chain Monte Carlo, hierarchical Bayes, and empirical Bayes models

Topical Outline

Module 1. Bayesian inference for the parameter(s) of discrete distributions

1. Introduction to bayesian statistics
2. Bayesian inference for a binomial proportion using a discrete prior
3. Bayesian inference for a binomial proportion using a continuous prior
4. Bayesian inference for the Poisson mean

Module 2. Bayesian inference for the parameter(s) of continuous distributions

1. Bayesian inference for the mean of a normal distribution using a discrete prior
2. Bayesian inference for the mean of a normal distribution using a continuous prior
3. Bayesian inference on difference between two means
4. Bayesian inference on difference between two proportions
5. Bayesian inference for the variance and standard deviation

Module 3. Bayesian inference for simple linear regression; Markov Chain Monte Carlo; and hierarchical and empirical Bayes

1. Bayesian approach to simple linear regression
2. Markov Chain Monte Carlo
3. Introduction to hierarchical models and empirical Bayes

References

1. Johnson, A. A., M. Q. Ott, and M. Dogucu (2022). Bayes Rules! An Introduction to Applied Bayesian Modeling. CRC Press Taylor & Francis Group, LLC
2. Albert, J. and Hu, J. (2020). Probability and Bayesian Modeling. CRC Press Taylor & Francis Group, LLC
3. Bolstad, W. M. and Curran, J. M. (2017). Introduction to Bayesian Statistics, 3rd edition. John Wiley & Sons, Inc.
4. Gelman, A., et al (2013). Bayesian Data Analysis, 3rd edition. Chapman and Hall/CRC.
5. Puza, B. (2015). Bayesian Methods for Data Analysis. ANU eView. Australian National University. Available at http://eview.anu.edu.au.
6. https://statswithr.github.io/book/
7. https://www.stat.columbia.edu/~gelman/book/

Course Requirements and Grading System

1. Quizzes (15%)
2. Problem Sets (25%)
3. Long Examinations (60%)

Grading System (% Passing: 60 %)			
Range	Grade	Range	Grade
98-100	1.00	53-59	3.25
95-97	1.25	46-52	3.50
90-94	1.50	39-45	3.75
85-89	1.75	32-38	4.00
80-84	2.00	25-31	4.25
75-79	2.25	18-24	4.50
70-74	2.50	11-17	4.75
65-69	2.75	0-10	5.00
60-64	3.00		