

ICPSR 2011

**Advanced Bayesian Models for the Social Sciences:
Bayesian Methods for Ideal Point Estimation**

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This course covers theoretical foundations and Bayesian estimations of item response theory (IRT) models. We start from the history of roll call data analysis in political science and social sciences and discuss the connection between spatial voting models and item response theory models. We learn Bayesian implementation of item response theory models using Markov chain Monte Carlo methods. Then, we review important extensions of IRT models such as the issue of multidimensionality, dynamic ideal points, and hierarchical modeling. Students are expected to have basic understandings of Bayesian statistics and working knowledge of R programming.

Day 1: History of Roll Call Data Analysis

James Enelow and Melvin Hinich. 1984. *The Spatial Theory of Voting*. New York: Cambridge University Press.

Keith Poole and Howard Rosenthal. 1985. "A Spatial Model of Legislative Roll Call Analysis," *American Journal of Political Science*, 357-384

James J. Heckman and James M. Snyder Jr. 1997. "Linear Probability Models of the Demand for Attributes with an Empirical Application to Estimating the Preferences of Legislators," *The RAND Journal of Economics*, 28: 142-189.

Keith Poole, 2000, "Non-parametric unfolding of binary choice data" *Political Analysis* 8: 211-32.

Wijbrandt H. van Schuur. 2003. "Mokken Scale Analysis: Between the Guttman Scale and Parametric Item Response Theory" *Political Analysis* 11: 139-63.

Keith Poole. 2005. *Spatial Models of Parliamentary Voting*. New York: Cambridge University Press.

Day 2: Binary Choice Models and IRT Models

Daniel McFadden. 1974. "Conditional Logit Analysis of Qualitative Choice Behavior." in P. Zarembka (ed.), *Frontiers of Econometrics*. New York: Academic Press.

J. Scott Long. 1997. "Ch. 3. Binary Outcomes: The Linear Probability, Probit, and Logit Models" in *Regression Models for Categorical and Limited Dependent Variables*

(Advanced Quantitative Techniques in the Social Sciences). Sage Publications.

George Rasch. 1980. *Probabilistic Models for Some Intelligence and Attainment Tests*. Chicago: The University of Chicago Press.

Yoshio Takane and Jan de Leeuw, 1997. "On the relationship between item response theory and factor analysis of discretized variables," *Psychometrika*, 52(3): 393-408.

John Londregan. 2000. Estimating Legislators Preferred Points, *Political Analysis* 8: 35-56.

Day 3: Bayesian Estimation of IRT Models

Jim Albert and Siddhartha Chib. 1993. "Bayesian Analysis of Binary and Polychotomous Response Data" *Journal of the American Statistical Association*, 88: 669-679.

Chapter 6 . Johnson, Valen, and James Albert. 1999. *Ordinal Data Modeling*. New York: Springer.

Simon Jackman, 2001. "Multidimensional Analysis of Roll Call Data via Bayesian Simulation: Identification, Estimation, Inference, and Model Checking." *Political Analysis*. 9: 229-240.

Joshua Clinton, Simon Jackman, and Doug Rivers, 2004, "The Statistical Analysis of Roll Call Voting: A Unified Approach," *American Political Science Review* 98: 355-370.

Joseph Bafumi, Andrew Gelman, David Park, and Noah Kaplan. 2005, "Practical Issues in Implementing and Understanding Bayesian Ideal Point Estimation." *Political Analysis* 13: 171-187.

Roy Levy. 2009. "The Rise of Markov Chain Monte Carlo Estimation for Psychometric Modeling" *Journal of Probability and Statistics*

Day 4: Extensions, Applications, and Critiques

Jong Hee Park, 2011. "Analysis of Preference Changes using Bayesian Change-point Item Response Theory Model," To appear in Steve Brooks, Andrew Gelman, Galin Jones and Xiao-Li Meng, eds., *Handbook of Markov Chain Monte Carlo*, Chapman & Hall/CRC Press.

Benjamin E. Lauderdale. 2010. "Unpredictable Voters in Ideal Point Estimation" *Political Analysis* 18: 151 - 71.

Michael Peress, 2009, "Small Chamber Ideal Point Estimation." *Political Analysis* 17: 276 - 290.

Daniel E. Ho and Kevin M. Quinn, 2008, "Measuring Explicit Political Positions of Media," *Quarterly Journal of Political Science*, 3: 353-377.

Johsua Clinton and Adam Meirowitz. 2004. "Testing Accounts of Legislative Strategic Voting: The Compromise of 1790," *American Journal of Political Science* 48(4):675-89.

Andrew Martin and Kevin Quinn. 2002. "Dynamic Ideal Point Estimation via Markov Chain Monte Carlo for the US Supreme Court, 1954-1999" *Political Analysis* 10: 134-153.

Michael Bailey and Kelly H. Chang, 2001, "Comparing Presidents, Senators, and Justices: Interinstitutional Preference Estimation" *Journal of Law, Economics, and Organization* 17: 477-506

Day 5: Software Implementations

Example BUGS and R codes.